[L. & M. 5,000—12-6-02.]

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Local & Munl. (1899) Department.

MISCELLANEOUS.

G.O., No. 44 Pmis ✓

DATED 6-1-99

[Despatch Abstract.]

Report on the outbreak of plague in the Jullundur & Hoshiarpur Districts. 1897-98

Requesting the Government of the ~~Punjab~~ that this Government may be supplied with six additional copies of the ——, together with a copy of the review of the Lieut. Governor thereon.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

[L & M.]
150—30-6-97.

LOCAL AND MUNICIPAL DEPARTMENT.

Papers to be read in proceedings :—

Again G.O., No. dated 189 .

Again G.O., No. dated 189 .

Current No. 2802 P of 189 8, dated 21-12-98, from the Govt. of Punjab.

" " " 189 , " , "

" " " 189 , " , "

ORDER. No. 44 P mis 96-1-99

The following letter will be addressed to the Government of Punjab :—

Letter

To

The Junior Secretary
to Government,
Punjab.

Sir,

With reference to para 2 of your letter, No. 1499, dated the 21st Dec., I am directed to state that six more copies of each of the reports forwarded with it are required for the use of this Government and to request that they may be supplied.

I.O. 5/1/99

H. 6/99

Local & Munl. (1898) Department.

CURRENT No. 2802 P

F. 3m

From The Govt of Punjab.

Order

No. 1499

Dated 21-.
Received 29-.
Registered 29-.
} Dcer 98

Enclosures 2

Spare copies. 1 S.C of 1 Encl & 1 S.C of report already sent

SUBJECT.

Forwarding copy of the report on the outbreak of plague in the Jullundur and Hoshiarpur Districts for 1897-98 together with the review of the Lt. Governor thereon, and enquiring whether any more copies of the reports are required.

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

1499

Cir. 2802

The Chief Secretary to
Govt:, Madras.
Local & Mcpal Depts

21st: Dec: 98.

His Excellency the Governor

SECRETARY TO GOVERNMENT
LOCAL & MUNICIPAL DEPARTMENT

44 Plague
99

Proceedings of the Hon'ble the Lieutenant-Governor of the Punjab in the Home (Medical and Sanitary) Department, No. 1479 $\frac{L}{P}$, dated 17th December 1898.

READ—

Letter No. $\frac{2311\frac{1}{2}\ U.}{XVII—43}$, dated 25th July 1898, from the Officiating Commissioner, Jullundur Division, forwarding reports on plague operations in the Jullundur and Hoshiárpur Districts by Major Inglis and other officers.

Letter No. 3950, dated 1st November 1898, from the Inspector-General of Civil Hospitals, Punjab, forwarding report on plague operations in the Jullundur and Hoshiárpur Districts by Captain James, I. M. S., with remarks by other Medical Officers.

Read again—

The diaries of officers employed on plague duty.

The correspondence from October 1897 regarding measures for the extermination of plague in the Jullundur and Hoshiárpur Districts.

REMARKS.—The epidemic of bubonic plague which occurred in the Punjab in 1897-98 was confined to that tract of the Jullundur Doáb which lies between the Hoshiárpur Siwáliks and the line of the North-Western Railway, and to the southernmost portion of that tract. A metalled road runs westwards through the heart of it to the Railway at Phagwára, and it is also traversed by unmetalled roads connecting Hoshiárpur with Rúpar and Banga and Garhshankar with the Ludhiána District. No place was infected outside the Garhshankar Tahsíl of Hoshiárpur* and the Nawáshahr and Phillour Tahsíls of Jullundur; and in the last of the three named only seven villages were attacked. At the time that the disease was most threatening the area under suspicion included, in addition to the three tahsíls named, the Phagwára iláka of the Kapurthala State, and covered an area of 1,000 square miles with a population of $5\frac{1}{2}$ lakhs. Banga, a town with 5,010 inhabitants, and Garhshankar, with 6,000, were attacked in March 1898; but with these exceptions the disease took hold of agricultural villages only until the outbreak at Ráhon, which is referred to in paragraph 7. This circumstance, while it obviated some of the special difficulties which would be likely to hamper proceedings for the suppression of the disease in the larger towns, created others of a different nature. It was necessary to deal with an enemy which showed itself in numerous and distant centres; to establish and perfect an organization fitted to a task of which the aspect and proportions were continually changing; to maintain in a considerable tract of country destitute for the most part of accommodation for the superior itinerating staff a vigilant watch which was continued throughout the rigours of a Punjab summer; to provide for the needs of an agricultural population cut off in part from the means of transacting its ordinary business; and to secure so far as possible the co-operation, or at least the acquiescence, of a hardy race of peasants credulous of rumour and accustomed to the vigorous assertion of their rights. The outbreak was small, when measured by others which have worked havoc in less fortunate Provinces. Up to the end of September 1898 only 86 villages, with an aggregate population by the census of 1891 of 91,892, had been attacked. There were 3,409 seizures and 2,103 deaths. That the disease spread no further, across the fertile and thickly-populated Doáb,† or into those neighbouring hill tracts where the dangers of its permanent establishment are so grave; that no considerable town and no place in the immediate vicinity of the line of Railway, which is the main channel of communication from one end to the other of the Province, was attacked; and that a widespread visitation has been averted through one season of danger, is due, under Providence, to the

* A case, probably imported from Khatkar Kalán, which took place about October 26th at Jandiála (distinct from the Jandiála near Jullundur), a village 12 miles east of the town of Hoshiárpur, has not been referred to in the reports.

† The following cases which occurred to the west of the line of Railway have not been referred to in the reports, though they are recorded in the diaries of the officers on plague duty:—

An imported case discovered on March 17th at Jandiála, a large village about eight miles south of Jullundur Cantonment.

A case at Basti Sheikhán, a suburb of Jullundur, in March.

devoted labours of the Civil, Medical and Police staffs engaged in the operations. The efforts made, the staff employed, and the funds expended will cease to appear disproportionate to the task in hand when that which has been is compared with that which might have been.

2. The circumstantial and interesting account of the outbreak at Khatkar Kalán, which has been given by Captain James, I.M.S., establishes the probability of original infection from Hardwár in April 1897. The disease seems to have lain almost dormant throughout the hot weather, but at least two more centres of infection at Jhander Khurd and Khán Khanán appear to have been established from Khatkar before plague was officially diagnosed at the latter place on October 17th. On receipt of that day's report orders issued for the complete evacuation of the village site, and the isolation of the inhabitants by a police cordon; and an Assistant Commissioner, Mr. L. Jones, was placed on special duty to superintend the operations, while Captain James, I.M.S., Deputy Sanitary Commissioner, was put in medical charge. These measures under the supervision and control of the Commissioner of Jullundur, Colonel Massy, who was succeeded on April 20th by Mr. Silcock, formed the basis of the system which was followed throughout with but few and temporary modifications, and experience has justified them. They were received with very varying degrees of cordiality by the people; hearty co-operation was occasional; passive obstruction was common; but no active resistance to authority occurred till April 1898, when the number of centres of disease had so greatly increased that the same close attention to individual needs on the part of the superior European staff ceased to be possible, and when some degree of encouragement had perhaps been given to opposition by the attempt to conciliate popular sentiment. The opposition culminated in the attack which took place on the Police at Garhshankar on April 28th. The Police fired on the mob, and the town was forcibly evacuated, after which there was no more resistance to the measures taken for the eradication of the disease in either the Jullundur or the Hoshiárpur District. Mr. Glancy, Assistant Commissioner, writing from Banga on May 16th, observed: "When sickness was concealed and deaths unreported it was necessary to keep a far closer watch on the villages. Now cases of sickness are shown to the visiting officer without hesitation and deaths are reported within two or three hours night or day." Henceforth infected villages were promptly evacuated and the remedial measures received full and fair trial.

3. The disease, which had spread very slowly up to the end of December, when only 5 villages had been attacked, and one of these almost at once freed from the infection by prompt evacuation, appeared in January to be dying out, as no fresh centres were discovered (though it would appear that 8 were attacked), and the number of recorded attacks had fallen to 1 or 2 per diem; but in February 15 more villages were found to be infected, and in March 27 more; while at the end of April the number in which operations were in progress was 63, and the number of seizures on the 21st of that month reached the high figure of 52. The recorded number of seizures for the 1st of May is a good deal higher, but it includes many cases which were discovered after the incidents at Garhshankar had broken down opposition. The mode of spread from village to village was, without question in the vast majority of cases, human agency, and probably in all others the importation of infected clothing, which must of course have been carried by human beings. The evidence that rats or other vermin spread the disease from house to house is strong, but it is not so clear that they carry it from one village to another, though Captain James does not reject the theory altogether. The practical conclusions to be drawn are, first, that a cordon, if perfectly efficient and established at once, should have the effect of checking the spread of plague to new areas, and secondly, that, as the disease can be carried throughout a village, after all human beings have left it, unless the seat of infection is discovered and dealt with at a very early stage, disinfection must in all but exceptional cases be complete and not confined to the infected houses and their neighbourhood. In point of fact the disease was carried to new villages in 26 instances before any cordon was established, and in 48 instances after the establishment of the cordon and in spite of it. The bearing of these facts will be further discussed below.

4. The Civil, Medical and Police staffs were steadily increased as the field of operations extended. In March the whole of the suspected area was entrusted to a separate observation agency, consisting of 10 European Officers, 5 Civil and 5 Medical, with a large subordinate staff, which replaced the 2 Commissioned Medical Officers who had originally been employed to seek out fresh centres of the epidemic; and Major Inglis, Deputy Commissioner, Hoshiárpur, was placed on special duty to supervise the whole field of operations under the immediate control of the Commissioner. At the beginning of May the staff employed on plague duty was constituted as follows:—

IN GENERAL CHARGE.

1 Deputy Commissioner on Special Duty.

OBSERVATION STAFF.

Civil.

4 Assistant Commissioners.
27 Tahsíldárs and Náib Tahsíldárs.
60 Kánúngos.

Medical.

4 Commissioned Officers.*
11 Hospital Assistants.
22 Compounders.
3 Female Practitioners.
22 Dháís.

EXECUTIVE STAFF.

Civil.

8 Assistant Commissioners.
6 Tahsíldárs or Náib Tahsíldárs.

Medical.

5 Superior Officers.†
52 Hospital Assistants.
27 Compounders.
7 Dháís.
5 Nurses.
3 Sanitary Inspectors.

POLICE.

1 District Superintendent of Police on Special Duty.‡
4 Assistant Superintendents of Police.
4 Inspectors.
27 Deputy Inspectors.
272 Sergeants.
2,564 Constables.

By this time the control and conduct of operations had been greatly facilitated by the establishment in the month of April of special postal arrangements and of a field telegraph line from the Railway at Phagwára through the infected tract *viâ* Banga to Garhshankar.

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* By May 7th there were 5.

† By May 9th there were 3 more.

[NOTE.—These figures include Commissioned Medical Officers, one officer of the Uncovenanted Medical Service, one Military Assistant Surgeon and one Private Practitioner.]

‡ Later on a second District Superintendent of Police was on Special Duty for a short period.

5. Mr. Silcock, Officiating Commissioner of Jullundur, has remarked in paragraph 6 of the letter with which he forwarded Major Inglis' report, on the inadequacy of the staff immediately before the additions were made to it which raised its number to that given in the preceding paragraph; he has said that at this time "no rules had been laid down for the systematic conduct of operations; that there was no sufficient definition or distribution of duties by which responsibility could be enforced; that the Police cordon was so defective as to be of very little use; that the branch concerned with the purchase and provision of huts and materials for shelter was being starved; and that finally there was, among the executive staff, very great hesitation and doubt how far evacuation of village sites should be insisted on and how far the disinfection of such sites should be pushed." The remarks on the subject of the Police cordon will be discussed below. With regard to the provision of huts and shelters the Lieutenant-Governor is not certain whether Mr. Silcock's strictures are directed against the scantiness of the funds provided; but if this is the meaning, they are hardly justified by the facts, for *carte blanche* was given to the local authorities in the matter of expenditure. No doubt there were difficulties in the collection of materials at the time when the discovery of fresh centres of disease was a daily occurrence; but they were not difficulties which a more liberal supply of funds could have averted. There were times of course when the staff available on the spot was weak for the duties to be done; but this was a necessary consequence of the rapid and sudden increase in those duties, and the difficulty of adjusting establishment to a constantly growing task. The formulation of rules and the definition and distribution of duties were necessarily deferred till experience had marked out the appropriate lines of action. General principles were laid down for the guidance of the staff; particular questions and particular difficulties were dealt with as they arose; and Sir Mackworth Young is of opinion that much would have been sacrificed by premature attempts to stereotype the system of Plague Administration in all its details. The work was emphatically one in which it was desirable for Government and its officers to feel their way; and it is only now when all the facts are accessible for comparison and deduction that it becomes possible, without forestalling a doubtful experience, to formulate certain definite conclusions.

6. In writing of the hesitation and doubt among the executive staff as to the extent to which operations were to be pushed, the Lieutenant-Governor believes Mr. Silcock to refer to a misunderstanding which arose after the issue on April 9th of certain instructions enjoining caution in the event of an outbreak of plague in any of the *large towns* of the Punjab. These instructions were addressed to Commissioners, and directed them to make a *report* to Government before enforcing *in any such town* any measure which would be likely to compromise the public peace. It is understood that the impression which was conveyed to the Plague staff on the communication to them of these orders by the then Commissioner was that remedial measures were everywhere, even in rural areas, to be subordinated to the consideration of preserving the public peace. At this time (on March 29th) the outbreak of plague in Garhshankar, a town of 6,000 inhabitants, had been recently discovered, and on April 10th the evacuation of the infected mohalla in that town was recommended by the Medical Officer. Orders were issued by Lieutenant-Colonel Massy, Commissioner, Jullundur, that evacuation was not to be enforced and that the policy of waiting for the people to be convinced by events was to be followed. Though Garhshankar was not one of those large towns for which the instructions already referred to had been designed, Sir Mackworth Young approved of these orders, on the understanding that the sick and their immediate connections were being removed, as only a portion of the town had been attacked, and it was desirable to give a fair trial to the system of persuasion with a view to possible contingencies in other towns of larger size. The policy of persuasion failed conspicuously: Garhshankar became the centre of a number of recusant villages, in one of which (Bhangal) an assault was made on the Plague officials sent to arrest some obstructive headmen; it was reported that the disease was gaining a serious hold on the town, and that dead bodies were being buried inside the houses; and on the 24th of April the Lieutenant-Governor telegraphed to Mr. Silcock, Officiating Commissioner,

discretionary authority to compel evacuation. Mr. Silcock at once asked for a similar discretionary authority in respect to other villages, when his attention was drawn by a telegram dated April 26th to the fact that he had misread the instructions, which were not applicable to rural areas. These are the facts on which Mr. Silcock has based his remarks regarding doubt and hesitation among the Plague staff. It will be seen that there was a misunderstanding, which doubtless led to such doubt and hesitation, but that it was a misunderstanding of short duration. The adoption of a conciliatory policy in the town of Garhshankar was deliberate, and it would serve no useful purpose now to enquire whether the disturbance which ultimately took place here might have been averted if there had from the outset been no hesitation in enforcing evacuation in the teeth of opposition.

7. From the second week in May the epidemic was on the wane. From the 8th to 9th of that month the number of daily attacks fell abruptly from 44 to 11, and never again rose higher than 13. Eight new villages were infected during May, 7 of them during the cool spell which occurred in the latter portion of that month, and there were a few cases, mostly of a mild type, in June and July. Early in the latter month large reductions were effected in the Plague staff. The Deputy Commissioner on Special Duty was withdrawn, and the direct supervision of the remaining measures entrusted to the Deputy Commissioners of Jullundur and Hoshiárpur respectively. The area under observation was considerably reduced and divided into three instead of five circles, with three Civil and one Medical Officer, and the executive staff, with the exception of the officers engaged in still uncompleted operations in recently affected villages, was withdrawn. There has never up to the present date been a complete cessation of operations; for, on July 23rd and 24th, 4 mild cases of plague were discovered at the village of Aur, to which reference will again be made; in the course of August there were cases at Garhi and Sirhál Qázián, both of which had suffered and been freed from the disease at an earlier period, and also at Dosanj Kalán; at the end of September and beginning of October there were outbreaks of a serious, but not fatal,* kind at Kariam in Jullundur, and Majra-Dingrián in Hoshiárpur; and from October 31st to November 2nd there have been 3 cases with no deaths among the coolies employed in disinfection work at the former place. On November 15th and 16th five cases† were discovered in the Municipal town of Ráhon (population 10,667), showing that the poison is not extinct.

8. The cost, direct and indirect, of the operations up to the end of June has been given by the Accountant-General, Punjab, at Rs. 2,11,377, including the salaries of officers and subordinates and their travelling and other allowances, and the pay of chaukídárs substituted for the Police withdrawn for plague duty; but this sum does not include the expenditure from the District Funds of Jullundur and Hoshiárpur. The total cost up to the end of September was probably but little short of four lakhs; but a portion of this expenditure would have been incurred even if there had been no operations against plague.

9. It is certain that the virulence of the epidemic varied not only at different periods, but also in different localities, and these variations cannot be shown to have been due to differences in the system of dealing with the disease. They show themselves partly in the proportion of the inhabitants of different villages who were attacked, and partly in the local percentages of deaths to attacks. Thus in the two small villages of Lakhpur and Núrpur, in which outbreaks occurred within three days one of the other, the percentage of attacks to the population, as recorded at the first roll-call, was, in the one 7·4, in the other 3·93, and that of deaths to attacks 74 and 59 respectively. The differ-

*Though no deaths from plague were recorded either at Kariam or Majra-Dingrián, one death which occurred at the former place before the discovery of plague there is suspected to have been due to plague. Among the five cases at Ráhon there have been three deaths.

†Two more cases at Rahon were reported on December 20th while these remarks were passing through the Press.—H. J. M.—21·12·98.

ences are not to be explained by differences in the period which elapsed before evacuation, for at Lakhpur this only amounted to 13 days, and at Núrpur to 11; nor by reinfection after evacuation, for whereas in the more gravely affected village the last case occurred 12 days after evacuation, in the more slightly affected one the interval was as long as 37 days. Similar illustrations might be multiplied indefinitely. Hapowál, a village with Hindu Játs as its predominating element, which was evacuated 17 days after the first case (not immediately, as is erroneously shown in the tabular statement on page 118 of Captain James' Report), had a percentage of attacks of only 2·2, while only 23 per cent. of those attacked died; whereas Dahan, another Hindu Ját village, which was attacked five days earlier and evacuated eight days after the first case, had 8·7 per cent. of its population attacked, with a death-rate among the sick of 74 per cent. To show how the virulence of the epidemic had diminished in its closing phases it is sufficient to instance the cases of Bhaura and Jhingrán, where the outbreak occurred on May 1st and April 28th, and the delay in evacuation was 25 and 28 days respectively. The percentage of attacks was 0·6 and 1, and that of deaths 50 and 54, while Lodipur, a village of similar size, which was attacked in the middle of February, and was evacuated after a delay of 24 days, had a percentage of attacks of nearly 4 with a death-rate of 67. Later on, when Aur, Kariam and Majra-Dingrián were attacked, no deaths occurred. The Commissioner of Jullundur has instanced the case of Laroya, where the death-rate was 77 calculated on the somewhat small number of 13 cases, to show that the disease was not less virulent in its later stages; but the first case at Laroya seems to have occurred on April 21st. Garhshankar, which is another of his instances, was infected on March 23rd: Garhi, though not reported till April 20th, was possibly attacked at an earlier date: while Kariha seems to have had its first case as early as April 5th.

Analysis of measures.

10. The measures taken for the eradication of the disease and the prevention of its spread group themselves under the following heads:—

I.—Discovery of outbreaks;
II.—Isolation of infected village;
III.—Evacuation of infected site;
IV.—Disinfection of site;

together with the important subsidiary measures of—

V.—Medical treatment of sick;
VI.—Prophylactic inoculation;
VII.—Inspection, detention and disinfection at Railway Stations.

These subjects will be treated in their order in the paragraphs which follow.

I.—Discovery of outbreaks.

11. In connection with the discovery of outbreaks it must be noted that concealment, though sometimes deliberate, has not always been so. When plague first makes its appearance in a new area it is not readily recognized by the people, and in its non-bubonic form at all events it is often difficult for a medical man to diagnose it correctly. There can be no doubt that the people of Khatkar Kalán were ignorant of the nature of the disease which had established itself among them till the occurrence of four deaths in one day roused their alarm, when they at once drew the attention of the authorities to what was happening. This difficulty of obtaining the recognition of plague at its first onset is a serious danger, and it shows the importance of very close attention to all indications of unusual mortality in any locality so long as the disease continues to exist in India.

12. On the assumption that the germs of infection are generally, if not always, imported by human agency, orders have for some time been in force in the Punjab under which lists of new arrivals from suspected localities and of places known to have relations with such localities are maintained by the Police. The object of this system is to provide for immediate and careful

enquiry into cases of death and illness occurring among persons who have recently been in a plague-stricken neighbourhood or in places where such persons are likely to be found. It furnishes an important means of self-protection to free areas, and the orders in respect to it were in force throughout the epidemic of 1897-98, and remain in force still, as against all suspected areas whether within or without the Province. No cases are known to have been discovered by its means; but no cases outside the infected tahsíls are known to have occurred.

13. Deliberate concealment in the Jullundur and Hoshiárpur Districts was combated by a system of punishments and a system of rewards. Under Punjab Government Notification No. 352, dated 8th March 1897, which was afterwards superseded by No. 490, dated 23th March 1898, certain persons are bound to report to the Police the occurrence of cases of bubonic plague. This obligation rests upon the eldest adult male residing in the house where the case occurs, upon serái-keepers and their servants, upon medical practitioners, upon Municipal Commissioners and Municipal servants, and upon village lambardárs and chaukídárs, Kánúngos and Patwáris, Police officers, jágírdárs, máfidárs and pensioners. Violation of the rule is punishable under the Epidemic Diseases Act; and a few lambardárs were sentenced to imprisonment and fine for failing to report cases which had occurred in their villages. It is observed that there is some difference of opinion as to the effect of these successful prosecutions, and that some officers are of opinion that they operated mischievously by closing the mouths of the people. It appears to the Lieutenant-Governor that Mr. Silcock is right in holding that prosecutions for concealment should be instituted only in exceptional cases, at all events in dealing with rural outbreaks. They stand on a footing different from that occupied by prosecutions for violation of the cordon or breach of orders, not because these offences are necessarily more injurious to the Plague Administration, but because they present themselves in a different light to the people; and the enlistment of general sympathy with the measures for the eradication of the disease is among the most important of the objects to be achieved. There is also the practical consideration to which Major Inglis has drawn attention, that the time when plague is in a village is not the time for imprisoning the headman through whom the plague officials work.

14. On the 4th of March,* when the spread of the disease was becoming serious, it was decided to pay a reward of Rs. 50 for each authenticated report of the first case in a newly infected village; and this system in the opinion of all the officers best qualified to judge gave valuable results, though it was discovered by the Commissioner early in June that great delay had taken place in the payment in several cases, a circumstance which must have deprived the stimulus of some of its effect. The system was suggested by one adopted in a portion of the Bombay Mufassil, where, however, the amounts paid appear to have been too small to form any inducement to informants; and it is understood that something similar was done in the town of Leicester in the United Kingdom in dealing with a threatened epidemic of small-pox there in 1884, though it is not known that the reward in this instance was claimable by any person other than the householder in whose family an attack occurred. Lieutenant Walton, I. M. S., has drawn attention to the ill-feeling which the grant of rewards has in some instances aroused between neighbouring villages; but this would presumably have existed even if the information had been given without the stimulus of a reward, and it is an absolute essential that information should be obtained. The idea that rewards would disgust and alienate the better classes was entirely refuted by experience; for in most cases it was by the more prominent and well-to-do that they were claimed. A charge was brought against a Municipal Commissioner of Banga of having brought a case of plague into the town expressly for the purpose of claiming the reward, but this was disproved; and it is evident that in a rural village where each individual and his antecedents are known to every one else, such clandestine importations could not escape disclosure, while general connivance at an act

* Not in February, as stated by Major Inglis.

which would bring so much trouble on the community is clearly out of the question. There is more force in the suggestion that the offer of large rewards arouses suspicion of the motives of Government; for it must be recollected that the people, and more particularly those at a distance from the actual operations, were prepared to believe not only that plague patients were being poisoned in the hospitals, but that deliberate efforts were being made to spread the disease. On the whole, the Lieutenant-Governor is of opinion that the dangers arising out of such false impressions must be faced, and the right way to face them is not to abstain from useful measures merely on the ground that they may be grossly misrepresented, but to persevere in the hope that tact and devotion will hold the field against ignorance and suspicion.

15. From a very early stage in the outbreak two Medical Officers, each assisted by a Hospital Assistant, were employed in touring in the neighbourhood to examine the registers of deaths which are maintained by the village watchmen, to follow up all indications of the presence of disease and investigate suspicious cases. In March this elementary Observation Agency was widened by the appointment of three more Medical and five Civil Officers to supervise systematic enquiries over the whole of the suspected tract. The basis of the system was the preparation of a nominal roll of inhabitants and absentees by the regular Patwáris, under the control of a large special staff of Kánúngos and Náib-Tahsíldárs. There was one Kánúngo to every four or five Patwár Circles, and one Náib-Tahsíldár to every two Kánúngos. An attempt was made to attach to each Naib-Tahsíldár one male and one female medical subordinate for the diagnosis of cases, but the number, especially of female practitioners, fell below this standard. The system in the form which it first took was that the whole village was inspected in front of the Inspecting Officer when he made his visit, each individual being medically examined and enquiries made into the case of each absentee. Later on it was found that these roll-calls were not efficacious owing to the facility with which absentees could be personated; that they were a fruitful cause of vexation, particularly in villages too far removed from actual centres of disease to realise the imminence of danger; and finally that the Observation Staff achieved its results not by making actual discoveries either by roll-calls or house-to-house search, but by providing a regular and ubiquitous agency for the reception of reports and for the following up of those clues which indicated the need of concentrating attention on specially suspicious centres. Under these circumstances the system of roll-calls by the Observation Staff was abandoned except for the occasional verification of reported outbreaks; and it became merely a visiting agency, a collector of information and a constant reminder to the people that information was expected. In this capacity there can be no doubt that it achieved most useful results with little annoyance.

16. There is some difference of opinion as to the nature of the agency which should be employed in work of the character referred to in the last foregoing paragraph, and some officers would increase the professional element while others would diminish it. The position, if the Lieutenant-Governor understands it correctly, is this: that bubonic plague in its more obscure forms almost defies diagnosis even by the most high skilled medical agency without prolonged and elaborate bacteriological investigations, while in its simpler and more obvious forms it is fairly easily recognizable from the symptoms, and an unprofessional man after a short experience of the disease is likely to identify it correctly in the majority of cases. The supply of the superior class of Medical Officers is strictly limited, and it is essential to economise it by confining them to those functions for which a professional agency is indispensable; while the medical subordinate is hardly better qualified to diagnose the disease than a non-professional man with some experience of its symptoms. The practical conclusion seems to be that the Observation Agency should be mainly non-medical, though it should include as large as possible a proportion of dháis or other female, practitioners for the purpose of dealing with purdah women, and arrangements should be available for calling in the assistance of the best medical opinion where diagnosis is doubtful. These are the principles on which the reduced Observation Agency has been constituted since July last. The area under suspicion is

divided into circles, each supervised by a Civil Officer, and there is one Commissioned Medical Officer available in cases of doubtful diagnosis, but employed in the meanwhile in executive measures.

17. Sir Mackworth Young is unable to accept without question the view put forward by Mr. Silcock and Major Inglis that officers of the Kánúngo class should not be employed on Observation duty. The Kánúngo has a recognized place in the ascending series of revenue functionaries, intermediate between the Patwári and the Náib-Tahsíldár and Tahsíldár: and it is not possible to eliminate him altogether from the work of supervision without casting an undue burden upon the officer immediately above him. The idea which lies at the base of the system of observation is the utilization of the revenue agency with improved and increased supervision to fit it for the discharge of a specially delicate duty, and the preliminary work is of the nature of a census for which revenue functionaries of all grades have a special aptitude and a special experience. The Lieutenant-Governor is satisfied that the arrangement by which one Kánúngo was provided for the supervision of four or five Patwáris, and one Tahsíldár or Náib-Tahsíldár for the supervision of two Kánúngos, was suitable at the time when Observation operations extended over a large and strongly suspected tract, and that it would have been absolutely impossible for the Tahsíldárs or Náib-Tahsíldárs to do their work properly without the help of an intermediate agency such as the Kánúngos supplied. That these officers were not considered to be entirely useless is clear from the long list which Major Inglis has given of Kánúngos whose work was such as to merit approbation. The Lieutenant-Governor takes this opportunity of saying that the arrangement by which the Tahsíldárs and Náib-Tahsíldárs were unprovided with tents and left to find "somewhere to live in" near the centre of their circles, was not a good one. Application should have been made for the supply of tents to these officers.

18. Recourse has been had to the system of house-to-house inspection generally with the object of verifying suspicions created by rumours of the existence of plague, but it is not known that any discoveries have been made by its means. Corpse inspection was tried, but there are many considerations which make against it. The non-bubonic variety of plague is never discoverable by its means. The supply of Medical Officers with the qualifications for accurate diagnosis is small. Corpses from a number of villages over a large rural area could not be brought into a single centre for examination, even if there were no danger of spreading disease by this means. Female corpses cannot be examined otherwise than by female practitioners of whom there are few and those few mostly ill-qualified. Finally, the system cannot be carried out without delay and interference or fancied interference with necessary rites, and probably as a rule its results are not worth its dangers, though it may properly be utilized, in highly suspicious cases, as an alternative to which the relatives of a deceased person may submit in preference to having action taken on the assumption that plague was the cause of death.

19. The results obtained by the measures for the discovery of outbreaks are shown in the second column of the tabular statement which is appended to these remarks. The delay in detection was worst at the beginning of the epidemic, when organization was incomplete or altogether lacking, and at the end of it when the disease was assuming a milder and perhaps less obtrusive and easily recognizable form. In the 13 villages in which the first cases are recorded to have occurred in February, the period before discovery averaged 11½ days. In the 23 villages in which the original outbreak has been referred to the month of March, when the system of rewards was introduced and the expanded Observation Agency began to get into working order, the average period was 9 days. For the 24 villages in which the first case has been traced to April it was 7½ only, although in 3 of the 24 (Chokran, Laroya and Jhingran) taken alone it was as high as 26.

II.—Isolation of infected village.

20. The most important of the measures taken for the isolation of infected villages was the establishment of a Police cordon. So long as the number of centres was small each village was separately cordoned, the sentries being stationed along the boundary of the village lands during the day so as to allow free access to the fields, and drawn in round the camps at night. Later on the practical exhaustion of the resources of the Police Department by the employment of over 2,800 men on this duty compelled recourse to the plan of cordoning blocks of infected villages with no attempt at cutting off intercommunication between them. The strength of the cordons varied from time to time, but was ultimately fixed at 24 per mile so as to allow of three reliefs of 8 per mile. Whether it would be worth while in the event of another rural epidemic greatly to increase this strength in the villages first attacked in the hope of completely stamping out the infection in its beginnings would be a question for consideration. In some cases, but not in all, there were additional cordons round the village site to prevent the people in the camps from surreptitiously re-entering their infected houses. The desirability of these second cordons is a moot point. On the one hand, the number of available Police is limited, and constables in the immediate neighbourhood of the site are specially liable to infection, and specially subject to temptation or to charges of having succumbed to it. On the other hand, it appears to be impossible to trust the villagers not to return occasionally to their houses, if there is no cordon at all or only a cordon established by themselves, as the dangers of the village site before disinfection are not realized.

21. Except in the one village of Mokandpur, where a delay of two days occurred, the cordon was in every instance established as soon as the disease was discovered, though it was not always practicable to give it its full strength from the outset. A strong reserve was maintained near the infected area, but this was very rapidly depleted at the time that the disease was at its worst, and reinforcements had to be brought up from the most remote districts of the Province. The mobilization of these reinforcements was effected with remarkable rapidity and reflected great credit on the organization of the Department. A force of 1,000, about 5 per cent. of the total strength of the Provincial Police, was withdrawn from the districts without the provision of substitutes, and nearly 2,000 more were found by replacing constables in rural thánas by village watchmen and by engaging watchmen in place of a proportion of the Municipal and Cantonment Police. The strain on the Police Administration which these demands involved was no doubt considerable, particularly as there was a simultaneous, though far smaller, drain for the protection of military lines of communication and for the guarding of overcrowded jails. But no difficulties were raised or suggested, and the cordial co-operation of the Inspector-General, Colonel Tucker, C.I.E., and his subordinates greatly facilitated the task of coping with the outbreak.

22. Major Inglis has remarked on the small number of British Officers available for duty with the Police, and has expressed the opinion that this circumstance rendered proper supervision impossible. No doubt there were considerable difficulties in the maintenance of discipline in so large a force collected from many districts and split up into numerous small camps, but they were difficulties which experience and the introduction of method and system would be likely to some extent to overcome. One weak point in the arrangements which were adopted seems to have been this: that Civil Officers, with no previous experience of such matters to help them, were required to organize supplies of food and hutting materials for nearly 3,000 men, under the extraordinary circumstances created by the interference with the ordinary course of trade and travel which the plague measures rendered necessary. As Major Inglis has observed, these were functions which on any future similar occasion might appropriately be made over to officers of the Police Department, who are more likely to know the needs of their own men and to have some of the experience required for the proper discharge of such duties. The attention of the Inspector-General of Police will be drawn to these remarks.

23. The number of cases in which infection was carried through the cordon after it had been established has already been noted. But, as has been very pertinently remarked in the course of the reports under review, to argue from this against the establishment of cordons is to confound imperfection with uselessness. In every village no doubt there are a certain number of people who do not particularly wish to leave and who would be sufficiently deterred from doing so by a simple order prohibiting departure. There are others whose motives for leaving are so strong that they would be deterred by nothing short of the Astrachan system of a triple military cordon armed with ball-cartridge, and perhaps not even by that. But between these two classes there are numbers who have business elsewhere, or friends or relatives to visit, and who would certainly leave if nothing were done to stop them, but may be deterred by the reflection that there is a cordon to be passed. Even if the Police took money to allow people to pass, as was freely alleged against them, the fact that there was a toll to be paid and the chance of running across an honest constable or a vigilant officer must have diminished the number of those who crossed the cordons. When it is remembered that each evasion may mean the establishment of a fresh centre of disease which may multiply itself ten or a hundred fold in as many days, the practical advantage of stopping even a moderate proportion of those who would otherwise travel from infected to uninfected places will be at once apparent.

24. In a town the facilities for oppression and extortion which cordon duty would give might be considerable, unless the publicity of crowded places acted as a countervailing influence. But in the villages of the plague-stricken tract the Police were rarely in immediate contact with the people and had no functions except that of guarding the line. There were a few cases in which they came into collision with the villagers, but on the whole their conduct was excellent, and the Lieutenant-Governor is decidedly of opinion that their presence contributed largely to the prevention of the further and wider spread of infection. It has been suggested that military cordons would be preferable owing to the superiority of the discipline of troops and the large proportion of European officers attached to them; but though in the event of a widely extended epidemic it might be necessary to ask for military assistance to supplement the Police (and this was at one time contemplated in the Punjab), Sir Mackworth Young's inclination would be to trust, in preference, to the establishment of cordons by the people themselves, when the resources of the Police Department were exhausted.

25. Though Mr. Silcock's view to which he has given expression when writing of the arrangements in force up to the second half of April, that "the Police cordons were so ineffective as to be of very little use" seems to overshoot the mark, it must be remembered that in March and part of April the high crops must greatly have facilitated the evasion of the cordons, and it is probable that in the early stages of the operations they were less efficient than they became after more experience had been gained—a fact which may have been due in part to the absence of definite instructions such as those which were promulgated later on. The proper course no doubt is to order the Police to allow no one to pass the line except superior officers and nurses and persons accompanying them, and pass-holders; and, as practically all constables are illiterate, all passes except those of which the colour indicates them to be permanent should be given up at the time of passing the cordon. The power to give passes should be conferred freely on responsible officers both Civil and Medical in order to obviate unnecessary obstruction of persons on duty such as appears occasionally to have occurred.

26. It is important even in rural areas to provide means by which persons who have urgent business requiring them to leave the infected centres shall be saved from the temptation to violate the cordon. This was furnished by the quarantine camps, the largest of which was formed near Bahram, a village nearly half-way between Banga, the practical centre of the infected tract, and Phagwára, a station on the North-Western Railway, with which it is connected by a metalled road. In these camps persons underwent ten days' observation and a final disinfection, after which they were furnished with a

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III.—Evacuation of infected site.

27. Some valuable remarks have been recorded by Captain James, I.M.S., on the selection of ground for camps and the construction and arrangement of them. For every village there should, as provided in Punjab Government Resolution No. 43, dated 11th January 1898, be three classes of camps,—first, the hospital camp for those suffering from plague, to which may be admitted a small number of the friends and relatives of those attacked, in close proximity to the actual hospitals if actual hospitals are established; secondly, the segregation camp, in which the people though not attacked come from infected mohallas or the vicinity of the infected houses; and thirdly, the health camp. There is no objection to having as many separate camps of each class as may be convenient; it is generally undesirable to mix up different castes together; and always difficult to control camps of unmanageable size. A useful note on the subject of the construction of huts by Mr. Gracey, Assistant Commissioner, is incorporated in Major Inglis' report. The best system in the Lieutenant-Governor's opinion is that which was adopted at the outset of the operations: to encourage the people to put up their own huts, to help them with materials, and to allow them to build as they please, subject to necessary regulations regarding the space to be occupied, the distances between the structures and the maintenance of proper passages. There is no reason why huts and materials for huts should not be supplied as freely as possible by the plague staff to those who need them, but it would be a false step to admit any obligation to do so or to allow the idea to arise that the absence of huts justifies delay in evacuation; for in the event of a sudden and great increase in the number of centres of disease Government would find it impossible to provide accommodation, if the people themselves remained apathetic. Captain James, I. M. S., has remarked that the huts made by the villagers may be and usually are more comfortable than the Government ones, and this in itself is a strong argument in favour of encouraging voluntary construction, since everything which diminishes the discomforts of the encampment tends to the more cordial acceptance of plague measures. The fact that privately-made huts admit less light and air is no doubt unfavourable to the

early extermination of the infection, but it does not outweigh their practical advantages, even if it be impossible to insist on such a mode of construction as secures free ventilation. The difficulties which arise from the burning of huts made by individuals for themselves would have to be met by a judicious apportionment of compensation when timber or agricultural implements have been used in the construction.

28. The extent of the delay which occurred in arranging the evacuation of villages after the discovery of the disease in them is shown in the fourth column of the statement in the Appendix to these remarks. So far as the 48 villages of the Banga Administrative Circle are concerned the causes of such delays as occurred have been explained in a report submitted by Mr. Gracey, Assistant Commissioner. In some cases of course, as in the town of Banga and the large village of Mokandpur, evacuation was a gradual process, each mohalla being emptied in succession as it was attacked. In some cases, particularly during the heavy rain which fell in February, the inclemency of the weather, and in some others the want of a sufficient supply of huts occasioned delay. The opposition of which the town of Garhshankar became the centre about the middle of April accounts for the interval which elapsed before evacuation in such villages as Kariha and Pirágpur. Generally speaking, although there were departures from the system, as at Hájipur where special difficulties were created by deficiencies in the water-supply, the attempt was made to arrange for the evacuation of each village as early as possible after the discovery of the first case, until the later stages of the epidemic when it was decided to wait as a rule till the occurrence of the second case, only the infected family being removed and segregated in the meanwhile. From the purely sanitary standpoint there can be no question that the best course is to require the evacuation of the whole village; and it must always be borne in mind that one of the reasons for evacuation is that disinfection, which alone can kill the germs of the disease, cannot be complete or perfect otherwise. But practical considerations may outweigh the advantages of unhesitating promptitude, particularly when work is growing and the staff has a difficulty in keeping pace with it; and Sir Mackworth Young does not consider that the rule requiring evacuation when a second family has been attacked, is an unduly liberal one. Of course if immediate discovery of the fisrt case at the earliest moment could be depended upon, it would be possible to make further concessions, as stringent measures with the known centres of infection would under these circumstances suffice; but experience, Sir Mackworth Young fears, has shown that this condition is not likely to be fulfilled, and that there is always a probability that rats or other vermin have carried the poison to some other house before the plague staff can get to work.

29. On pages 118 to 121 of Captain James' Report are two tabular statements illustrating the effects of the evacuation of the village site on the course of the epidemic. It has, of course, never been contended that removal exercises any remedial influence on plague actually present or incubating in the individual; and it is not expected to produce either a diminished mortality among the actual sufferers at any time, or a fall in the number of seizures before a sufficient period has elapsed to allow the disease to develop in all persons who may have contracted it before leaving the village. The time of evacuation is, indeed, in one respect a specially dangerous one; for when people leave their houses and remove their property, they handle articles in which the germs of disease may be lying dormant, and disturb dust, which is always a potent vehicle of infection. Further, if the removal takes place, as it generally did, while the disease is still on the increase, the figures for the first few days spent in camp will naturally show an upward tendency. Under these circumstances it is in the number of attacks after the people have been in camp for a period equal to the average period of incubation that the results of the evacuation of the site can best be traced. The period of incubation cannot of course be determined with certainty, though Captain James thinks that it varies from two to eleven days, and that the great majority of the sufferers were attacked between the second and fifth days.

30. Apart from this, there is another consideration to be borne in mind when comparing the figures for the periods before and after evacuation has had

certificate and allowed to leave. Not many people availed themselves of this means of getting away on business, but the camps were useful also for officials and Police under orders of transfer elsewhere and for prisoners whom it was necessary to remove to head-quarters. Something was done to lessen the strength of the motives for cordon breaking by providing subsistence for persons cut off from their ordinary means of livelihood, by importing through the agency of the Tahsíldár necessary stores of provisions and miscellaneous supplies, and by arranging for the cultivation of lands held outside village limits by cordoned agriculturists, for the institution of civil suits on claims nearing limitation in the courts of the officers in charge of the operations, for the postponement of cases in other courts in which residents of cordoned villages were concerned, and for the sale of stamps and preparation and registration of deeds on the spot. The functions of the Post Office within the infected villages were discharged by the Plague Staff ; and extension of leave was obtained for sepoys resident in them. Uninfected villages were encouraged to protect themselves by posting chaukídárs to keep out outsiders. In order to effect the partial isolation of the whole of the suspected area the Head-quarters Punjab Command, the Educational authorities and other Deparments were warned against allowing persons under their control to visit it ; the Courts of the Munsifs of Nawashahr and Garhshankar were closed except for the reception of plaints ; the whole tahsíl establishment at the latter place was transferred to Mahalpur, 12 miles to the north ; and fairs located within the three dangerous tahsíls or at places to which persons would be likely to travel *viâ* infected routes were prohibited. The crossing of the Sutlej between Phillour and Rúpar was forbidden to all except Government servants on duty and persons holding a permission from a 1st Class Magistrate ; posts for the inspection, detention and disinfection of travellers were established on the line of railway, to which further reference will be made below ; and the transportation by rail of used apparel and bedding, except the personal luggage of travellers, from all stations between Jullundur and Ludhiána, was prohibited.

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early extermination of the infection, but it does not outweigh their practical advantages, even if it be impossible to insist on such a mode of construction as secures free ventilation. The difficulties which arise from the burning of huts made by individuals for themselves would have to be met by a judicious apportionment of compensation when timber or agricultural implements have been used in the construction.

28. The extent of the delay which occurred in arranging the evacuation of villages after the discovery of the disease in them is shown in the fourth column of the statement in the Appendix to these remarks. So far as the 48 villages of the Banga Administrative Circle are concerned the causes of such delays as occurred have been explained in a report submitted by Mr. Gracey, Assistant Commissioner. In some cases of course, as in the town of Banga and the large village of Mokandpur, evacuation was a gradual process, each mohalla being emptied in succession as it was attacked. In some cases, particularly during the heavy rain which fell in February, the inclemency of the weather, and in some others the want of a sufficient supply of huts occasioned delay. The opposition of which the town of Garhshankar became the centre about the middle of April accounts for the interval which elapsed before evacuation in such villages as Kariha and Pirágpur. Generally speaking, although there were departures from the system, as at Hájipur where special difficulties were created by deficiencies in the water-supply, the attempt was made to arrange for the evacuation of each village as early as possible after the discovery of the first case, until the later stages of the epidemic when it was decided to wait as a rule till the occurrence of the second case, only the infected family being removed and segregated in the meanwhile. From the purely sanitary standpoint there can be no question that the best course is to require the evacuation of the whole village ; and it must always be borne in mind that one of the reasons for evacuation is that disinfection, which alone can kill the germs of the disease, cannot be complete or perfect otherwise. But practical considerations may outweigh the advantages of unhesitating promptitude, particularly when work is growing and the staff has a difficulty in keeping pace with it ; and Sir Mackworth Young does not consider that the rule requiring evacuation when a second family has been attacked, is an unduly liberal one. Of course if immediate discovery of the fisrt case at the earliest moment could be depended upon, it would be possible to make further concessions, as stringent measures with the known centres of infection would under these circumstances suffice ; but experience, Sir Mackworth Young fears, has shown that this condition is not likely to be fulfilled, and that there is always a probability that rats or other vermin have carried the poison to some other house before the plague staff can get to work.

29. On pages 118 to 121 of Captain James' Report are two tabular statements illustrating the effects of the evacuation of the village site on thecourse of the epidemic. It has, of course, never been contended that removal exercises any remedial influence on plague actually present or incubating in the individual ; and it is not expected to produce either a diminished mortality among the actual sufferers at any time, or a fall in the number of seizures before a sufficient period has elapsed to allow the disease to develop in all persons who may have contracted it before leaving the village. The time of evacuation is, indeed, in one respect a specially dangerous one ; for when people leave their houses and remove their property, they handle articles in which the germs of disease may be lying dormant, and disturb dust, which is always a potent vehicle of infection. Further, if the removal takes place, as it generally did, while the disease is still on the increase, the figures for the first few days spent in camp will naturally show an upward tendency. Under these circumstances it is in the number of attacks after the people have been in camp for a period equal to the average period of incubation that the results of the evacuation of the site can best be traced. The period of incubation cannot of course be determined with certainty, though Captain James thinks that it varies from two to eleven days, and that the great majority of the sufferers were attacked between the second and fifth days.

30. Apart from this, there is another consideration to be borne in mind when comparing the figures for the periods before and after evacuation has had

time to take effect. There are dangers of reinfection and influences which partially neutralise for a time the good results of the move. As has been already pointed out, many carry the disease in their systems when they go out, and some of these probably pass it on to others while in camp. A certain amount of property, including such specially susceptible articles as clothes and bedding, is carried out from the village, and although it is a counsel of perfection that all persons and all property should be disinfected at the time of evacuation or as soon after it as possible, this process is a lengthy one and the staff generally has its hands too full to undertake it; while, admitting the value of evacuation as a means of checking spread, it would clearly be unjustifiable to keep the people or some of them inside the village till arrangements for the disinfection of them and their belongings could be effected. It follows that even the health camps contain from the outset the possible germs of disease, though they exist there under conditions less favorable to spread than in the ill-ventilated and ill-lighted houses in the village site, and that these germs may establish a new, though more precarious, home in a new soil. Again, the heavier and more bulky articles of property and the large stores of grain are necessarily left in the houses to be disinfected when the cleaning of the village begins. This circumstance and the occasional inclemency of the weather, particularly when rain falls, are standing temptations to an unthinking people to pay surreptitious visits to the seat of the danger, and no second cordon round the actual site of the village, whether of police or of villagers, will entirely stop these visits. There are moreover other communications between the site and the camps, which are necessarily permitted by authority. People must occasionally go in to fetch necessary articles which have been left behind: or to turn over and expose to the cleansing rays of the sun their stores of grain. A disinfecting gang must be organized among the village menials, and whatever precautions may be taken here lies another danger of the reimportation of the infection into the camps. Finally it is desirable to allow the owners to be present in the village when their property there is exposed for disinfection, even if not to take part in the actual operations or at least in the final process of white-washing.

31. Beside the establishment of site cordons (which may or may not be effectual and may or may not be practicable) and the disinfection of all the camps and all the people and property in them (which is generally impracticable at the time when needed, *viz.*, at the time of evacuation), it may be noted, by the way, that there are other means of diminishing danger. One of these is to reduce temptation by encouraging the removal of as much property as possible into the camps; and this, when feasible, has the further advantage of checking thefts and false claims based on alleged thefts. Another is to increase the facilities for access to the site under proper precautions. It is the surreptitious visits which are most likely to be prolonged and to be made under risky conditions. It is not stated that any of the persons who were allowed to return for the purpose of exposing their grain to the sun or to watch disinfection and assist in white-washing were attacked by plague, and it may be suggested that this indicates the lines on which measures against the infection of the camps could perhaps be based. Admitting, however, that nothing will provide completely against the danger of reinfection. this fact does not discount the value of evacuation, if it can be shown that the hold which the disease obtains under the conditions of camp life is comparatively a feeble and precarious one.

32. The total number of attacks in the two districts taken together, as shown in Captain James' tabular statement, was 3,409. Out of these 2,228, a percentage of 67, took place before or within four days after evacuation. If we allow the longer period of seven days for the incubation of the disease, the percentage of cases in which the infection might have been contracted before evacuation had had time to take effect would be nearly 78. The total number of cases in both districts which occurred after the 20th day from evacuation was only 312, or 9 per cent. of the whole: and the average period for the cessation of the epidemic after evacuation was 21 days in Jullundur and 26 days in Hoshiárpur. There were nine villages in which partial evacuation was tried and in which there was subsequently a reappearance of the disease, and in only one of these nine (Rámpur Bilron) has it been established that this second outbreak

was due to reinfection and not to a survival or recrudescence of the latent poison. In all the nine recourse was ultimately had to complete evacuation. In one village (Naura) where the outbreak was discovered within five days one case occurred; three houses only were evacuated, and notwithstanding this there were no further attacks. But this instance, together with the doubtful one of Arapa (to which reference is made on page 82 of Captain James' Report) is the only exception to the rule established by the history of this epidemic that outbreaks are prolonged unless evacuation is complete.

33. These facts are eloquent of the results of evacuation of the village site in stopping the spread of the disease, and Sir Mackworth Young has been able to satisfy himself during his recent tour in the Hoshiárpur District that they have carried conviction to the minds of the people generally. This general conviction of the value of one of the most important of the measures for the extirpation of plague will, it may be hoped, bear valuable fruit, in the event of another outbreak in the same neighbourhood.

34. The period spent in camp is shown in the seventh column of the statement in the Appendix to these remarks. The date of return is conditioned by the completion of disinfection operations (though there were four instances in which return was allowed earlier, a departure which appears to the Lieutenant-Governor to have been a dangerous one) and cannot be fixed till a certain period has been passed without fresh attacks. The Medical Officers are probably right in the view that three weeks of freedom is the minimum period which can be taken as guaranteeing the cessation of an epidemic; but it might in practice be desirable to waive this rule under certain circumstances, *e. g.*, if a long period had been spent in camp, if the weather were inclement, or if the final attack were a dropping case in some isolated portion of the camp. As a matter of fact the interval which expired between the last attack and the return to the village was in most cases more than three weeks, a fact which is sometimes attributable to delay in commencing and completing the disinfection, but is not always thus explicable. The Lieutenant-Governor understands that it is quite unnecessary to wait until the last case under treatment in hospital is discharged; for a person may remain under treatment for the sequelæ of the disease long after he has ceased to be a source of danger to others. The whole subject is important, because unduly prolonged detention in camp adds to the unpopularity of the plague measures and therefore to the difficulty of enforcing them. Delays in disinfection will appropriately be discussed under the heading which deals with that subject. Sir Mackworth Young will only observe here that there is no apparent reason why villages such as Mahálgahla, Táhirpur, Baharwál, Punián and Parágpur should have been kept out so long after the completion of disinfection notwithstanding the length of the interval of freedom from disease. Some time must of course be allowed for the final disinfection of the people which takes place before they leave the camps, but in these instances at all events the detention appears to have been excessive, though the Lieutenant-Governor does not overlook the heaviness of the duties of the plague staff at the time.

IV.—Disinfection of site.

35. Captain James has given a clear account on pages 108 *sqq.* of his report of the process of disinfecting a village in the four stages of (1) disinfecting with liquid antiseptics, (2) cleaning, (3) ventilating and (4) white-washing. The antiseptic used was phenyle in a solution of about 1 in 200, exact measurements being found in practice less serviceable with a half-taught staff than an instruction to pour enough phenyle into the water to make a dense white fluid looking like milk. In head A of the Instructions which were promulgated with Circular No. 1025, dated 19th June 1897, and republished with Circular No. 1342, dated 8th November 1897, the use of perchloride of mercury was advocated. It was observed that this forms an inert compound with albumen, and two methods of getting over this difficulty, one recommended by the Local Government Board of the United Kingdom, and one in use at that time in the Bombay Presidency, were suggested. Sir Mackworth Young is quite open to conviction that there were practical advantages in the use of phenyle in preference to perchloride of mercury in the Jullundur and Hoshiárpur Districts. But he observes that the medical opinion on the subject

is not unanimous, Lieutenant Walton criticising the use of phenyle as unreliable, and as the instructions above referred to were drawn up after careful consideration by the Inspector-General of Civil Hospitals and the Sanitary Commissioner, a departure should not have been made from them without reference to Government. The Lieutenant-Governor will be glad to have the opinion of the Inspector-General of Civil Hospitals and the Sanitary Commissioner as to the practical suitability of the disinfectant which was employed, and the propriety of altering the standing instructions on the subject. It is noticed on page 28 of Volume I of Mr. Nathan's compilation "The Plague in India, 1896, 1897," that Mr. Hankin found that phenyle when in a quarter per cent. solution in all cases destroyed the microbe, under the conditions of the experiments made by him.

36. In theory, no doubt, the best agency to employ in disinfection work is a permanent trained gang in which each man has been inoculated with M. Haffkine's prophylactic. The men available for this work in Jullundur and Hoshiárpur were for the most part village menials, whose patrons objected particularly at the time of the spring harvest, when plague operations were heaviest, to their being employed at a distance, and who were naturally unwilling, for the sake of temporary high wages, to quarrel with the men with whom their relations are life long. It was moreover a convenient method of arranging for the subsistence of the poorer villagers, when cut off from access to the outer world, to employ them on disinfection work. Partly for these reasons, and partly because of the large number of centres in which disinfection work was proceeding at one and the same time, it was not practicable except to a very small extent to employ permanent disinfectors, and the need of specially careful supervision of the work was therefore particularly urgent. The immediate supervising agency consisted ordinarily of Hospital Assistants. One Assistant Surgeon was employed on this work under Captain Wilkinson in the Banga Administrative Circle and several Compounders were also engaged in it. Experiments were also made with non-medical agency. Four European or Eurasian Sanitary Inspectors on Rs. 100 per mensem each were engaged, but with one exception the selections made do not appear to have been fortunate. Some Tahsíldárs were employed, and Captain Coleman, I.M.S., is said to have found Kánúngos satisfactory overseers. Sanction was given to the employment of some British Non-Commissioned Officers also, but was not utilised, and no experience of this agency was obtained. The controlling and inspecting officers were in all cases Commissioned Medical Officers.

37. A very important question with reference to the economisation of professional staff in the event of a widespread epidemic of plague is the extent to which Medical Officers and Medical subordinates could properly be replaced by a non-medical agency in the supervision and inspection of disinfection operations. The general opinion among Medical Officers is understood to be adverse to the employment of laymen, although it is believed that in the United Kingdom operations of this character are ordinarily entrusted to non-medical men, carefully trained. Sir Mackworth Young is unable to see why it should be necessary to employ a professional agency to supervise those portions of the process which consist in the making of ventilation holes in the roofs and the lime-washing of walls, pillars, doors, corn-receptacles and fixtures; and in regard to the use of the liquid disinfectant he cannot but think that what is required in the supervising staff is conscientiousness and a grasp of certain simple principles rather than expert knowledge. Captain James has observed that when the inspecting officer came on his rounds a few hours after the disinfectant had been sprayed on the buildings, not a sign of it could be seen, so that there was practically no means of verifying the fact that the process had actually been performed. It may be suggested by the way that the mixture of aniline blue with the disinfectant as suggested in the instructions cited in paragraph 35 of these remarks might have rendered it easier to check the work done, and the Inspector-General of Civil Hospitals will be asked to consider whether there is any way of colouring the disinfecting solution which without causing unnecessary damage to property will make verification possible. But for the purposes of the point now under consideration, the conclusion to be drawn from Captain James' remarks clearly is that a highly skilled Medical agency is not in a better position than the civil staff to ascertain that orders have been carried out. There are, however, many difficulties of detail which arise in the conduct of the operations: and some of these are of a character in which medical advice is indispensable. On the whole Sir Mackworth Young is disposed to hold that it is a counsel of perfection that disinfection should be controlled and inspected by Medical Officers and supervised by Medical subordinates; though he quite sees that in the event of a widespread epidemic, making very large demands on the Medical Staff, this might be impracticable, and it might be necessary to work with a non-professional agency assisted as much as possible by expert opinion. From what class the disinfecting overseers should be drawn, if medical subordinates were not available, is a question to which it is unnecessary to find a final answer here. But in the event of another rural outbreak of plague Sir Mackworth Young is inclined to give a trial to British Non-Commissioned Officers, and to pensioners and reservists from Native Regiments, the trial of whom has been recommended by Major Inglis. It is essential no doubt that the final inspection should be done by Europeans, and if the drain on Commissioned Medical Officers for other duties were great, and the supply of Assistant Commissioners were short, Staff Corps Officers would probably be suitable for this work.

38. The possibility has been suggested by Captain James that more was done in the way of disinfection than was actually necessary, and that possibly one or more of the processes employed might have sufficed to eradicate the poison. The figures in the sixth column of the statement in the Appendix shows how prolonged the operations sometimes were. It is of such paramount importance to conciliate the people who are the subjects of the plague measures by reducing damage to property and delay in camp to the minimum, that the Lieutenant-Governor would like the Inspector-General of Civil Hospitals and Sanitary Commissioner carefully to consider whether, in the event of another outbreak, it would be safe to curtail or abandon any portion of the various processes employed. The adoption of some satisfactory means of verifying the work done as suggested in the last foregoing paragraph might help in the attainment of this end. The rule which required an interval of 10 days to elapse between evacuation and the commencement of disinfection, in order to give time for the rats to die off or leave, was doubtless unnecessary, and should be expunged from any future plague code, but the fifth column of the statement in the Appendix shows that the interval was not infrequently far longer than that prescribed by the rule, and there will no doubt always be practical difficulties, when the centres of disease are numerous, in the organization of disinfecting gangs and the early commencement of operations. All that can be said is that it is desirable to aim at beginning immediately after evacuation has been effected. The work or at all events the preliminary part of it, is of course extraordinarily dangerous, and this is an argument against expediting operations by allowing the owners to take part, as arrangements can be made for isolating the menials of the disinfecting gang while it might be impracticable to keep other villagers away from their fellows, but the owners should be allowed to be present so that they may see what is being done with their property, and Sir Mackworth Young thinks that there is a balance of advantage in favour of allowing them to make the required holes in their roofs and to do their own white-washing, under proper supervision, as the worst, though not the whole, of the danger is over when the liquid disinfectant has been properly applied. One cause of delay in some instances is understood to have been a deficiency in the supply of lime. It may be noted that unslaked lime (which is the kind required) can be obtained in considerable quantities close to the Railway Station of Pind Dádan Khan at the rates of five annas six pies per maund: and further information on the subject could no doubt be furnished by the Deputy Commissioner of Jhelum.

39. Attention has already been drawn to the important fact that infection can be and is carried from house to house by other than human agency. No doubt if the disease could be detected and dealt with at the very outset and

in its first centre, no germs would remain for rats or other vermin to carry elsewhere, and it would suffice to disinfect those houses in which the existence of the poison was ascertained. In practice, however, such early discovery and prompt treatment are not to be looked for, and though the Lieutenant-Governor is willing to believe, with Captain Clark, I.M.S., that it is best to begin with the known centres of infection, there can be no doubt that the best course from the sanitary standpoint is ultimately to carry the operations of disinfection throughout the entire village.

40. There are four or possibly five instances in which the experiment of partial disinfection or no disinfection at all was tried. Naura, Aujla and Aur were visited with plague, and not disinfected; and if the disease which occurred at Arapar was really plague, which is doubtful, this village falls into the same category. Rámpur Bilron, on the occasion of the first outbreak there, was partially but not completely disinfected. Out of these five instances, in one of which the original outbreak is doubtful, there were in two cases, Aur and Rámpur Bilron, fresh outbreaks at a later date, but in the latter of these two the fresh outbreak is attributed to reimportation of the disease and not to recrudescence. In Naura, Aujla and Arapar there was no second outbreak, but it must be added that the first outbreak in each of the three was an exceptionally slight one. These facts cannot be taken as proving that there is no necessity for disinfection as a means of providing against recrudescence.

41. There were five villages in which disinfection was complete, or intended to be complete, which nevertheless suffered from a recrudescence of plague, as opposed to proved reinfection from an outside source. These were Pharála, Khatkar Khurd and Baharwál and two others, Garhi* and Sirhal Qaziánt, to which no reference is made in Captain James' Report. At Pharála there is reason to suspect that the operations of disinfection had been hurried on to allow the return of the people before the autumn rains. In the other four cases it is of course possible that the disease was reimported, but this is not proved and cannot be assumed. None of the instances, however, impeaches the value of complete disinfection. The fact no doubt is that, if the second outbreak was really a recrudescence, there was something deficient in the original disinfection. That some nook in which infection lurked should have been overlooked or incompletely dealt with where so many villages and so many thousands of houses were concerned would, in the Lieutenant-Governor's opinion, be no matter of surprise. What is surprising is that there were at most only five cases of recrudescence in villages in which an attempt was made to disinfect completely, and this fact appears to Sir Mackworth Young to be an evidence of the great value of the process.

42. Apart from the efficacy of disinfection as a means of preventing the recrudescence of the disease, Captain James has laid stress on its effects in reducing to very small dimensions any second outbreak which may occur in a completely disinfected village. It is the case that the second outbreaks in the completely disinfected villages of Pharála, Khatkar Khurd, Baharwál, Sirhal Qázián ‡ and Garhi ‡ (where they were due to recrudescence) and of Jhander Khurd (where the second outbreak was due to reinfection) were of the slightest possible character; while Rámpur Bilron, which had been incompletely disinfected, suffered severely in the second visitation. The contrast may have been due to the fact that the disinfectants still continued operative, or that the free use of them had driven away the rats or other vermin who generally carry infection with them, or that the general cleanliness of the village concerned was unfavourable to the growth of the disease. But as the easy escape of the six completely disinfected villages at the second visitation may possibly have been due to the

* Recrudescence about August 9th after freedom from plague since April 8th.

† Recrudescence on August 13th after 2½ months of freedom from disease.

‡ One case only in second outbreak.

acquired or natural immunity of the surviving rats or of the surviving population, Captain James' contention on this point cannot be held to be scientifically proved.

V.—Medical treatment of sick.

43. The Lieutenant-Governor understands that the system of treatment of plague consists mainly in rest and the administering of stimulants to keep the patient alive until the height of the disease is passed. There is no means of ascertaining to what extent the treatment in hospitals under European management was successful, but it would be unreasonable to suppose that many lives were not saved in cases where the struggle between nature and the disease was not too unequal. For practical purposes, however, there is no need to estimate the success attained; for while European medical treatment must, so far as possible, be given to all who wish for it, it is the fixed policy of Government not to force that treatment on any one if he or his friends in his behalf have any objection to it. Absolute freedom to receive or reject European treatment and medicines, free access on the part of baids, hakíms and other private practitioners to all patients who wish to be treated by such, and free access on the part of a limited number of friends and relatives to the sick whom they desire to tend, are unalterable canons of any hospital system to which Government can give its approval, and public announcements, which amount to public pledges, have been made on all three points. Mr. Silcock, Officiating Commissioner, has remarked that the removal of plague patients from their families was one of the greatest of their grievances; but it is not known to what period of the operations he refers. His experience of the measures dates from April 20th, and in paragraph 6 of the Resolution of this Government, No. 43, dated 11th January 1898, it was distinctly declared that "friends or relatives in reasonable number will be allowed to accompany the sick; but if they elect to do so they will be subjected to precisely the same restrictions as if they were themselves sufferers from the disease." If this important principle was extensively ignored or violated, as Mr. Silcock's remark implies that it was, attention should have been drawn to the matter at an earlier date. That it was not realized or acted upon by all the Medical Officers is evident from Lieutenant Walton's remark that the hospitals were inadequately guarded and that "there would have been little difficulty at night in persons visiting their friends in hospitals;" clearly implying that some attempt was made to prevent their doing so. On the other hand, Major Inglis has distinctly stated in his report that persons in the segregation camps have been allowed to visit their friends in hospital.

44. The Lieutenant Governor fully recognizes that practical difficulties of some magnitude have to be faced if effect is to be given to the principles which have been above enunciated, and that a fundamental change in the arrangement of hospitals built without due regard to them may even be necessary. Subject to a reasonable limitation as to numbers and to the condition quoted in the last foregoing paragraph the friends or relatives who wish to do so must be able to come to and remain with the patient when they please and as long as they please. If they contract infection, it is in the performance of the natural duties of humanity. Either they must have free access to the hospitals, and the hospitals must be so arranged as to give them accommodation by the bedside of the sick: or hospitals proper must be altogether replaced by hospital camps, in which huts will be set apart for families with sick members. The free access of private practitioners to their patients can be provided for either by making over particular hospitals altogether to them, as was done by Captain Heard, I. M. S., in the case of the hakíms of Garhshankar, or by allowing them to visit the hospital camps where these have replaced hospitals. The danger of the carrying of infection by practitioners who do not observe the same precautionary rules as officers trained in the European manner is no doubt a serious one; but it will have to be faced. The whole subject is of such supreme importance with a view to the diminution of the grounds for discontent which are created by plague measures, and it involves such far-reaching issues,

both administrative and medical, that the Lieutenant-Governor will be glad to receive practical proposals from the Inspector-General of Civil Hospitals after consultation with the Commissioner of Jullundur and with any of the officers, civil and medical, employed in the late operations, whose opinions would be likely to be serviceable. It has been suggested in the report submitted by Mr. Butler, Assistant Commissioner that something is to be gained by allowing outsiders to see the hospitals if they wish to do so, with a view to checking rumours of maltreatment and actual poisoning. If the friends and relatives are allowed free access, the advantages of the admission of outsiders would seem to be counterbalanced by the risk of spreading infection by their means. But this also is a point on which the Lieutenant-Governor will be glad to have opinions, from the point of view of general administrative expediency as well as from that of purely medical considerations.

45. In connection with the subject of hospital management and sanitary precautions generally Sir Mackworth Young notices on page 106 of Captain James' report a remark to the effect that in the Hoshiárpur District plague corpses (of course only those of Muhammadans) were buried in quick-lime. It is added that this was not done in the Jullundur District, as sufficient lime (four to eight maunds per person) could not be procured. The burial of bodies in quick-lime in all cases in which any person interested raises an objection was prohibited by Government in orders published with Circular No. 1025, dated 19th June 1897, and republished at the commencement of the Punjab epidemic with Circular No. 1342, dated 8th November 1897. It is not certain that the process is necessary or efficacious, and it is one which is likely to give offence.

VI.—Prophylactic inoculation.

46. Inoculation with M. Haffkine's anti-plague prophylactic medium was performed on 2,408 persons in Jullundur and 1,510 in Hoshiárpur. Eight hundred and eighty out of this total were females. The great majority of those inoculated in the former district were Hindús, mostly Játs, Khatrís and Brahmins, only 181 in all being Muhammadans; but in Hoshiárpur the Muhammadans were in excess, being 699, against 475 Hindús, while the balance consisted apparently of Chamárs, Chuhrás and other inferior castes. Submission to the process was of course voluntary; no inducements were authorized by Government, and it is believed that none were held out; but there seems to have been in some quarters marked willingness, not to say eagerness, to obtain protection, and possibly if the Medical Staff had had more leisure the number of operations might have been considerably increased. It may here be noted that the question of the concessions and exemptions which might properly be allowed to inoculated persons was still undecided when the epidemic in the Punjab was at its height. It has since been determined by the Government of India that "inoculated persons should be exempted—

(1) from segregation, unless they are actually attacked by plague. They will, however, remain liable to evacuate infected houses;" and, it must be added, to evacuate any other houses which it may be necessary to disinfect, at all events to such extent and for such period as may be necessary to allow of adequate disinfection;

"(2) from observation and detention when travelling, subject to disinfection of clothes.

In each case the exemption is subject to the process of inoculation having been performed not more than six months before. The period of the efficacy of inoculation requires further investigation, and it may in the future become possible to extend the six months period."

47. Out of a total of 3,918 people inoculated, 3,119 belonged to villages in which outbreaks of plague occurred. Eight attacks of plague took place among the inoculated, all in the Jullundur District; and of these 1 was fatal, the case being that of a woman who received a dose of only half the minimum strength recommended by M. Haffkine for adults, and who showed none of the

signs of the reaction which usually follow a successful insertion of the prophylactic. In Banga, where inoculations began on the day that the first case of plague was discovered, 865 residents of the town were inoculated, making 17·4 per cent of the population as determined at the roll-call census which was taken at that time. In the town as a whole 2·09 per cent. of the population was attacked and the percentage of deaths was 63. Among the inoculated the percentages were ·693 and 0 respectively. The results of the operations were thus highly promising.

VII.—Inspection, detention and disinfection.

48. The arrangements on the line of Railway for the protection of uninfected areas against importation of disease by travellers by rail were as follows. Eight stations from Jullundur City to Ludhiána inclusive were treated as suspected on account of the facility with which they could be reached from the area under suspicion. All tickets sold at these stations were marked with a special punch mark, and special 3rd class carriages were added to the trains for the accommodation of 3rd class passengers from these stations.* Inspection posts under the Regulations published with Punjab Government Notification No. 1345, dated 10th November 1897, were established at the stations of Beas, on the northern or Amritsar side of the river of that name, and at Ludhiána, five miles to the south of the Sutlej at Phillour. Up trains were inspected at the former and down trains at the latter post, and passengers from the suspected stations were prohibited when travelling up, from leaving the railway limits between the Kartárpur and Beas stations, and, when travelling down, from leaving them between the Phillour and Ludhiana stations, arrangements being made by the North-Western Railway Administration to reconvey to their destinations without extra charge those passengers who were carried past them in compliance with this regulation. A small patrolling force of police travelled with the trains to see that these orders were obeyed, the object being to lessen the facilities for alighting before the inspection posts were reached and working past them by road. There was no prohibition against crossing the Beas, by fords or otherwise, as that river is situated at a considerable distance from the suspected area; but the crossing of the Sutlej between Rúpar and Phillour was prohibited, and the down ferry trains across the Phillour bridge were run on to Ludhiána instead of stopping as usual at the intermediate station of Ladhowál. Both at Beas and at Ludhiána detention camps were established, Lieutenant Frizelle, an Assistant Commissioner, being put in charge of the former, and a Náib Tahsíldár being stationed at the latter to manage the camp (situated at district head-quarters) under the control of the Deputy Commissioner. The orders were to detain all suspicious persons as defined in paragraph 11 of Government of India, Home Department, Resolution No. 227—240, dated 3rd February 1898, the period (except for those who were suspicious by reason of their symptoms) being fixed first at a period of seven to ten days, but afterwards reduced to 24 hours. Apparatus for the steaming of the clothes and bedding of detenus was provided by the North-Western Railway Administration at both camps, in order to provide against the danger of the exportation of infection in such susceptible articles. As already noted, the carrying of clothes and bedding from the suspected stations otherwise than as the personal luggage of travellers was prohibited altogether.

49. The camps were constructed on the system proved suitable by the experience gained at Khánpur between Mooltan and the Sind border in the spring and summer of 1897, except that the huts were made of sirkís and not of sleepers. It was ordered that families should not be separated, except in the event of plague, and that in that event friends or relatives in reasonable number should be allowed to remain with the sufferer; but as a matter of fact no cases of the disease were discovered or occurred. A small force of police was employed at each, but there was no difficulty in maintaining order, as the detenus were well behaved and contented, and only a few escapes took place, mostly on the part of beggars or vagrants who could not be subsequently traced. Complete figures of

* Passengers from Ludhiána by down trains were not required to travel in the special carriage.

both administrative and medical, that the Lieutenant-Governor will be glad to receive practical proposals from the Inspector-General of Civil Hospitals after consultation with the Commissioner of Jullundur and with any of the officers, civil and medical, employed in the late operations, whose opinions would be likely to be serviceable. It has been suggested in the report submitted by Mr. Butler, Assistant Commissioner that something is to be gained by allowing outsiders to see the hospitals if they wish to do so, with a view to checking rumours of maltreatment and actual poisoning. If the friends and relatives are allowed free access, the advantages of the admission of outsiders would seem to be counterbalanced by the risk of spreading infection by their means. But this also is a point on which the Lieutenant-Governor will be glad to have opinions, from the point of view of general administrative expediency as well as from that of purely medical considerations.

45. In connection with the subject of hospital management and sanitary precautions generally Sir Mackworth Young notices on page 106 of Captain James' report a remark to the effect that in the Hoshiárpur District plague corpses (of course only those of Muhammadans) were buried in quick-lime. It is added that this was not done in the Jullundur District, as sufficient lime (four to eight maunds per person) could not be procured. The burial of bodies in quick-lime in all cases in which any person interested raises an objection was prohibited by Government in orders published with Circular No. 1025, dated 19th June 1897, and republished at the commencement of the Punjab epidemic with Circular No. 1342, dated 8th November 1897. It is not certain that the process is necessary or efficacious, and it is one which is likely to give offence.

VI.—Prophylactic inoculation.

46. Inoculation with M. Haffkine's anti-plague prophylactic medium was performed on 2,408 persons in Jullundur and 1,510 in Hoshiárpur. Eight hundred and eighty out of this total were females. The great majority of those inoculated in the former district were Hindús, mostly Játs, Khatrís and Brahmins, only 181 in all being Muhammadans; but in Hoshiárpur the Muhammadans were in excess, being 699, against 475 Hindús, while the balance consisted apparently of Chamárs, Chuhrás and other inferior castes. Submission to the process was of course voluntary; no inducements were authorized by Government, and it is believed that none were held out; but there seems to have been in some quarters marked willingness, not to say eagerness, to obtain protection, and possibly if the Medical Staff had had more leisure the number of operations might have been considerably increased. It may here be noted that the question of the concessions and exemptions which might properly be allowed to inoculated persons was still undecided when the epidemic in the Punjab was at its height. It has since been determined by the Government of India that "inoculated persons should be exempted—

(1) from segregation, unless they are actually attacked by plague. They will, however, remain liable to evacuate infected houses;" and, it must be added, to evacuate any other houses which it may be necessary to disinfect, at all events to such extent and for such period as may be necessary to allow of adequate disinfection;

"(2) from observation and detention when travelling, subject to disinfection of clothes.

In each case the exemption is subject to the process of inoculation having been performed not more than six months before. The period of the efficacy of inoculation requires further investigation, and it may in the future become possible to extend the six months period."

47. Out of a total of 3,918 people inoculated, 3,119 belonged to villages in which outbreaks of plague occurred. Eight attacks of plague took place among the inoculated, all in the Jullundur District; and of these 1 was fatal, the case being that of a woman who received a dose of only half the minimum strength recommended by M. Haffkine for adults, and who showed none of the

signs of the reaction which usually follow a successful insertion of the prophylactic. In Banga, where inoculations began on the day that the first case of plague was discovered, 865 residents of the town were inoculated, making 17·4 per cent of the population as determined at the roll-call census which was taken at that time. In the town as a whole 2·09 per cent. of the population was attacked and the percentage of deaths was 63. Among the inoculated the percentages were ·693 and 0 respectively. The results of the operations were thus highly promising.

VII.—Inspection, detention and disinfection.

48. The arrangements on the line of Railway for the protection of uninfected areas against importation of disease by travellers by rail were as follows. Eight stations from Jullundur City to Ludhiána inclusive were treated as suspected on account of the facility with which they could be reached from the area under suspicion. All tickets sold at these stations were marked with a special punch mark, and special 3rd class carriages were added to the trains for the accommodation of 3rd class passengers from these stations.* Inspection posts under the Regulations published with Punjab Government Notification No. 1345, dated 10th November 1897, were established at the stations of Beas, on the northern or Amritsar side of the river of that name, and at Ludhiána, five miles to the south of the Sutlej at Phillour. Up trains were inspected at the former and down trains at the latter post, and passengers from the suspected stations were prohibited when travelling up, from leaving the railway limits between the Kartárpur and Beas stations, and, when travelling down, from leaving them between the Phillour and Ludhiana stations, arrangements being made by the North-Western Railway Administration to reconvey to their destinations without extra charge those passengers who were carried past them in compliance with this regulation. A small patrolling force of police travelled with the trains to see that these orders were obeyed, the object being to lessen the facilities for alighting before the inspection posts were reached and working past them by road. There was no prohibition against crossing the Beas, by fords or otherwise, as that river is situated at a considerable distance from the suspected area; but the crossing of the Sutlej between Rúpar and Phillour was prohibited, and the down ferry trains across the Phillour bridge were run on to Ludhiána instead of stopping as usual at the intermediate station of Ladhowál. Both at Beas and at Ludhiána detention camps were established, Lieutenant Frizelle, an Assistant Commissioner, being put in charge of the former, and a Náib Tahsíldár being stationed at the latter to manage the camp (situated at district head-quarters) under the control of the Deputy Commissioner. The orders were to detain all suspicious persons as defined in paragraph 11 of Government of India, Home Department, Resolution No. 227—240, dated 3rd February 1898, the period (except for those who were suspicious by reason of their symptoms) being fixed first at a period of seven to ten days, but afterwards reduced to 24 hours. Apparatus for the steaming of the clothes and bedding of detenus was provided by the North-Western Railway Administration at both camps, in order to provide against the danger of the exportation of infection in such susceptible articles. As already noted, the carrying of clothes and bedding from the suspected stations otherwise than as the personal luggage of travellers was prohibited altogether.

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* Passengers from Ludhiána by down trains were not required to travel in the special carriage.

the numbers detained have not been furnished, but during May and June 1,331 persons were detained at Beas out of 20,735 who booked from suspected stations; and from May 19th to the end of June 951 persons were detained at Ludhiána. Out of these numbers suspicious symptoms were the grounds of detention in 51 cases only. Clothes which were so filthy and useless as not to justify disinfection were burned, compensation either in money or kind being awarded to the owner. A large number of detenus were fed at the public expense at the time when the period of detention was seven to ten days; and it is understood that this continued at Ludhiána even after the period had been reduced; but the total expenditure under this head was small, and it is of course unquestionably necessary. Persons furnished with certificates showing that they had not come from the suspected area, or that they had undergone a period of observation in one of the Quarantine Camps there, and later on also persons provided with certificates showing that they had undergone within six months inoculation with Haffkine's prophylactic, were never treated as suspicious for the purposes of detention and disinfection, unless suffering from suspicious symptoms.

Attitude of the people.

50. In the villages which actually suffered from plague the Lieutenant-Governor believes that it is now generally recognized that the measures taken for the eradication of the disease were for the best, and during his recent tour through the Garhshankar Tahsíl he has been greatly impressed by the readiness with which this was admitted; but it is possible that false or exaggerated rumours have obtained credence elsewhere, and certain that nothing could be done to secure complete and universal co-operation in the event of a second outbreak. The key to success lies, however, in obtaining co-operation, as nearly complete and as nearly universal as possible, and Sir Mackworth Young thinks that experience indicates some improvements of method and policy which are likely to tend in this direction. The strongest and most disconcerting of all the prejudices with which the Plague Staff had to deal was probably the terror of the hospital and of European medicines, partly based upon and certainly strengthened by the natural aversion to separation from sick friends. Stress has been laid on the paramount importance of freedom to receive or reject treatment, and free access by friends and relatives to the sufferers. The matter is one in which medical must be entirely subordinated to political and administrative considerations. Next in order no doubt comes the dislike to the disturbance of privacy, business and comfort, and the possible danger to property, which is involved in the move into camp. Encouragement and help in the construction of shelters by individuals in accordance with their own tastes and requirements, and reduction of the detention in camp by acceleration of disinfection, are the principal remedies here indicated. When each family is dealt with as a united whole, as it is the intention of Government that they should be, and the largest possible use is made of female practitioners in dealing with women, as was the case in this epidemic, few grievances are likely to arise on the score of intrusion upon domestic privacy. That the Plague Staff could have done more than it did to facilitate the agricultural operations and other business of the cordoned villagers, the Lieutenant-Governor sees no reason to suppose; but the point is mentioned because of its bearing upon that enlistment of sympathy which is essential to success. Injury to property arises or may be apprehended from two directions. It may suffer in the process of disinfection, and it may be exposed to danger of theft when left behind in the evacuated village. In the first instance the remedy is prompt compensation in money or kind, though the principles laid down in Government of India, Home Department, Resolution No. $\frac{10\ \text{Sanitary}}{1044-1057}$,* dated 23rd March 1897, must not be lost sight of in this connection. The risk of theft is a subject which has not been dealt with in the reports, but the recorded correspondence shows that some cases of burglary, and, later on, one or two of deliberate mischief, did occur in evacuated villages, and close attention must be directed to the question of preventive measures if it should unfortunately become necessary to cope with a second outbreak.

* Republished as an annexure to Punjab Government Circular No. 1342, dated 8th November 1897.

Notice of Officers and Staff.

51. Where the general standard of zeal and work was so high it is not easy to select individuals for special mention, and Sir Mackworth Young desires to express his cordial acknowledgments alike to all departments and to all grades which took part in these peculiarly trying and delicate duties. It was no doubt the case that the subordinates of the Medical and Police Departments were frequently selected as the objects of complaint. That these departments, like others, contain men who abuse their opportunities goes, of course, without saying; but the Lieutenant-Governor is persuaded that an instinctive sense of the nature of the complaints which would be most likely to find credence dictated the direction in which charges should be levelled and that the natural feeling of annoyance at restrictive measures found a vent in attempts to discredit those subordinate agencies without which no measures of any sort could possibly be carried out. Without the police constable there would have been no isolation of the infected villages; without medical subordinates the Commissioned Medical Staff would have been powerless in hospital management and in the execution of sanitary measures. The men who actually carry out unpopular orders are naturally the butt of hostile criticism, and when (as must always be the case) some of them misbehave, and most of them are sufficiently ill-paid for bribe-taking to be a plausible charge, general accusations against the class are the ready recourse of malcontents. Vigilance to minimise the opportunities and temptations of the lower grades must always be the duty of the superior staff, but imputations upon medical and police subordinates in general were, considering all the circumstances, perhaps never less justifiable than in connection with the recent operations against plague.

52. The following officers merit the special thanks of the Lieutenant-Governor:—

Civil.

Lieutenant-Colonel Massy, I. S. C., Commissioner of Jullundur.

Mr. J. G. Silcock, I. C. S., Officiating Commissioner of Jullundur.

Major Inglis, I. S. C., Deputy Commissioner of Hoshiárpur, and thereafter on special duty in control of plague operations.

Mr. L. Jones, Assistant Commissioner.

Medical.

Captain James, I. M. S.

Dr. Datta, U. M. S.

Police.

Mr. Turnbull, District Superintendent of Police.

The names of the other officers who have been specially mentioned in Major Inglis' report will be brought to the notice of the departmental heads concerned. The Lieutenant-Governor approves of the proposal that the non-officials who gave noteworthy assistance in the operations should receive Sanads and Khillats. When at Hoshiárpur on his recent tour through that district he presented in public Darbár these tokens of the approbation of Government to eight gentlemen whose efforts to bring the people to adopt a reasonable attitude towards the Plague Administration had marked them out as specially deserving. As operations are still in progress in Jullundur a similar evidence of appreciation of the numerous helpers of Government in that district is deferred for the present.

53. In conclusion, Sir Mackworth Young records with much regret the names of the following who died of plague contracted in the discharge of their duties :—

Mr. Goulburne, Sanitary Inspector.

Third Class Hospital Assistant Ali Bakhsh.

Foot Constables Muhammad Waláyat Shah, Alladád Shah, Ghulám Farid, Hame Shah, Idu, Mam Ráj, Hákim Shah and Hákim Beg.

Report by Major E. Inglis, Deputy Commissioner, On Special Duty, and enclosures.
From Commissioner and Superintendent, Jullundur Division, No. 2311½ A XVII–43, dated 25th July 1898.
Report by Captain C. H. James, I. M. S.

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(3) All Commissioners and Deputy Commissioners in the Punjab.

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(6) All Civil Surgeons in the Punjab.

(7) Inspector-General of Police, Punjab.

(8) To the officers honourably mentioned in paragraph 52 of the Review.

By order of the Hon'ble the Lieutenant-Governor,

H. J. MAYNARD,

Junior Secretary to Government, Punjab.

Punjab Government Press, Lahore—20-12-98—230.

APPENDIX.

JULLUNDUR DISTRICT.

Village.	Number of days which elapsed between							
	Outbreak and report.	Report and cordoning	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return.	End of disinfection and return.
Khatkar Kalan ...	? 180	Nil.	11	Began before evacuation.	64	59	23	Returned before end of disinfection.
Jhander Khurd ...	30	Nil.	2	2	35	69	32	32
Khan Khanán ...	39	Nil.	13	1	88	90	38	2
Khatkar Khurd ...	5	Nil	1	5	28	45	33	12
Shikohpur ...	? 60	Nil.	1	4	51	68	35	11
Sirhál Qázián ...	9	Nil.	10	2	52	71	17	17
Mallupota ...	15	Nil.	9	7	51	71	40	13
Gunachaur ...	11	Nil.	16	3	89	82	54	Returned before end of disinfection.
Sahlon	? 30	Nil.	9	4	49	54	29	2
Mahal Gohla ...	1	Nil.	22	6	57	79	32	15
Kumam ...	6	Nil.	8	13	42	59	31	4
Jagatpur ...	6	Nil.	11	?	?	67	33	6
Karheron ...	? 30	Nil.	9	21	42	69	32	6
Karnána ...	2	Nil.	36	35	29	65	39	1
Balon ...	6	Nil.	2	4	43	51	22	4
Lakhpur ...	4	Nil.	9	2	49	52	40	1
Núrpur ...	9	Nil.	2	?	?	55	18	?
Lodhipur ...	21	Nil.	3	21	39	65	31	5
Salh Kalán ...	12	Nil.	7	5	31	43	32	7
Mohámpur ...	2	Nil.	5	36	30	68	21	2
Naura ...	5	Nil.	Not evacuated.	Not evacuated.	...	...	...	...
Masáni ...	14	Nil.	19	Began before evacuation.	79	65	27	1
Banga ...	4	Nil.	50	Ditto.	109	60	9	1
Katt ...	16	Nil.	4	10	51	68	28	7
Hapowal ...	Nil.	Nil.	17	23	29	60	24	8
Chak Bilga ...	3	Nil.	2	39	36	77	47	2
Dahan ...	6	Nil.	2	19	30	53	35	4
Tahírpur ...	10	Nil.	6	12	34	71	55	25
Mazra Nauabad ...	1	Nil.	7	4	33	42	43	5
Mahmúdpur ...	18	Nil.	2	28	38	67	47	1
Satran ...	6	Nil.	Nil.	22	25	65	28	18
Músapur ...	7	Nil.	Nil.	25	38	64	19	1
Sodián ...	3	Nil.	Nil.	22	41	64	38	1
Lidhar Kalán ...	4	Nil.	Nil.	22	29	54	24	3

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Khatkar Kalan ...	? 180	Nil.	11	Began before evacuation.	64	59	23	Returned before end of disinfection.
Jhander Khurd ...	30	Nil.	2	2	35	69	32	32
Khán Khanán ...	39	Nil.	13	1	88	90	38	2
Khatkar Khurd ...	5	Nil	1	5	28	45	33	12
Shikohpur ...	? 60	Nil.	1	4	51	68	35	11
Sirhál Qázián ...	9	Nil.	10	2	52	71	17	17
Mallupota ...	15	Nil.	9	7	51	71	40	13
Gunachaur ...	11	Nil.	16	3	89	82	54	Returned before end of disinfection.
Sahlon	? 30	Nil.	9	4	49	54	29	7
Mabal Gohla ...	1	Nil.	22	6	57	79	32	15
Kumam ...	6	Nil.	8	13	42	59	31	4
Jagatpur ...	6	Nil.	11	?	?	67	33	6
Katheron ...	? 30	Nil.	9	21	42	69	32	6
Karnána ...	2	Nil.	36	35	29	65	39	1
Balon ...	6	Nil.	2	4	43	51	22	4
Lakhpur ...	4	Nil.	9	2	49	52	40	1
Núrpur ...	9	Nil.	2	?	?	55	18	?
Lodhipur ...	21	Nil.	3	21	39	65	31	5
Salh Kalán ...	12	Nil.	7	5	31	43	32	7
Moh ámpur ...	2	Nil.	5	36	30	68	21	2
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Hapowal ...	Nil.	Nil.	17	23	29	69	24	8
Chak Bilga ...	3	Nil.	2	39	36	77	47	2
Dahan ...	6	Nil.	2	19	30	53	35	4
Tahírpur ...	10	Nil.	6	12	34	71	55	25
Mazra Nauabad ...	1	Nil.	7	4	33	42	43	5
Mahmúdpur ...	18	Nil.	2	28	38	67	47	1
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Lidhar Kalán ...	4	Nil.	Nil.	22	29	54	24	3

JULLUNDUR DISTRICT—*concluded.*

Village	Number of days which elapsed between: Outbreak and report.	Report and cordoning.	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return.	End of disinfection and return.
Kháopur ...	30	Nil.	2	11	30	51	26	10
Barwál ...	9	Nil.	1	21	14	61	37	26
Mazári ...	1	Nil.	1	20	31	55	48	4
Salh Khurd ...	5	Nil.	3	Began before evacuation.	31	31	27	2
Heon ...	4	Nil.	1	6	48	20	21	Returned before end of disinfection.
Langeri ...	3	Nil.	1	15	48	63	34	Nil.
Lálpur ...	3	Nil.	Nil.	13	13	43	25	17
Chahlan ...	6	Nil.	Nil.	29	27	57	32	1
Bisla ...	5	Nil.	Nil.	20	26	61	17	17
Aur* ...	2	Nil.	Not evacuated.	Not disinfected.	...	...	...	...
Malpur ...	?	Nil.	Nil.	20	23	44	36	1
Bika ...	1	Nil.	Nil.	10	20	62	25	3
Hansron ...	30	Nil.	Nil.	21	20	42	34	1
Sirhái Mandi ...	? 1	Nil	23	8	18	36	22	4
Dhandua ...	4	Nil.	1	19	22	55	2	14
Mokandpur ...	5	2	26	15	10	34	34	Nil.
Gobindpur ...	38	Nil.	10	Nil.	40	43	25	3
Lail ...	5	Nil.	1	22	16	43	18	5
Chak Kalál ...	Nil.	Nil.	18	3	23	30	38	4
Punián ...	4	Nil.	6	4	34	53	43	15
Kariha ...	15	Nil.	14	24	19	46	15	3
Parágpur ...	?	Nil.	10	17	25	44	34	27
Rasúlpur ...	12	Nil.	7	18	21	40	32	1
Rahpa ...	6	Nil.	1	15	22	40	24	3
Goslan ...	1	Nil.	3	12	29	46	36	5
Bhangal ...	14	Nil.	3	19	26	46	35	1
Bajon ...	6	Nil.	3	18	19	38	30	1
Malah ...	5	Nil	Nil.	11	37	49	45	6
Aujla ...	6	Nil.	16	No disinfection.		25	6	...
Chhokrán ...	24	Nil.	Nil.	23	12	35	21	1
Laroya ...	27	Nil.	Nil.	18	14	36	20	4
Pharála ...	?	Nil.	1	11	27	43	13	5
Ladhana Jika ...	10	Nil.	1	10	15	26	24	1
Bhaura ...	24	Nil.	1	4	17	24	23	3
Turan ...	20	Nil.	Nil.	8	10	21	19	3
Jhingáa ...	28	Nil.	Nil.	10	16	35	27	9

* The particulars given in regard to this village refer to the first outbreak there only.

HOSHIARPUR DISTRICT.

Names.	Number of days which elapsed between: Outbreak and report.	Report and cordoning.	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return.	End of disinfection and return.
Bírámpur ...	36	Nil.	15	52	24	79	37	3
Parkhowál ...	7	Nil.	Nil.	12	46	58	23	Nil.
Rámpur Bilron ...	6	Nil.	*89	10	38	67	25	19
Simmalmazra ...	12	Nil.	24	9	35	45	18	1
Deron ...	23	Nil.	1	22	5	27	29	Nil
Bhajjal ...	15	Nil.	3	18	24	49	15	7
Sadhowál ...	?	Nil.	Nil.	32	8	42	21	2
Hájipur ...	3	Nil.	24	18	12	26	1	Returned before end of disinfection.
Parowál ...	6	Nil.	Nil.	27	12	32	4 days after return.	Ditto.
Garhshankar ...	7	Nil.	33	6	48	68	16	14
Sanwáli ...	?	Nil.	1	22	6	29	24	1
Garhi ...	?	Nil.	10	10	29	42	20	3
Kullewál ...	?	Nil.	15	7	36	45	12	2
Chankoha ...	2	Nil	8	6	31	47	10	10
Bhagwain ...	7	Nil.	1	12	20	34	26	2
Palewál ...	?	Nil.	10	2	27	33	34	4

* This village was not evacuated, except by the Chamárs among whom the disease first appeared, until after a second outbreak which occurred on April 12th.

Punjab Government Press, Lahore—20 12-97—230.

JULLUNDUR DISTRICT—*concluded.*

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Dhandua ...	4	Nil.	1	19	22	55	2	14
Mokandpur ...	5	2	26	15	10	34	34	Nil.
Gobindpur ...	38	Nil.	10	Nil.	40	43	25	3
Lail ...	5	Nil	1	22	16	43	18	5
Cnak Kalál ...	Nil.	Nil.	18	3	23	30	38	4
Punián ...	4	Nil.	6	4	34	53	43	15
Kariha ...	15	Nil.	14	24	19	46	15	3
Parágpur ...	?	Nil.	10	17	25	44	34	27
Rasúlpur ...	12	Nil.	7	18	21	40	32	1
Rahpa ...	6	Nil.	1	15	22	40	24	3
Goslan ...	1	Nil.	3	12	29	46	36	5
Bhangal ...	14	Nil.	3	19	26	46	35	1
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Malah ...	5	Nil	Nil.	11	32	49	45	6
Aujla ...	6	Nil.	16	No disinfection.		25	6	...
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Rámpur Bilron ...	6	Nil.	*89	10	38	67	25	19
Simmalmazra ...	12	Nil.	24	9	35	45	18	1
Deron ...	23	Nil.	1	22	5	27	29	Nil
Bhajjal ...	15	Nil.	3	18	24	49	15	7
Sadhowál ...	?	Nil.	Nil.	32	8	42	21	2
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Kullewál ...	?	Nil.	15	7	36	45	12	2
Chankoha ...	2	Nil	8	6	31	47	10	10
Bhagwain ...	7	Nil.	1	12	20	34	26	2
Palewál ...	?	Nil.	10	2	27	33	34	4

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Punjab Government Press, Lahore—20 12-97—230.

7
Cno. 2802P of 98

44 Plague of 99

REPORT

ON THE

OUTBREAK OF PLAGUE

IN THE

JULLUNDUR & HOSHIARPUR DISTRICTS

OF THE

PUNJAB,

1897-98,

BY

Major E. INGLIS, Deputy Commissioner on Special Duty,
and other Officers.

Price Rs. 3-10-0.

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No. $\frac{2311\frac{1}{2}\text{-U.}}{\text{XVII-43}}$, dated Dharmsála, 25th July 1898; despatched from Jullundur on 3rd August 1898.

From—J. G. SILCOCK, Esquire, Commissioner and Superintendent, Jullundur Division,

To—The Junior Secretary to Government, Punjab.

I HAVE the honor to forward a report on the plague operations in the Jullundur and Hoshiárpur Districts submitted by Major Inglis who was placed on special duty in connection with the disease and has for the last few months been in general charge.

This report is accompanied by seven subsidiary reports from the officers on observation duty, by three from the Civil Officers in charge of the executive plague operations, and by three from the Senior Medical Officers in charge of the three plague centres.

2. All matters that are now held to be of importance have been fully discussed in these several reports, but it is to be regretted that Major Inglis has not been in a position to give a detailed history of all the operations which have been carried on in these two districts from the discovery of the first case on the 17th October 1897 up to the present date. No executive officer is now on duty who was present at the commencement, and Colonel Massy, my predecessor, who practically superintended all operations in both districts from October to April, has left India. I am myself only able to speak with certainty, or from personal knowledge, of the facts which occurred after the 20th of April, the day on which I took over charge of the Commissionership of Jullundur. The report contains no clear statement of the establishment of Civil, Medical and Police Officers employed, or of the system under which operations were conducted, or of the various stages and alterations in such system.

As it is desirable that there should be some record on these points, giving a fairly continuous history, I supplement the report by a brief account, which, however, may not be correct in all particulars, as the materials at my disposal are somewhat defective regarding the earlier periods of the operations.

3. The first case of plague occurred on the 17th October 1897 in the village of Khatkar Kalán, and the last case has occurred on the 10th of July in the village of Pharála. The course of operations between these two dates may be for the purpose of review divided into four periods—

(1) From 17th October to 1st March, during which the disease was spreading in a slow and desultory fashion, and only a small staff of officers was employed.

(2) From 1st March to 1st of May, when the disease was increasing by leaps and bounds, appeared to have got beyond control, a much larger staff was employed, and observation duty was separated from executive and entrusted to a different set of officers.

(3) From 1st of May to 1st July, during which the disease was brought fully under control, its spread checked, and a still larger executive staff of Civil and Medical Officers employed.

(4) From 1st July to present time, the period of closing operations, withdrawing of the staff, and making fresh arrangements for observing the plague area during the rains.

In the first period there were 11 villages attacked in Jullundur and 6 in Hoshiárpur, the disease having first appeared in the latter district on the 11th December.

In the second period the number of villages attacked were respectively 52 and 8.

In the third period the numbers were 7 and 2, and the fourth period is as yet blank.

The great increase in the second period and the sudden fall in the third is worthy of note, especially when this is accentuated by the fact that the month of April, in which the disease reached its height with a total of 32 fresh villages, the combined heat and dryness of atmosphere was practically greater than in any of the preceding or following months. Cold also is supposed to be favorable to the disease, but in this outbreak there was not a single fresh village infected in January, the coldest month in the year.

4. During the first period the disease which had attacked Khatkar Kalán on the 17th October did not appear in any other village until the 2nd of November, when it was discovered in Jhander Khurd; a third village became infected on the 24th November; and Birámpur, the first village in Hoshiárpur, was attacked on the 11th December. There were no cases in January, but the disease began to spread in February.

The staff employed consisted of four Civil Officers, Messrs. Leslie Jones, Johnston, Butler and Loxton, Assistant Commissioners, and four Medical Officers, Surgeon-Captains Davidson, James, Wilkinson and Walton in Jullundur, and one Civil Officer, Mr. Stow, and two Medical Officers, Surgeon-Captain Heard and Dr. Datta, in Hoshiárpur. There were several intermediate changes among officers, but this appears to have been the strength about the end of February.

There was a small subordinate staff of Tahsíldárs, Hospital Assistants and Compounders; and a Police force of 2 officers and 1,425 men in Jullundur and 1 officer and 450 men in Hoshiárpur.

No separate observation staff existed. The number of infected villages being comparatively small, no necessity existed for a separate establishment.

5. During the second period many changes were effected. About the 1st of March it was decided to introduce a separate observation staff on the lines which had been adopted in the North-Western Provinces, to increase the number of officers on plague duty, and to provide a large subordinate staff of Tahsíldárs, Kánúngos and Hospital Assistants for the thorough and systematic inspection of villages.

Major Inglis was placed on special duty to supervise this separate staff, the executive plague work remaining, as before, under the immediate supervision of the Commissioner. Messrs. Clark, Bird, Langley, Gracey and Tek Chand, Assistant Commisioners, and Surgeon-Captain Ewens and Assistant Surgeons Davis, Mason and Weston were added to the numbers of officers already on plague duty.

Five observation circles were established in Jullundur and five in Hoshiárpur, and an officer with a special subordinate staff was placed in charge of each circle.

The Police force was increased by 1 officer and 1,000 men, and in April Mr. Turnbull, District Superintendent of Police, of Jullundur, was placed on special duty in charge of the whole Police, force.

There were therefore, for the most of this period, 9 Assistant Commissioners, 9 Medical Officers and 6 Police Officers, with a large subordinate staff and a force of 3,000 Police actively engaged in the struggle with the plague, and yet the disease appeared to have got beyond control and 60 fresh villages had become infected.

The treatment of the disease was the same in both these periods; the object aimed at was to have each infected village either partially or wholly evacuated, and the village site disinfected, the area being at the same time surrounded by a cordon of Police to prevent any communication between the infected and uninfected villages.

6. The third period from 1st of May to 1st of July is marked by a further increase of the staff and by a remarkable fall in the number of infected villages.

It was seen that with the large number of villages on hand the staff then existing was utterly unable to cope with the work to be done; it was found that no rules had been laid down for the systematic conduct of operations; that there was no sufficient definition or distribution of duties by which responsibility could be enforced; that the Police cordon was so defective as to be of very little use; that the branch concerned with the purchase and provision of huts and materials for shelter was being starved; and that finally there was among the executive staff very great hesitation and doubt how far evacuation of village sites should be insisted on, and how far the disinfection of such sites should be pushed. It was also recognized that unless the disease was stamped out during the months of May and June, *i.e.*, before the rains, all our efforts would be in vain.

Application was accordingly made for more officers, and 8 more Civil, 6 Medical and 1 Police Officer were immediately provided, rules were laid down enunciating the principal lines on which the operations were to be carried out and defining the responsibility of the different departments, and pointing out clearly in what matters discretion was allowed and on what it was not; the Police cordon was taken in hand, its defects remedied, written orders given to the officers defining their duties and responsibility, the number of such officers increased by taking Police Officers off all other duty, the cordon made impassable by any but European Officers or those who had obtained passes, a system of passes instituted, a very large amount of material for hutting and shelters ordered, and directions issued that total evacuation of each village site after the occurrence of two cases was to be insisted on, and that the disinfection of the sites was to be thoroughly carried out, the roofs of all infected houses being removed, and holes made in the roofs of all other houses. All these orders were thoroughly and efficiently carried out by all concerned, and the result was that on the 1st of July only seven infected villages remained on our hands in Jullundur and only three in Hoshiárpur (all of which have since been declared free of plague), and that in the closing week of June it was possible to arrange for the winding up of operations, the reduction of the staff and the withdrawal of the Police force.

7. The fourth period is one which calls for little remark. It dates from the 1st of July, and is not yet concluded, Jullundur District being not yet declared free from plague. In Hoshiárpur the last village, Palewál, was uncordoned on the 21st, and all the Police and staff removed with the exception of Surgeon-Captain Hunter, who remains on for the present. In Jullundur there are still two villages, Laroya and Pharála, which have not been declared free. There have, however, been no fresh cases in Laroya since the 3rd of June and none in Pharála since the 10th instant, and it is hoped, therefore, that in a short time these villages may also be removed from the plague list. It is, however, in my opinion useless to expect that dropping cases will not occur for some time to come. Meanwhile great reductions have been made in the staff. Major Inglis left on the 4th and his office has been abolished. All Assistant Commissioners on executive work, except Mr. Gracey, who is in charge of the concluding operations in Laroya and Pharála, have left.

Of the Medical Officers, Surgeon-Captain Wilkinson alone remains in Jullundur and Surgeon-Captain Hunter in Hoshiárpur. Similarly only a few of the subordinate executive staff remain on duty.

The observaton staff has at the same time been reduced from 10 to 3 officers, 1 in Hoshiárpur and 2 in Jullundur. Each officer has been provided with 2 Náib Tahsíldárs, 2 Hospital Assistants and 2 dháís, and all the remaining members of the subordinate observation staff have left.

The conduct of all operations has now been made over to the Deputy Commissioners of Jullundur and Hoshiárpur.

The main facts of the outbreak are as follows:—

D

Eighty-six villages have been attacked,—70 in the Jullundur District and Hoshiárpur.

52 and the epidemic lasted for nine months, and reached its height in March In t when 60 villages became infected.

yet blank.

The total number of cases have been 3,390.

The total number of deaths 2,103, or about 61 per cent. of attacks. I have had these cases analysed for the purpose of seeing what effect evacuation of the village site had on the disease, and I find from the statements made out that of the total 3,390 cases—

1,335 occurred before evacuation,
1,014 " within four days after evacuation,
421 " within the second period of four days,
169 " within the third period,
103 " within the fourth period,
88 " within the fifth period.

This gives the total cases up to 20 days after evacuation: enquiries were not pursued beyond this period.

The cases which occurred within the first four days after evacuation are cases which must have taken the infection in the village, and which were only discovered as soon as the people came out into camp. Adding these 1,014 cases to those known to have existed before evacuation, it is found that 2,349 cases out of a total of 3,390, or practically two-thirds, are directly due to infection inside the village.

It may be also fairly assumed that many of the cases included in the second period of four days were infected before evacuation, as the ordinary period of incubation is five or six days.

The result of evacuation, as shown by the successive drops from 1,014 to 421, 169, 103 and 88 is most clearly marked. The fall is not to be ascribed in any way to the disease having run its course, since it was proved over and over again that in the evacuated houses in the villages the disease still retained its full virulence.

The work done by the executive staff was to provide the people with hospitals, huts and other shelters, to mitigate in other ways the hardships suffered by them in camp, to disinfect thoroughly every house in the evacuated village, and all clothes and other articles belonging to the inhabitants, to destroy all clothes, &c., which for medical reasons required to be destroyed, and to pay compensation for the same, to arrange for the support of the indigent and helpless, and for the provision of work for those who were able to work, to settle about the cultivation of the village lands with reference to the cordon, and in fact to take over the whole administration and government of all the villages within the cordon, as communication either from or to the outer world was strictly prohibited. The cost of these operations has not been given in the report, but from returns made to me I find that, excluding the separate cost of the observation staff and salaries of the officers and of the higher subordinate staff and of the Police, the direct expenditure on plague work has been from the commencement up to the 1st July Rs. 1,23,195 in the Jullundur District and Rs. 51,992 in the Hoshiárpur, or a total of Rs. 1,75,187.

This expenditure is undoubtedly heavy, but when the large area over which the disease extended is considered, the number of people whose wants had to be attended to, and the long period over which operations extended, it will, I think, be found that the expenditure, in addition to being unavoidable, has been fairly moderate. The chief heads of expenditure have been (1) construction of huts, (2) hospital charges, and (3) disinfection of houses.

Spread of the disease.

8. Major Inglis has not discussed this subject at any great length in his report; he has left it, as he states, to be fully dealt with by Surgeon-Captain James in the special report which he is understood to be writing. Dr. James does not touch on it, however, in his present subsidiary report. This is much to be regretted, as the question has been thoroughly gone into by

Mr. Butler and Surgeon-Captains Smith and Clark for the Nawashahr and Garhshankar Circles, and it would have been of very great advantage in discussing the theory of the propagation of the disease to have had the benefit of a statement of the facts of the Banga Circle and of the opinion of an officer, who had been present during the whole outbreak, and who is understood to have accumulated a large number of facts relating to that circle.

There are three ways in which, according to the latest accepted views, the disease can be propagated. They are—

(1) Human agency.

(2) Clothes sent from one village to another.

(3) Rats.

At the commencement, when the disease broke out in widely separated villages, there can be no question (and there was no question) that human agency was the means of infection. Sufficient evidence was obtained to show that there was no necessity to have recourse to any other theory. Possibly in some cases the disease may have been conveyed in bundles of clothes, but in the great majority of instances it was found that some person had come from an infected village and brought the disease with him.

When, however, in March and April the disease was increasing at such a rapid rate, when it was found that it was not attacking widely distant villages, but was spreading from an infecting centre to all the villages round that centre, and that too in spite of the cordon and without any evidence of infection by human agency, it was held that rats must in many cases have been the infecting agents.

This was the view held in April, but when I found how inefficient the Police cordon had been in March and April, and that in almost every case investigated there was very good reason to hold that the disease had been communicated by human agency, and when in no one case had rats (plague infected or otherwise) been found going from one village to another, it was not difficult to arrive at the conclusion that for all intents and purposes rats might be neglected as far as infection from one village to another was concerned, though they are by no means a negligable quantity in regard to the spread of infection inside a village.

Mr. Butler has now made an exhaustive report on the Nawashahr Circle of villages under his control, and he has in my opinion conclusively established that in almost all those villages human agency or clothes were the infecting cause. Surgeon-Captain Smith has also written fully on the subject of rats, and has given reasons for the opinion that infection never is conveyed by them from one village to another. Similarly in the Garhshankar Circle Surgeon-Captain Clark has shown that in the vast majority of new villages the infection was by human agency. It is greatly to be regretted then that no information is available regarding the villages of the Banga Circle, especially as it was in this circle that the rat theory first received any acceptance. It is understood that there are some cases of infection in this circle which it is very difficult to account for on any other theory but that of rat infection.

The case of Chak Kalál may be instanced, where the people evacuated the village before a single case of plague occurred, but went back one night during a heavy storm of rain, found the place full of dead rats, and immediately became infected. There are probably other cases similar to this. It is very hard to see how it can be explained on any other theory than that of rat infection, and at any rate it must be explained before it can be said that infection *never* occurs through the agency of rats.

It may of course be contended that the place must have been infected before the inhabitants turned out, and that they knew of this, otherwise they would not have been so ready to evacuate, and that if this was so, it is quite

possible that the infection was through human agency. This may be so, but no evidence countenancing this theory has, as far as I am aware, been obtainable.

I have, however, no hesitation in saying that for all practical purposes the rat theory may be neglected, because in the first place we can take no precautions or measures which can meet it, and secondly because it is very evident that in the enormous majority of cases infection has been brought by human agency. It is to be regretted that in connection with this point the remarkable drop in the disease in May and its practical collapse in June has not been considered or discussed in the report, or by any of the officers.

I should be only too glad if this sudden decrease could be rightly attributed to the increased efficiency in May of all branches of the executive, but especially of the cordon; but after taking credit for all there still remains a balance which is not accounted for.

As I have already said, April was a much hotter and drier month than May, when thunderstorms were frequent, and therefore according to the received ideas of the effects of atmospheric conditions there should have been, other things remaining the same, an increase instead of a decrease in the latter month.

It is possible that the presence of standing crops round the villages during April allowed the cordon to be evaded with much less difficulty than in May, when all the crops had been cut. It would be satisfactory to think that this was a sufficient explanation. It is at any rate impossible to imagine any other unless it is held that after April the virulence of the disease began to lessen. This I do not consider to have been the case, but this point will be discussed afterwards.

It is difficult to come to any definite conclusion as to the causes of the spread of plague until we know with more certainty how infection is conveyed from man to man. This information the Medical authorities have not been as yet able to confidently supply. There appears to be good reason to believe that only very rarely can the infection be conveyed in the open air; else why the practically complete immunity of all plague attendants and the almost immediate cessation of the disease when the villagers are turned out of their houses into the open air.

It would seem probable therefore that to convey infection by human agency from one village to another it is necessary for a man to live or sleep in an infected house, take the disease, carry it *in* his own body, not *on* it, to another village, and infect a house there by becoming ill in it.

It is, I think, beyond question that in the great majority of cases the infection has been conveyed in this way, but there are also instances in which it appears clear that the disease has been communicated through clothes. It has been found that the clothes of an infected house have been frequently sent away to another village, through fear of their being destroyed, when the disease had been discovered; also that the clothes of those who have died are often taken as perquisites by Náís, Chamárs and other low castes, conveyed to another village and give rise to the disease there. It is remarkable in how many cases the disease has appeared first in the houses of persons who, it is known, are accustomed to receive such presents of clothes in return for services rendered during illness or at death.

Practically speaking, these two modes of spreading infection are what we have to guard against, and this can only be done by having the observation staff in such a state of efficiency that it can discover without delay the outbreak of plague in any village, and secondly by having the Police cordon put on at once and kept up so strictly that it should not be possible for the inhabitants of the infected village to have any communication with the outside world or send away any clothes.

It is well known that the cordon was evaded in March and April without much difficulty; few cases are known of it having been passed in May or June.

The theory of a decrease in the virulence of the disease ramains to be considered. I regret that this question has not been taken up in the report or in any of the subsidiary medical reports. Mr. Butler has gone fully into the question as regards Kariha, and has attempted to show that at the close of the epidemic in that village there was a distinct decrease in virulence; but whether his contention is true or not (and I agree with Dr. James that he has not made out his percentages correctly nor instituted a proper comparison), it has little bearing on the general question of fall in virulence.

Kariha is the village in which the disease was most virulent, and, although it may have exhausted itself *in* that particular village, yet there is no question but that when it attacked it, there was no decrease in virulence over the general plague area.

There is a very considerable difference shown in the number of cases occurring in fresh villages before the 1st of May and after it, but the decrease in May cannot be attributed to a decrease in virulence. The villages in which the death-rate has been highest, Garhshankar, Kariha and Garhi, are all villages in which the epidemic was raging at the end of April, and in which immediate evacuation was not enforced. The microbe had certainly not lost its power then, and if fresh villages infected after 1st May show very few cases, the cause cannot properly be attributed to any failure in power, since loss in virulence is always gradual, never sudden. Similarly very little is to be gained by any examination of the proportion of deaths to total cases in the May villages as compared with those in the former months. The proportion is very heavy in Laroya, 10 to 13, and light in Pharála, 6 to 17, both infected in May. These proportions do not differ much from those in March and April villages. There does not appear, therefore, to be any good ground for holding that the disease was losing its virulence in May, or that the occurrence of so few cases in that month is to be attributed to any other cause than the speed with which infected villages were then evacuated.

Cordons.

9. Major Inglis has dealt fully with the question of cordons, and also with that of passes to which any proper system of cordon must give rise. Up to the 1st of May there was no efficient cordon and no passes were required for crossing the line. The cordon may have had a moral effect with the people. It certainly had very little physical effect. In some cases the sentries were only four to a mile, or 440 yards apart. Practically therefore, except for the moral effect the cordon might as well have been taken off.

When once the Police force knew what its orders were, I have no hesitation in saying that it worked up to those orders most efficiently, and I credit, as I have already said, this increased efficiency with a very large share in the reduction of the disease in May and June.

The minimum number of sentries to a mile was finally laid down at eight, but this was simply because the force was not large enough to give more. An efficient cordon should have at least one sentry to each 100 yards, or 18 to a mile, and this at three men to each sentry post would require 54 men to a mile, or many more than there is any hope of having supplied from a purely Police force. I agree therefore with Major Inglis that in case of another large outbreak it would be desirable to employ military. The objection I have had to employing a military force is that so many special arrangements are required for each force in the way of supplies, camping necessaries, &c. A Police force is accustomed to live among the villages; it can more or less arrange for itself, while a military one has to have nearly everything done for it. The difference is very great when it comes to practical working, but I am now of opinion that if it is impossible to assemble a sufficient Police force to give at least 12 sentries to the mile, that force should be supplemented by a military one. I do not agree with the opinion that the cordon should be purely military, as I see no necessity

for it. The difficulties which were found in managing the Police force collected in the plague area were only difficulties, until it was insisted that they should be faced and met. A force of 3,000 men cannot be administered and provided for without a little forethought and trouble. The principal defect found in the cordons as they were finally constituted was that there were not a sufficient number of men available for all emergencies; but when it is considered that constituted as it was the cordon performed the duty required from it and succeeded in confining and repressing the disease, I think it may with justice be held to have done all that could be required from it. All the officers and men deserve the highest commendation for the uncomplaining zeal and energy with which under very adverse circumstances and in the greatest discomfort they carried out the duties entrusted to them.

No remarks are necessary regarding the system of passes as finally settled upon. Undoubtedly some friction occurred until officers were forced to devote a little thought to the subject and to find a way out of the difficulties which are inseparable from a rigid system of cordon.

Observation.

10. Major Inglis has gone fully into the details of the duties of the observation staff.

I agree with all that he says. I think rewards for information should be given freely, and that prosecutions should only be instituted in very exceptional cases.

It cannot be excepted that we should under any circumstances have the people with us in giving information about first cases. It is to the interest of the whole community to conceal them, and it is only by holding out to individuals an inducement sufficient to outweigh in their minds the general resentment of the community that we have any chance of obtaining timely and reliable information. Prosecutions again might be expected to have as great an effect in forcing Lambardárs to give information as in concealing it, but in actual practice their effect has been discouraging, and I therefore would disallow them. It has been objected to the usefulness of the observation staff that in no single instance have their investigation brought an unreported case of plague to light. This is true, but if the staff had not been there there, would almost certainly have been no reports made.

I agree with Major Inglis that experience has proved that neither Kánúngos, Hospital Assistants nor Compounders should be employed on observation duty, and also that it is unnecessary to employ Medical Officers, provided one such officer is available to be called in for diagnosis when required.

I place the greatest reliance on the work of the observation staff, but to enable them to do their work properly I am of opinion that no Tahsíldár should have more than 50 villages to look after, and that no officer should have more than three Tahsíldárs under him. If the area is greater than this, the supervision must be to a great extent superficial.

Roll-calls and corpse inspections need not be enforced. They are greatly objected to by the people, and, except when suspicions are strongly directed against any particular village, they only do more harm than good.

Attitude of the people.

11. As the report has clearly expressed it, we can never hope to have the people with us when we compel them to evacuate their houses. In no country in the world, civilized or otherwise, could the people ever look on such action with anything but hatred and repugnance. When once the inhabitants have come out, however, they often change their ideas, and see that things might be a great deal worse, and that the hardships they have to undergo, though undoubtedly great and real, are by no means so great as anticipation had foreshadowed them.

Still with every new village the same objections have to be met. The very efficiency of our cordon in preventing one village knowing what the other has experienced prevents it ever being possible to remedy this state of affairs.

This, the main grievance, cannot be removed or remedied, but their removal into camp can be lightened very considerably by making ample provision of huts and shelter, and this has always been done in late months, though I am afraid that in the earlier months of the epidemic the people had too much reason to complain. Plague patients should never be removed from their families, nor, I believe, is this ever insisted on now. It was one of their greatest grievances, and it was on account of it that I was of opinion that no hospitals should be set apart for treatment of plague. No treatment that we have been able as yet to discover has any effect against the disease. The only thing that can be done is careful nursing, and this can be done better by the family than by any one else. The risk in the open air of any of the family, or of the neighbours in the segregation camp, taking infection is so small that it may be disregarded. Naturally patients should with their friends be placed at one side of the segregation camp and measures taken as far as possible to prevent any undue association.

Major Inglis mentions under this head Inoculation, and shows how in many instances the people accepted it without demur, and in others even asked for it. Inoculation can, however, never be popular, just as vaccination and especially adult revaccination can never be popular.

There is no question that it materially reduces the mortality of the plague, and it should therefore always be made available, and even pressed on the acceptance of those who are in danger of infection; but none of the facts or statistics as yet available have convinced me that it has any appreciable effect in preventing the spread of the disease, and as all our operations are directed to the latter purpose, and only incidentally to reduce the mortality, I do not consider that it is very material what view is held by either Medical Officers or the people on the subject of inoculation. If we had any sufficient grounds for holding that it could be substituted for evacuation, I should be strongly in favor of introducing it and pressing it, exactly in the same way as vaccination is pressed, but unfortunately experience here, and I believe in Bombay also, is against it.

Functions of Medical Officers.

12. Major Inglis recommends that in future operations the whole work of disinfection should be placed in the hands of Civil Officers. I am not altogether in favour of this. Medical Officers would necessarily have the work carried out much more scientifically than Civil Officers, and we have had some cases, notably at Bilron, where the work done by Civil Officers had to be done over again because it was not up to the standard. It would therefore be necessary always to have the work supervised by Medical Officers, and that being so, it is a question whether it would not be best to let the Medical Officers do it themselves. If, however, from the scarcity of Medical Officers it should be necessary to make some new distribution of the work, there is no doubt that the disinfection work could be taken over by the Civil Officers and carried out with fair efficiency, provided a set of standard rules was made out to which they would be rigidly bound to adhere. I would in this case, however, insist that the work should be passed by a Medical Officer. It should be clearly understood that for every Medical Officer reduced from the staff it would be necessary to add a Civil Officer to it. The latter has had his hands full during this outbreak, and it would be impossible for him to add anything to his duties without more or less neglecting some of them. The subordinate staff for the work of disinfection should be either Non-Commissioned officers from British Regiments or Hospital Assistants, or both combined. I would exclude all other classes.

Hospital Assistants have been tried and have done fairly well, but they are unfortunately open to persuasion in certain respects at the hands of the villagers.

Non-Commissioned officers have not been tried, but there is a general opinion that they would be the best agency to employ, and I think they should be given a trial.

I wish here to call attention to the great desirability of having one Medical Officer deputed for plague duty without any executive charge, but simply to examine into facts and make some record of them for future use. We have been, as I have already shown, working in the dark as to many matters connected with the disease, and I am certain that a great many facts have occurred which, if carefully noted, investigated and followed up, would have given clues to many things which are still in doubt. All officers were during these operations so heavily overworked that they had little leisure to even note a new fact, much less to follow it up.

Evacuation and disinfection.

13. The advantages of evacuation and thorough disinfection of the whole village site have been so accepted, as fully proved, that little argument has been used regarding them in the report. A comparison of the number of cases in Banga, Bhangal, Kariha, Garhi and Garhshankar, where immediate evacuation was not insisted on, with that of the later villages, where no delay was allowed to occur, will show clearly the necessity of having all the villagers camped out in the open air at the earliest possible moment.

It may be said that if there was no regard to be paid to the mortality and the disease was allowed to run its course in a village it would of itself die out, and that therefore if the inhabitant chose to run the risk of the disease in preference to the discomforts of camping out in the open they might be allowed to do so without any harm to the general community; but there are no grounds for believing that the disease has shown any tendency to die out in a village. In even the strong case which Mr. Butler takes, that of Kariha, Dr. James shows that the disinfecting gang was twice infected during the cleaning of the town, even after the lapse of 34 days.

In Banga also every effort was made to eradicate the disease without having the town evacuated, but in the end it was found, and it was also clearly recognised and admitted by the inhabitants, that there was no remedy but for all to evacuate.

There are only two villages in the whole plague area which can be instanced in favour of non-evacuation of the whole village. They are Aur and Naura. In both of these only one case occurred, and only the infected family was turned out and the disease did not spread.

To-day, however, news has been received that the disease has re-appeared at Aur with four cases, and that it is not imported but indigenous. This must mean that the disease has either been latent there since the 8th April, when the case occurred, or that it has been all along existing in the village and concealed. At any rate the occurrence would appear to furnish a strong argument in favor of evacuation of the whole village on the occurrence of even the first case.

According to the rules at present in force, evacuation is only compulsory after the occurrence of two independent cases.

Major Inglis has asked each of the three Circle Medical Officers their opinion as to whether every village infected should be evacuated, and if so when, and I regret to observe that all of them give a hesitating opinion and say that it should be left to the discretion of the Medical Officer in charge. If Medical Officers after their present experience of the disease can give such an opinion *from a medical point of view*, I am on my part of opinion that it is a matter which certainly ough *not* to be left to their discretion. If experience is to count for anything, the ctse is a very plain one. We find that we have not a single village except Aur and Naura in which a first case has not been followed by a s[illegible] deal and more; and we see now that it was a mistake not to have had Aur evac[illegible] great d them.

at once, even with its one case, since I am afraid we must assume now that the village has become permeated with the disease, and that on the occurrence of some condition (at present unknown) favorable to it, it will rise to virulence.

We know also that we are hardly ever able to get the first or even the second case, and that under no circumstances can we be ever sure of having done so. This being so, I fail to see what room there is for discretion, or why the Medical Officers should claim it. Every officer, whether he is Civil or Medical, naturally prefers to have as much as possible left to his discretion, but I am of opinion that in this epidemic there was a great deal too much left at first to the discretion of individual officers. We know now what course the plague takes; we know what we can do to oppose it and what we cannot do, and on the main lines of operations there is no room for discretion. It is essential that these main lines of treatment should be clearly and distinctly laid down, and that no departure should be allowed from them without special reasons. Even after the experience I have gained, I am not prepared to modify a single one of the rules which I drew up at the beginning. Some of them may be wrong or may be unnecessarily strict, but through acting on them the disease has been stamped out, and I am content that they should be judged by the result.

I see that the rule laying down an interval of ten days between evacuation and disinfection is objected to as unnecessary, and as uselessly delaying the return of the villagers to their homes. This rule was laid down purely and solely to meet the theory of the spread of infection by rats. If Medical Officers will assure me that there are no grounds for any longer believing in this theory, the rule will be at once cancelled; but they have not as yet been able to assure me, and I do not see how in face of known facts any such assurance could be given.

The argument is this. Plague shows no tendency to spread from house to house unless it is carried by human beings or animals.

Rats take the disease, and it is admitted that after being infected they have no tendency to leave their homes, unless they are disturbed, and that in ten days all that live in the infected houses should have died. If, however, they are disturbed by the roofs being at once taken off infected houses, floors being dug up and everything being flooded with phenyle, they must leave the infected houses and carry the infection to other houses. In front therefore of the line of disinfection through a village there must be an advancing wave of infection carried by rats; and when the disinfection reaches the last house in the village, the remaining rats must either double back into the houses already disinfected, thus reinfecting them, or they must leave the village and carry the infection to some other village, and either result is clearly one to be avoided.

The matter may be somewhat ridiculous, but given the premisses, the conclusion and therefore the rule would appear to be sound.

A second point on which opinions were solicited was whether a period of three weeks should elapse from the occurrence of the last case before a village should be allowed to return, there being an additional proviso that the hospital should then be free. I did not lay down this rule, but I think there can be very little doubt that it is a good one and should be carried out. Some definite time must be fixed, and calculating the time required for a plague case to recover, I think that it will be found that three weeks is short enough.

It appears to have been overlooked on this subject that the rule laid down by me, and which should be in force, was that the Medical Officer should decide when a village should be re-occupied, but that if he urged the re-occupation while there was a plague case in hospital the sanction of the officer on special duty was to be obtained. This does not appear to be a very cumbersome form of procedure, and I am not aware that sanction ever was refused when a reasonable representation was made.

Dr. Smith has also raised the question of whether disinfection should to carried out by means of phenyle or bicloride of mercury. This is a The sol question, but even from that point of view it is doubtful (*vide* Report of sioned o[illegible]ay Plague Research Committee) whether the advantage is not on the I would e[illegible]nyle.

From the practical point of view there can be no hesitation; bicloride is useless without acid; acid can only be used in wooden squirts; wooden squirts are useless. Nothing but good metal pumps would stand the usage which they have to endure.

But a much greater disadvantage in the sublimate method is that it cannot be told by looking at the mixture whether it is correct or not, while by looking at the phenyle mixture this can be at once seen. This would turn the scale at once in favor of phenyle when it is considered that the disinfection has to be carried out by native agency.

Railway Inspection Camps.

14. These camps were established in May, one at Ludhiána Railway Station and one at the West Beas, with the object of disinfecting persons travelling from the plague or suspected area.

The Ludhiána camp is under the control of the Deputy Commissioner of Ludhiána, and that at West Beas under Mr. Frizelle, Assistant Commissioner. The inspect on began early in May, but the disinfecting tanks were not in proper order until about the 20th May. At first the instructions issued were that all suspicious characters were to be delayed seven days in quarantine. This rule was found to be unworkable, and resulted in a number of persons who ought to have been detained and disinfected being allowed to pass through, since otherwise the numbers in camp would have become unmanageable. Eventually it was settled that 24 hours' detention was sufficient, and now practically every one coming from the suspected area, unless through his having a pass, or being clearly from his appearance, free from suspicion, is detained 24 hours and undergoes thorough disinfection. No case of plague has as yet been discovered at either camp.

The reports furnished by Mr. LeRossignol and Lieutenant Frizelle supply all the necessary information regarding the mode of construction of the camps and the methods of disinfection used.

These inspections are still being continued. It does not appear advisable to discontinue them until plague has altogether disappeared.

15. Major Inglis has brought to notice the services of those officers, both superior and subordinate, whom he considers most deserving of commendation.

Major Inglis' own services are well known to Government, and it is unnecessary to say anything regarding them and the success which has attended his efforts.

Of the junior officers, those who occupied the most responsible positions, and for which they were specially selected, were Messrs. Leslie Jones, Gracey, Butler and Langley.

Major Inglis' praise of the energy and resource of Surgeon-Captain James has my full concurrence. To his name I would add those of Surgeon-Captains Wilkinson and Clark. The Police Officers employed were all very junior, with the exception of Messrs. Turnbull and Rundle; but they administered the large Police force under their control with discretion and success. Mr. Rundle's services in introducing order into certain matters which much required attention are deserving of commendation.

16. It is unfortunate that the present recrudescence at Aur should detract somewhat from the credit which otherwise might have been taken for having stamped out the disease, but at the same time I am of opinion that even this recrudescence, when viewed correctly, should count not against but in favor of the plague staff and their work, since it is not in a fresh village or in a properly treated village that the disease has broken out, but in a village in which the disease was known to exist, and which under the ideas in force in April was not treated, or considered to require treatment.

Supplementary—October 1st.

17. The disease at Aur assumed and retained a very mild form, and showed no tendency to spread; only boys were attacked, and there were no deaths: the last patient was discharged cured on the 10th of August, and the district remained free from plague until 21st August.

On that date a case was discovered at Dosanj Kalán (about 20 miles from Aur), and again on the 23rd another case was found at a neighbouring village, Sirhál Qázián.

Both these attacks were very mild cases in boys, and the patients were discharged cured on the 5th and 13th of September respectively. Since then there have been no more cases, and the district has been declared free.

The peculiarity of these three outbreaks is the very mild nature of the attack, and that only boys were affected. Reasoning by analogy, there can be very little doubt that it was quite possible for the disease to have remained semi-dormant last year from April to October, since, if there had been no observation staff this year, these cases, though undoubtedly plague, would have attracted no attention, but would have been looked on as ordinary cases of fever.

There seems reason to believe that the plague microbe only acquires virulence through being passed frequently through the human body, *i.e.*, when one patient is infected by another, and not from some independent source in either the air or the soil.

Memo. dated Simla, 13th July 1898.

From—Major E. INGLIS, Deputy Commissioner, on Special Duty,

To—The Commissioner and Superintendent, Jullundur Division.

I HAVE the honor to forward herewith a report on the recent plague operations in the Jullundur and Hoshiárpur Districts drawn up on the lines laid down in the letter of 25th June from the Junior Secretary to Government, Punjab.

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Report on Plague Operations in Jullundur and Hoshiarpur Districts.

1. SOURCE AND SPREAD OF THE DISEASE.

IN the letter dated 25th June from Junior Secretary to Government, Punjab, regarding this report, I was directed first to deal with the source of the disease, the means by which it has been spread, the evidence in each case in which evidence is available being closely examined. If spread by human beings, what were the objects of the persons concerned in going about to uninfected places? If by clothes, why were the clothes removed? Influence of rats and other animals.

I regret that I am in a position to deal with this only in a fragmentary manner. I had nothing to do with the real seat of the disease till the middle of March, and nothing in connection with the infected villages there till towards the end of April. Mr. Leslie Jones, who was in immediate charge of all of the Jullundur operations, was transferred early in June.

In regard to the Nawashahr group Mr. Butler has made a most careful investigation regarding the source of infection in each village in his charge. But even his report, careful though it is, needs checking with facts known to Surgeon-Captain James before Mr. Butler's arrival.

Doctor James is the one man who has followed the disease throughout and has made notes at the time regarding each village in the main Banga group and many of the villages in the Nawashahr group, and he is now employed on collecting these notes, and from the deep interest he takes in the medical questions at issue, I feel certain he will, now that he is free from actual plague work, elucidate many facts which have hitherto seemed dark to us, and will send in a complete report on this whole subject; but I cannot have the advantage of seeing that report before mine has to go in, and though I know Dr. James would have placed his notes at my disposal, they were not in such a state that any one but he could utilise them, and now if I dealt with the subject on the information at my disposal I should probably make statements at variance with facts which Dr. James will bring to light in his report.

The outbreak began last October in the village of Khatkar Kalán. From there it spread to Jhander Khurd and Khán Khanán in Jullundur during November, and on 11th December it broke out in Birámpur in Hoshiárpur. One other village, Khatkar Khurd, in Jullundur was attacked in December. In January no village in either district became infected. After this the disease ran as follows:—

	Villages.
In February—	
In Jullundur	7
In Hoshiárpur	5
In March—	
In Jullundur	24
In Hoshiárpur	4
In April—	
In Jullundur	28
In Hoshiárpur	4
In May—	
In Jullundur	7
In Hoshiárpur	1
In June—	
In Jullundur	1
In Hoshiárpur	1

The total population of the villages attacked in both districts was 75,000. The total number of cases up to end of June was 3,389 and deaths 2,103.

I believe that when the facts are fully known, it will be found that infection has almost always been spread from village to village by human agency. The facts brought out by Mr. Butler's investigation in the Nawashahr villages, though they are liable to correction in some cases, goes to show this. I can't help thinking that in March and April, when we were at a loss to account for infection spreading from village to village, we may have seized on the rat and crop theory as a plausible explanation without having sufficient grounds to go on. Surgeon-Captain Smith has in his report argued at length against the rat theory, and will, I have no doubt, give his reasons also in the report he is submitting to the Inspector-General of Civil Hospitals; and if Surgeon-Captain James still favors the theory in his report, an opportunity will then be given of hearing both sides of the question. It would be useless for me to discuss it here without his report to go by. There can be no doubt that rats get the disease, and therefore it is highly probable they are a means of infection *within the village.*

So far as has been ascertained, people have conveyed the disease from village to village when going about their ordinary pursuits. In some cases men have broken the cordon to go and condole with friends in other villages, or to attend a religious gathering, bringing back from it sometimes food and sometimes clothes. In many cases the persons have not contracted plague themselves, but have given it to members of their household on their return.

Mr. Gracey remarks: "The custom in this country that the relatives of a sick or dying person should come and sit round him has had a lot to do with the spread of plague, and it is particularly important that all the relatives of an infected person should be immediately traced, and, if necessary, segregated. The family gatherings at marriages have also been a means of spreading infection, and cordons have been broken by many to attend these gatherings. The outbreak] at Pharála may have been due to this cause."

Mr. Butler too has brought to light a custom which may have had a good deal to do with the spread of the disease. Before plague is known to be in a village, but when people are becoming ill, they get their 'bubos' opened by some 'Chamár' or other women. It is then the custom for the female friends of the patient to come and condole with her, and each one touches the open wound with the edge of her 'chadar.' There could perhaps be no better way of spreading the disease.

There is one other point which I regret that I cannot take up in this report. It has perhaps more to do with the medical side of the question, and will, I know, be fully dealt with by Surgeon-Captain James. This is the advantage of evacuation of a village. Doctor James claims to have proved the advantage by figures showing cases and deaths before and after evacuation. I have not these figures, but I know they will go up with Dr. James' report. Whether the advantage is proved in this way or not, I myself feel assured that there is nothing which can save a village except evacuation. It may be that in time the disease will die down in a village, but without evacuation a village cannot be disinfected and eventually the infection will spring up again.

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Doctor James is the one man who has followed the disease throughout and has made notes at the time regarding each village in the main Banga group and many of the villages in the Nawashahr group, and he is now employed on collecting these notes, and from the deep interest he takes in the medical questions at issue, I feel certain he will, now that he is free from actual plague work, elucidate many facts which have hitherto seemed dark to us, and will send in a complete report on this whole subject; but I cannot have the advantage of seeing that report before mine has to go in, and though I know Dr. James would have placed his notes at my disposal, they were not in such a state that any one but he could utilise them, and now if I dealt with the subject on the information at my disposal I should probably make statements at variance with facts which Dr. James will bring to light in his report.

The outbreak began last October in the village of Khatkar Kalán. From there it spread to Jhander Khurd and Khán Khanán in Jullundur during November, and on 11th December it broke out in Birámpur in Hoshiárpur. One other village, Khatkar Khurd, in Jullundur was attacked in December. In January no village in either district became infected. After this the disease ran as follows:—

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The total population of the villages attacked in both districts was 75,000. The total number of cases up to end of June was 3,389 and deaths 2,103.

I believe that when the facts are fully known, it will be found that infection has almost always been spread from village to village by human agency. The facts brought out by Mr. Butler's investigation in the Nawashahr villages, though they are liable to correction in some cases, goes to show this. I can't help thinking that in March and April, when we were at a loss to account for infection spreading from village to village, we may have seized on the rat and crop theory as a plausible explanation without having sufficient grounds to go on. Surgeon-Captain Smith has in his report argued at length against the rat theory, and will, I have no doubt, give his reasons also in the report he is submitting to the Inspector-General of Civil Hospitals; and if Surgeon-Captain James still favors the theory in his report, an opportunity will then be given of hearing both sides of the question. It would be useless for me to discuss it here without his report to go by. There can be no doubt that rats get the disease, and therefore it is highly probable they are a means of infection *within the village*.

So far as has been ascertained, people have conveyed the disease from village to village when going about their ordinary pursuits. In some cases men have broken the cordon to go and condole with friends in other villages, or to attend a religious gathering, bringing back from it sometimes food and sometimes clothes. In many cases the persons have not contracted plague themselves, but have given it to members of their household on their return.

Mr. Gracey remarks: "The custom in this country that the relatives of a sick or dying person should come and sit round him has had a lot to do with the spread of plague, and it is particularly important that all the relatives of an infected person should be immediately traced, and, if necessary, segregated. The family gatherings at marriages have also been a means of spreading infection, and cordons have been broken by many to attend these gatherings. The outbreak at Pharála may have been due to this cause."

Mr. Butler too has brought to light a custom which may have had a good deal to do with the spread of the disease. Before plague is known to be in a village, but when people are becoming ill, they get their 'bubos' opened by some 'Chamár' or other women. It is then the custom for the female friends of the patient to come and condole with her, and each one touches the open wound with the edge of her 'chadar.' There could perhaps be no better way of spreading the disease.

There is one other point which I regret that I cannot take up in this report. It has perhaps more to do with the medical side of the question, and will, I know, be fully dealt with by Surgeon-Captain James. This is the advantage of evacuation of a village. Doctor James claims to have proved the advantage by figures showing cases and deaths before and after evacuation. I have not these figures, but I know they will go up with Dr. James' report. Whether the advantage is proved in this way or not, I myself feel assured that there is nothing which can save a village except evacuation. It may be that in time the disease will die down in a village, but without evacuation a village cannot be disinfected and eventually the infection will spring up again.

Memo. dated Simla, 13th July 1898.

From—Major E. INGLIS, Deputy Commissioner, on Special Duty.

To—The Commissioner and Superintendent, Jullundur Division.

I HAVE the honor to forward herewith a report on the recent plague operations in the Jullundur and Hoshiárpur Districts drawn up on the lines laid down in the letter of 25th June from the Junior Secretary to Government, Punjab.

CONTENTS.

1. Source and spread of the disease.
2. Police cordon.
3. Means of obtaining observation.
4. Attitude of the people.
5. Functions at present discharged by Medical Officers.
6. Duties of executive officers.
7. Provision of huts.
8. Disinfection of villages.
9. Police arrangements.
10. Subordinate Medical Staff.
11. Detention Camp at Beas and Ludhiána.
12. Notices of officials and non-officials in connection with the recent operations.

Report on Plague Operations in Jullundur and Hoshiarpur Districts.

1. SOURCE AND SPREAD OF THE DISEASE.

IN the letter dated 25th June from Junior Secretary to Government, Punjab, regarding this report, I was directed first to deal with the source of the disease, the means by which it has been spread, the evidence in each case in which evidence is available being closely examined. If spread by human beings, what were the objects of the persons concerned in going about to uninfected places? If by clothes, why were the clothes removed? Influence of rats and other animals.

I regret that I am in a position to deal with this only in a fragmentary manner. I had nothing to do with the real seat of the disease till the middle of March, and nothing in connection with the infected villages there till towards the end of April. Mr. Leslie Jones, who was in immediate charge of all of the Jullundur operations, was transferred early in June.

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I believe that when the facts are fully known, it will be found that infection has almost always been spread from village to village by human agency. The facts brought out by Mr. Butler's investigation in the Nawashahr villages, though they are liable to correction in some cases, goes to show this. I can't help thinking that in March and April, when we were at a loss to account for infection spreading from village to village, we may have seized on the rat and crop theory as a plausible explanation without having sufficient grounds to go on. Surgeon-Captain Smith has in his report argued at length against the rat theory, and will, I have no doubt, give his reasons also in the report he is submitting to the Inspector-General of Civil Hospitals; and if Surgeon-Captain James still favors the theory in his report, an opportunity will then be given of hearing both sides of the question. It would be useless for me to discuss it here without his report to go by. There can be no doubt that rats get the disease, and therefore it is highly probable they are a means of infection *within the village*.

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2. Police Cordons.

From the few cases in which infection from one village to another cannot be traced to human agency I feel convinced that the theory that rats conveyed it must be set aside. The part which rats have played has been to carry infection right through a village which has once become infected.

Thus it is on the Police cordon that we must chiefly depend to keep the infection from spreading, and it is therefore necessary to make it as effective as possible. The question how to do this depends almost wholly on the number of Police available, though other matters of detail arise which will be discussed later on.

The strength of the cordon has varied, but the minimum strength aimed at of late has been eight sentries to the mile. Such a cordon as this cannot be called perfect, but every available policeman was on this duty, and the best use had to be made of the means at our disposal. There is no denying the fact that people did get through. Shikohpur, Jagatpur, Lakhpur, Gunachâur, Baharwal and Bhaura and other villages in the Nawashahr group are all believed to have been infected in this way.

Surgeon-Captain Smith writes: "That people passed our cordon I have little doubt. How could eight men to the mile, however willing, be effective in the dark?"

But the cordon has for all that done good. Mr. Butler, Assistant Commissioner, remarks: "The main effect of a Police cordon is a moral one. However many sentries there are to a mile, probably any one who deliberately meant to break the cordon would be able to do so"; and Mr. Langley writes: "Certainly people have got through the cordon, but to say that the cordons are therefore of no use is to confound uselessness with imperfection. Cordons have prevented numbers from leaving, and have made it impossible for the sick in one village to be conveyed to another"; whilst Surgeon-Captain Smith again draws attention to the fact that the mischief has probably already been done before information reaches, and before a cordon can be put on.

It would therefore be wrong to conclude that because plague has spread in spite of the cordon no good has come from the cordon. There would certainly have been a general exodus from the infected area if no cordon had been put on, and I think it may be attributed mainly to the cordon that the disease has been confined to comparatively speaking so small an area, though within that area some villages have been infected by men breaking through from a cordoned village.

At the outbreak of the disease each village was cordoned separately, but as more villages became infected the cordon had to be taken round several combined villages till finally in the Jullundur District there were only two cordons which between them confined the 60 or so villages on the list. In the Hoshiárpur District, where the villages were more or less isolated, separate cordons, except in one or two cases, have been maintained throughout. There can be no doubt that for sanitary purposes each village should be separately cordoned, but to do this more Police would have been required. The villagers within the cordon seemed to keep aloof from one another, and if a village was known to be badly infected people from less infected villages would not go there; but no doubt some intercommunication did go on; but from the other point of view, the combined cordons had their advantages in making supervision of and supplies to the Police easier, and in the same way in lessening the difficulty of providing for the wants of the villagers. Another way in which combined cordons proved of advantage was that no difficulty arose about arranging for watching and harvesting of crops owned by the people of one village within the boundary of another. Isolated cordons have one great advantage over combined cordons, in that with the former it is possible to draw in the sentries at night close round the camps and village sites, thus giving greater security against people getting through in the dark. Later on in the epidemic this advantage would have been lost, as it became necessary to allow the zaildárs to watch and harvest their crops during the night time.

In connection with the cordons, Surgeon-Captain Smith writes: "The first essential in all such Police work is to enlist the sympathy of the surrounding villages and get them to do their own *chaukídári*"; and he instances how the villages of Karna, Mangoowál and Ráipur protected themselves when the disease laid such terrible hold on Kariha. Undoubtedly very much good would come from the people exerting themselves in this way, and I think it is worth considering whether in case of another outbreak Government should not help them by bearing a portion of the cost of the extra chaukídárs; but these village protective measures would not do away with the necessity of the cordon round the infected village, since the inhabitants of that village must be kept as far as possible from leaving it.

Mr. Gracey has raised the question in his report whether it would not be better to use military cordons. There are certainly advantages in doing so, and I think that if ever it comes again to having so long a cordon to watch, the question should be considered whether a military cordon should not be at once put on, provided of course that regiments can be obtained for this work. The objection usually raised to using a military force seems

to me more fanciful than real. To use a military force sounds like "dragooning" the people, but the regiments would be performing no duty which the Police are not supposed to do now, and would have nothing to do with work in the villages,—in fact they need come only to a slight degree into contact with the villagers. The advantages would be that the cordon would be kept by a force under much stricter discipline and controlled by British and Native officers in sufficient numbers to ensure that the work was properly done, whilst to the sepoys the work would be of a kind to which they are accustomed.

The Police have done their work well, but it was work to which they were not accustomed. The small number of British officers available rendered proper supervision impossible, and the difficulty of the supply of food and huts and transport to 3,000 men collected from many districts in the Punjab and split up into numerous small camps threatened at one time to render the cordon useless. It is creditable, I think, to the Police that they have come through these difficulties well, but I think the trouble should if possible be avoided a second time, and it seems to me that with a military force it could be avoided.

Passes.

Following on after Police cordons comes the system of passes. The rules now in force were introduced with the sanction of the Commissioner at the beginning of May. Previous to that any European officer, Civil, Medical or Police, could grant a pass to any one whom he had to send across the cordon, whilst any official having duty inside the cordon could cross the line without a pass. It was found that this system was open to abuse, owing partly to the fact that many constables could not read.

Accordingly in the early part of May new rules were issued as under:—

1. No one but Europoan officers will be allowed to pass the cordon without a written pass.
2. Passes will be of three kinds—
   (*a*). Permanent.
   (*b*). Temporary.
   (*c*). Quarantine,

and no pass of any kind can be given by any official other than the Assistant Commissioner in charge of a group of villages.

3. Permanent passes may be given only to Tahsíldárs, Náib Tahsíldárs and Assistant Surgeons whose duties must take them continually in and out of the cordon.
4. Temporary passes may be given to officials of all other ranks whose duty takes them across the cordon. These passes must be given up at the Police post on the cordon and returned by the Police to the Assistant Commissioner who issued them.
5. Passes to go into quarantine camp at Behram may be given to every one wishing to go into quarantine. The Police will arrange to escort these persons from the cordon line to the quarantine camp.
6. A list of all temporary and quarantine passes must be sent by the Assistant Commissioner to Major Inglis in the evening of the day of issue. These rules were subsequently modified in a few particulars. The 3rd rule was changed to "Permanent passes may be granted to all Government officials whose work necessitates their constantly crossing the cordon." This modification was a very useful one, as under the original rule no provision was made for Kánúngos on plague work, nor for chaprásís and permanent messengers.

Other modifications were that—

1. A permanent pass granted by one Assistant Commissioner will enable holders to cross the cordon line of any group of villages.
2. Civil, Medical and Police officers may be provided with some of the printed passes, which in cases of necessity they can give to persons whom they have during their day's work to send on urgent business across the cordon lines.
3. The Hospital Assistants in charge of hospitals may be provided with printed passes which they can give to messengers whom they have to send across the cordon line either to head-quarters or elsewhere on urgent messages. These passes should be marked Hospital Assistants' passes, and the Hospital Assistants must report the number of passes issued by them.
4. The list of passes sent may be discontinued, but the list of quarantine passes should be sent to the Medical officer in charge.

The passes were printed on paper of different colors.

Any system of passes to be satisfactory must be strict enough to ensure efficiency and elastic enough to meet any ordinary emergency. The system introduced in May was too strict, but it perhaps gained its object in bringing home to every one that the cordon is our strongest defence and that a cordon cannot be effective unless strict.

I think that a system on the following lines would work :—

1. All European officers and all nurses and all persons going with European officers or nurses should be allowed to pass any cordon with passes.

2. Permanent card-board passes should be given to all of whatever rank whose duties require them to be often crossing the cordon.

3. Temporary passes, printed on some colored paper, should be given to all officials down to Náib Tahsíldárs to give to coolies and cartmen who are conveying goods across the cordon. These passes should be printed " for bearer " and must be given up on the holder's return. Similar passes should be provided in small numbers to Hospital Assistants in charge of outlying hospitals in case of any emergency.

4. Passes to go into the quarantine camp should be given only by the Assistant Commissioner in executive charge of the group of villages.

In devising any system of passes it must be remembered that many constables cannot read. This rendered it impossible to allow a temporary pass to run over two cordons. Each sentry had to take the pass and give it up when he came off duty. Thus it sometimes happened that six separate passes had to be given to one man who was going on a message across three cordons, and this involved on Mr. Gracey the labor of signing sometimes, I believe, over 200 passes in one day.

I quote Mr. Butler's remarks with reference to the pass system. The deadlock he refers to occurred immediately after the introduction of the new rules, when several instances occurred of persons whose duty carried them across the line being " held up " by the Police. Thus a nurse was stopped because, I believe, her dhooli bearers had not passes ; the man carrying the mails was stopped and also a cooly conveying phenyle to a village under disinfection. Of course all these matters only needed arrangement, and when the necessary modifications in the rules were introduced things went smoothly, but I have gone into this pass system at some length, as it closely affects the cordon system on which all our measures depend.

Mr. Butler writes :

"With reference to passes, there can be no doubt that the rules introduced in May did not work well, even after they were modified to do away with a deadlock which had been produced ; but there was nothing wrong in the rules. The whole secret of an efficient pass system lies in the situation of the heads-quarters' camp, and it is absolutely essential that this should be outside the cordon, and it should be made so at all costs. When this circle head-quarters were at Shikohpur inside the cordon there were constant difficulties in the way of people being stopped who should have had free access to the officers in charge.

" Lambardárs reporting new villages, carts bringing huts and lime, " dâk runners " from some unusual place, &c., &c., would frequently he held up with a loss of valuable time and the production of much unnecessary irritation. On the other hand, if the matter was left to the discretion of the Police, it was not to be expected that a constable would nicely distinguish between a lambardár bringing news of a fresh outbreak and some other man who professed a desire to have an interview with one of the officials."

Quarantine Camps.

These follow as a natural consequenee of the cordon, as some means must be provided whereby persons can under certain conditions leave the infected area. It was found, however, that few villagers availed themselves of these camps, but many Government officials, who were transferred to their districts or going on leave, underwent ten days' observation in them.

One camp was provided near Garhshankar and one at Behram, just outside the cordon round the Banga group of villages. No camp was started near Nawashahr as there were no applications from the villagers near there, and Government servants could be arranged for in the Behram camp.

A Medical officer was in charge of each quarantine camp, and in the Behram camp an Assistant Surgeon and a Kánúngo were permanently stationed.

At each place two camps were arranged for and admissions into one or the other were made every five days. Thus all the people in one camp were kept segregated for ten days and then permitted to go, and a fresh batch was admitted into that camp. A small establishment of sweepers and water-carriers was entertained, and the Kánúngos had to arrange for supplies.

Surgeon-Captain Davidson started the Behram camp, and his system was found to work well. The camp was kept up for about six weeks only, up to 21st June. So many villages had then become uncordoned that the camp practically closed itself, arrangements being separately made for keeping under observation the large number of Government officials including the Police whowere being drafted back to their districts.

3. MEANS OF INFORMATION.

I have stated above that it is chiefly on the Police cordon we must rely to prevent the spread of the disease, but the success of Police cordons and all other preventive measures is dependent to a great extent on our obtaining early information of the disease having attacked a village.

During the earlier months of the epidemic Surgeon-Captain Davidson and Surgeon-Major Nicholson were at work at different times in the infected area, chiefly in the Jullundur District, visiting villages, and from the time the disease broke out in Jullundur up to the institution of the special observation staff in March, Dr. Datta was on special duty watching the villages in the Garhshankar Tahsíl and with him on the same duty was one Extra Assistant Commissioner, Sardár Guláb Singh, or Sheikh Amír Ali.

In Jullundur Surgeon-Captain Davidson worked on the village death reports, and by personally seeing every one sick in a village. In this way and by talking to the lambardárs and people he was successful in discovering plague.

In Hoshiárpur Dr. Datta and the Extra Assistant Commissioner kept constantly on the move throughout the Garhshankar Tahsíl, visiting sometimes 20 villages a day, marking down arrivals from villages near the infected area in Jullundur and segregating them. In this way he learned of the case at Jandiála. At the time there was doubt whether this was a case of real plague, but thesymptoms pointed to its being so, and Dr. Datta later on had plenty of opportunities of seeing plague and is convinced that this was a real case. The prompt measures taken to segregate this case and to burn the hut in which the patient was may have saved us from an outbreak in the Mahalpur Thána, and I think credit is due to Dr. Datta for this.

In February the system of rewards was introduced. Sanction was given to the payment of a reward to the man who first reported plague in a village.

There are no doubt objections to this system, but it seems to me that we must take the people as we find them, and if the payment of rewards results in earlier information being given, then we must give rewards, hoping that the time may come when the people will learn to do what they are not only bound to do by law, but what is also for their own good, without any such in ducement.

This reward system in my opinion resulted in good. During the worst time in April and May early information was given, enabling the plague staff to segregate the cases before the disease spread in the village, and now at the end of epidemic it has brought to light suspicious cases which, if left hidden, might have caused a fresh outbreak. I am not in favour of punishing lambardárs and others for not reporting cases, except in extreme cases of concealment. Our object must be to get the people on our side. With punishments comes the feeling to the people that all plague measures are only another part of the " Sirkar's " laws, some thing on the same footing as the Excise rules, which are to be broken and evaded if possible. Of course there may be cases in which punishments should be given, but I do not look on punishments for concealing cases as any help to us in plague operations. I think they only still more alienate the people. Under no circumstances would I imprison a lambardár whilst plague is in a village. It is at this precise time we have to depend on him for help, and if the headman is removed, the management of the village is sure to be more difficult.

The special observation staff which was put on in March consisted of Assistant Commissioners or Assistant District Superintendents of Police, Medical Officers, Tahsíldárs or Náib Tahsíldárs, Kánúngos, Hospital Assistants, Compounders, Nurses and Dháis. The " infected " area was held to be the Garhshankar Tahsíl of the Hoshiárpur District, the Nawáshahr Tahsíl and the Apra Gudáwari Circle of the Phillour Tahsíl in the Jullundur District, and the Phagwára Tahsíl of the Kapurthala State. For convenience sake each Girdáwar's circle was made an observation division. Thus in the Garhshankar Tahsíl there were five observation divisions, in the Nawáshahr Tahsíl three, in Phillour Tahsíl one, and one more for Phagwára.

To each division one executive officer, either an Assistant Commissioner or an Assistant District Superintendent of Police, or a Medical Officer, was appointed. It was at first intended to give both an executive officer and a Medical officer to each division, but this was found impossible. Under the officer in charge of each division were three Tahsíldars or Náib Tahsíldárs, six Kánúngos, one or two Hospital Assistants, with one or two Compounders and Dháis. There were also five nurses available for work where most required.

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These follow as a natural consequenee of the cordon, as some means must be provided whereby persons can under certain conditions leave the infected area. It was found, however, that few villagers availed themselves of these camps, but many Government officials, who were transferred to their districts or going on leave, underwent ten days' observation in them.

One camp was provided near Garhshankar and one at Behram, just outside the cordon round the Banga group of villages. No camp was started near Nawashahr as there were no applications from the villagers near there, and Government servants could be arranged for in the Behram camp.

A Medical officer was in charge of each quarantine camp, and in the Behram camp an Assistant Surgeon and a Kánúngo were permanently stationed.

At each place two camps were arranged for and admissions into one or the other were made every five days. Thus all the people in one camp were kept segregated for ten days and then permitted to go, and a fresh batch was admitted into that camp. A small establishment of sweepers and water-carriers was entertained, and the Kánúngos had to arrange for supplies.

Surgeon-Captain Davidson started the Behram camp, and his system was found to work well. The camp was kept up for about six weeks only, up to 21st June. So many villages had then become uncordoned that the camp practically closed itself, arrangements being separately made for keeping under observation the large number of Government officials including the Police whowere being drafted back to their districts.

3. MEANS OF INFORMATION.

I have stated above that it is chiefly on the Police cordon we must rely to prevent the spread of the disease, but the success of Police cordons and all other preventive measures is dependent to a great extent on our obtaining early information of the disease having attacked a village.

During the earlier months of the epidemic Surgeon-Captain Davidson and Surgeon-Major Nicholson were at work at different times in the infected area, chiefly in the Jullundur District, visiting villages, and from the time the disease broke out in Jullundur up to the institution of the special observation staff in March, Dr. Datta was on special duty watching the villages in the Garhshankar Tahsíl and with him on the same duty was one Extra Assistant Commissioner, Sardár Gulâb Singh, or Sheikh Amír Ali.

In Jullundur Surgeon-Captain Davidson worked on the village death reports, and by personally seeing every one sick in a village. In this way and by talking to the lambardárs and people he was successful in discovering plague.

In Hoshiárpur Dr. Datta and the Extra Assistant Commissioner kept constantly on the move throughout the Garhshankar Tahsíl, visiting sometimes 20 villages a day, marking down arrivals from villages near the infected area in Jullundur and segregating them. In this way he learned of the case at Jandiála. At the time there was doubt whether this was a case of real plague, but thesymptoms pointed to its being so, and Dr. Datta later on had plenty of opportunities of seeing plague and is convinced that this was a real case. The prompt measures taken to segregate this case and to burn the hut in which the patient was may have saved us from an outbreak in the Mahalpur Thána, and I think credit is due to Dr. Datta for this.

In February the system of rewards was introduced. Sanction was given to the payment of a reward to the man who first reported plague in a village.

There are no doubt objections to this system, but it seems to me that we must take the people as we find them, and if the payment of rewards results in earlier information being given, then we must give rewards, hoping that the time may come when the people will learn to do what they are not only bound to do by law, but what is also for their own good, without any such in ducement.

This reward system in my opinion resulted in good. During the worst time in April and May early information was given, enabling the plague staff to segregate the cases before the disease spread in the village, and now at the end of epidemic it has brought to light suspicious cases which, if left hidden, might have caused a fresh outbreak. I am not in favour of punishing lambardárs and others for not reporting cases, except in extreme cases of concealment. Our object must be to get the people on our side. With punishments comes the feeling to the people that all plague measures are only another part of the "Sirkar's" laws, some thing on the same footing as the Excise rules, which are to be broken and evaded if possible. Of course there may be cases in which punishments should be given, but I do not look on punishments for concealing cases as any help to us in plague operations. I think they only still more alienate the people. Under no circumstances would I imprison a lambardár whilst plague is in a village. It is at this precise time we have to depend on him for help, and if the headman is removed, the management of the village is sure to be more difficult.

The special observation staff which was put on in March consisted of Assistant Commissioners or Assistant District Superintendents of Police, Medical Officers, Tahsíldárs or Náib Tahsíldárs, Kánúngos, Hospital Assistants, Compounders, Nurses and Dháis. The "infected" area was held to be the Garhshankar Tahsíl of the Hoshiárpur District, the Nawáshahr Tahsíl and the Apra Gudáwari Circle of the Phillour Tahsíl in the Jullundur District, and the Phagwára Tahsíl of the Kapurthala State. For convenience sake each Girdáwar's circle was made an observation division. Thus in the Garhshankar Tahsíl there were five observation divisions, in the Nawáshahr Tahsíl three, in Phillour Tahsíl one, and one more for Phagwára.

To each division one executive officer, either an Assistant Commissioner or an Assistant District Superintendent of Police, or a Medical Officer, was appointed. It was at first intended to give both an executive officer and a Medical officer to each division, but this was found impossible. Under the officer in charge of each division were three Tahsíldars or Náib Tahsíldárs, six Kánúngos, one or two Hospital Assistants, with one or two Compounders and Dháis. There were also five nurses available for work where most required.

The Patwáris throughout the infected area were also made available for observation work, but when once the work was got into order it was found unnecessary to take from them more than half their time, while during the remaining half they could do their ordinary revenue work.

Mr. Glancey, Assistant Commissioner, remarks in his report that it is on the Patwáris we must depend for early information, and it is certainly the fact that if the Patwáris are made to do their part of the work we must get news of all cases of sickness.

The work of the observation staff began by the Patwáris making out a nominal roll of all the inhabitants of their villages and a second list of all absentees. These lists were the foundation on which the subsequent work of the observation staff afterwards rested, and as far as possible were ready by the time the observation staff arrived.

Each Divisional Officer had then to divide up his division amongst the three Tahsíldárs and six Kánúngos. This gave roughly about 30 villages to each Tahsíldár or Náib Tahsíldár. The rules issued at the commencement laid down that each Tahsíldár should inspect two villages daily and visit some eight or ten more. At inspections the whole of the inhabitants, except *parda-nashín* women, were turned out, and each man, woman and child, as entered on the Patwári's roll, passed under the personal observation of the Tahsildár and the Hospital Assistant with him, whilst the *parda-nashín* women were examined in their houses by the dháís. At his "visit" to any village the Tahsíldár questioned the lambardárs, chaukidárs and others, examined and signed the chaukídár's death register, found out whether there were any new arrivals in the village, and personally examined all sick men and children. There was no real obstruction to the inspections, though people in some parts did not like them, and as soon as the harvesting began it was found that the inspections caused unnecessary inconvenience to the zamíndárs by taking them away from their work. It was therefore determined at the end of April to forego the inspections except in the case of villages neighbouring on infected villages or of those which came under supervision for some other reason.

The observation staff has without doubt resulted in plague being brought to light and in rousing the people to a sense of the need of showing up cases; but plague has not usually come to light in the way it might have been expected, namely, in actual discovery of plague by members of the observation staff, though there were instances of this. It has generally been discovered through information brought in either to the observation staff or to the officers in plague villages. The observation staff having thus got a clue were able to follow the cases up. In nearly all the later infected villages the information was given in time to get the village out before more than one or two cases had occurred. If there had not been the large establishment visiting the villages this information would not have been given so quickly, and probably in each village many cases would have occurred before plague was known to exist in the village,—probably we should not have known of it until the number of deaths brought it to our notice.

With reference to this I quote some remarks from Sheikh Asghar Ali's report. Sheikh Asghar Ali, Assistant Commissioner, remarks: "I am convinced that these cases were found through the personal exertion of the observation staff, without whose strict and close watch either village (Bagwain and Palewál) would not have been found at all, or they would have been found only when the disease had assumed much larger proportions. As it is the disease has been nipped in the bud in the two places, and there is a concensus of opinion that these two villages were found the earliest in the district. I say this to show in what direction the usefulness of the observation staff may be looked for,—to keep in contact with the villages, to get information and hints and follow them up, and to bring to light cases at the earliest opportunity. The turning out of a village and the roll-call is, I think, more vexatious and annoying than useful."

Having therefore regard to the way in which the observation staff has been proved to be of use, it seems to me that the "inspection" of villages was useless from the beginning, and that reliance should be placed on the checking of the lists prepared by the Patwáris, in watching closely all deaths, and, where possible, inspecting all cases of illness, and in keeping in constant touch with the lambardárs and people. For this purpose I think the Tahsíldárs and Náib Tahsíldárs are admirably suited, provided that the men chosen are young and active, but the larger establishment of Kanúngos do not appear requisite. I also doubt the utility of using Hospital Assistants on this work. Their diagnosis of cases cannot be trusted and has at times been found misleading. It has always ended in a European Medical officer being summoned to inspect suspicious cases.

In some instances, especially in villages near Garhshankar, the nurses were found to be useful; but as a rule they can be far better employed in the plague hospitals. It is not an easy matter to arrange for the accommodation and food of a nurse in an out-of-the-way village, and it was finally decided to keep the nurses, two together, at central points, whence they could be summoned if necessary. I do not therefore recommend their employment again on observation duty except in towns; but they have worked well, some of them in a manner beyond praise, in the hospitals, and it is there, I think, they can be best employed.

Most of the observation officers have reported well of the dháís. It was an easy matter to arrange for their accommodation, food and transport, and the people understand them.

The compounders were useless on observation work.

Mr. Glancey remarks that it is waste of strength to employ Medical Officers on observation duty, and to some extent I agree with him. It so happened that he was in charge of the worst infected division, namely Banga. Both he and his predecessor, Mr. Vanrenen, Assistant District Superintendent of Police, learnt to know plague so well that they seldom reported false cases and owing to the proximity of the Banga head-quarters, a Medical Officer was always at hand.

Mr. Bird, Assistant Commissioner, recommended corpse inspection and no doubt this is advisable, but it cannot always be enforced, especially during the hot months, and in cases of deaths of women, especially of Rájpút women, the people do not like it.

There are some minor points which are perhaps worth mentioning in case an observation establishment has again to be put on.

The Tahsíldárs and Náib Tahsíldárs were not provided with tents, and at first there were constant applications for these; but I think later experience has shown that they were not necessary. Each Tahsíldár could find somewhere to live in near the centre of his 30 or so villages.

A munshi should be sanctioned for the Divisional Officer, as he has to hear and answer many vernacular reports each day.

Whenever a village became infected it was the duty of the Divisional Officer to send particulars of absentees to neighbouring Divisional Officers, if absentees were known to be in villages near by, or to the Deputy Commissioner of the district to which they had gone. I can't say that any good was ever proved to have resulted from this, though the absentees were followed up and marked down; but good might result from it, and I think the system should be continued.

Maps should be furnished to each Divisional Officer for himself and for each Tahsíldár. Stationery has to be supplied, and each Divisional Officer should have phenyle by him, and printed forms of health reports to be sent in by the Patwári of each village daily.

An observation staff is a necessary adjunct to plague operations. The officials on duty in plague infected villages have so much to do, especially when new villages came on to their hands, that they have not the time to pay attention to what is going on in another village, and certainly cannot make periodical rounds of inspection, which are necessary if the Lambardárs and Patwáris are to be kept up to their work; but I think the experience gained during this outbreak shows that the observation staff need consist only of Tahsíldárs or Náib Tahsíldárs, with European officers over them, and working through the Patwáris. If there are Medical officers on duty in the infected villages, there is no need for Medical officers to be put on observation duty, but if a Medical officer cannot be quickly summoned to diagnose suspicious cases, then one or two Medical officers must be appointed to the observation staff.

4. Attitude of the people.

There can be no doubt that the people dislike our measures, and it would fit in much better with native ideas to be left alone to die in the villages. It has come with a great shock to them having to turn out of the villages. The trouble and discomfort which they must undergo in camp is great, but the anticipation of it is worse than the reality. When once out in camp they quickly settle down and make themselves fairly comfortable as long as the weather remains good. The necessary infringement of the *pardah* system was felt as a dishonor by many, especially by the Muhammadan Rájpúts; but even in this case when once in camp they found that the state of things was not so bad as might have been expected. It was this removal of *pardah* women which led to the only obstruction throughout. Another thing which made our measures unpopular was the opening up of the roofs.

But the present dislike to our measures is now amongst those villages which have not been infected. Many instances have occurred in which the people have expressed themselves as thankful for having, as they said, "saved" them, and this was especially the case in regard to Garhshankar.

I have under another head mentioned the usual wants of the villages. The discomfort can be lessened if huts are provided quickly and in sufficient quantities, if due consideration is given to the special circumstances of each village, allowing the people to divide themselves into groups or castes as suit them best, giving them blankets for themselves and sacks for their cattle during the winter, and by allowing them, as far as

can be done in accordance with sanitary requirements, to look after their land and crops, and by giving ample but not indiscriminate gratuitous relief. Our medical treatment must never be forced on them, nor should the sick be taken right away from their families. They should never be left solely in the hands of the Native Hospital Assistants. They trust the British Medical officers, but generally distrust all the subordinates, though here have been exceptions where the Hospital Assistants have gained the respect of the villagers. They like the nurses and feel that Government has in sending them done its best to meet their wishes.

I think that every hospital should be visited by a British Medical officer daily, and in the same way no day should pass when the Assistant Commissioner does not visit every village in his charge. The villagers are being tried to the utmost, and deserve our sympathy and help in every way, and much help can be given to them and confidence instilled by visits from their *Sáhib*. Our measures can never be popular, nor will the people ever admit the necessity of them until they learn it from their own bitter experience; but amongst the villagers in the infected area I believe there is now a feeling that Government has done its best by them, and they know that if it had not been for the measures taken their losses would have been far greater; but outside the infected area, even amongst educated people, the feeling is, I believe, as strong as ever that our measures were unnecessary and too severe, and I believe that whenever plague operations have to be started, there will always be obstruction until the people learn for themselves what plague, if unchecked, can do.

In connection with the attitude of the people it may be as well to mention inoculation, though in its purely medical aspect, Surgeon-Captain James will, I have no doubt, deal with this subject. When once started in Banga and one or two neighbouring villages under Surgeon-Captain James, whom the villagers had got to know and trust, it went on easily, and so also in Garhshankar, where Surgeon-Captains Clark and Hunter interested themselves in it. There was no pressure put on the people to accept inoculation, and at times when some case had occurred to give an impetus to it, people came forward and asked for it. In Garhshankar, where a scheme was started for increasing the disinfecting gangs if the members were inoculated, many came forward to undergo the operation. There seemed to be no prejudice against it, but it seemed to me that unless the Medical staff is much increased, or the method of inoculation simplified, inoculation can never be depended upon as a general safeguard. At present, owing to the dose differing according to the varying strength of each bottle of "serum" and to the care with which inoculation has to be done, the work cannot be entrusted to subordinates, and I think one Medical officer cannot inoculate at the outside more than 200 persons a day, and even this is hard work. But I make these remarks subject to correction by the Medical officers, and I have no doubt Surgeon-Captain James will go into the subject fully in his report.

5. FUNCTIONS AT PRESENT DISCHARGED BY MEDICAL OFFICERS.

I am asked to report whether it is possible to economise the expert Medical staff by making over some of their duties to non-professional agency.

When writing about the observation staff I gave it as my opinion that the work can quite well be done by Assistant Commissioners, provided there is a Medical officer available from some other source to diagnose cases.

The duties of Medical officers in plague infected village are as follows:—

1. The purely medical work in connection with the hospitals.
2. Choice of sites for hospitals and camps.
3. Supervision of the segregation camp.
4. Supervision of the quarantine camp.
5. Inoculation.

The Medical officers cannot be relieved of any of these, but during the present epidemic the whole of the disinfecting has been on the shoulders of the Medical staff, though occasionally, as in Garhshankar, the Assistant Commissioners have heped. This system started when there were only one or two villages and when a method of disinfecting had to be worked out. Later on, when more villages became infected, the Assistant Commissioners had their hands full of work in connection with provision of huts, Police arrangements, and other demands on their time due to so many people being in camp, and the disinfection remained with the Medical officers of some portion at any rate of this work, there was an idea of relieving the Medical officers of some portion at any rate of this work, it was clear from the answer received that the Medical officers looked upon disinfecting of villages as a duty properly appertaining to them. It therefore seemed best to allow matters for the present to go on as they had begun; but this disinfection takes up by far be s.the greater portion of the time of the Medical officers, and I cannot resist thinking that i observ might be handed over to non-professional agency. I may seem to be decrying the wo ner beyond done by the Medical officers. This is not my meaning, as no one can for an instant that the disinfecting work was not well done. It demands constant supervision a

close attention to details. It is dangerous, as proved by Mr. Goulburn's death and by the number of men amongst the disinfecting gangs who have contracted the disease, and it is most tiring work, going in and out of the houses and pulling things about, perhaps on a day in May and June. The Medical officers have done the work willingly, and at the end under great pressure, causing me often to wonder how much longer they would be able to stand it. But I cannot help thinking that their services might have been utilized in a better manner. For instance, many times I heard it said that there was no leisure to work out scientifically the lessons taught by this outbreak.

Disinfection is almost the same in one village as in another. When rules regarding it have been laid down, it might, I think, be handed over to European non-professional agency with a Medical officer at hand to aid them with his advice, whilst the Medical officers might be set free for work which they alone can do.

6. DUTIES OF EXECUTIVE OFFICERS, AND GENERAL ARRANGEMENTS IN PLAGUE VILLAGES.

When a village comes under suspicion a cordon has at once to be put round the site until the Medical officer decides whether plague exists in the village. If plague is found, the cordon has then to be drawn round the village area, perhaps in conjunction with other villages, and the Assistant Commissioner, in consultation with the Medical officer, has to determine on the number and locality of the hospitals and camps. Surgeon-Captain James writes about this as follows:—

"The position of the plague camps should be settled according to the general sanitary principles which are well known. The following details, however, require special attention:—

"1. No camp should be situated near the village or near any high road, as some people are almost sure to return to the village to get out things they require on the one hand, or to talk, sit and smoke with passers-by on the other hand.

"2. It is very important to have, if possible, a few trees near the camp. In winter they are useful to shelter the cattle from the frost and dew, and during the hot weather the people have some pleasant shade against the burning heat of the sun. We have found that it is bad to place camps actually in groves, gardens or bâghs, because the people do not get the full benefit of the air and sun, and the gardens are often used as latrines, and sometimes one or two of the chief men of the village take up a central position in the grove and practically exclude the rest of the camp and especially the poorer members of it. If, on the other hand, the huts are placed round or near the garden, they get the disinfecting benefit of the sun's rays and every body in the camp has plenty of room where he is able to sit under the trees during the day, and all the huts are open to easy inspection by the Medical and Civil staff.

"The ordinary rules about water, soil, high grounds, position of standing crops, &c., should be observed. Sandy soil, if possible, should be avoided. We have not noticed any advantages or disadvantages in positions taken up with regard to the prevailing winds, and as far as the disease is concerned the question of the prevailing winds may be discarded.

"The burning and burying grounds should, however, be situated as far away as possible, and care should be taken in selecting the former that sites are not chosen where the smoke and smell is likely to be carried to the camps.

"There is probably no smell so unbearable as that given off by a burning corpse. We have, however, no evidence to show that any other deleterious effects are produced.

"In selecting sites of camps one is mainly guided by the amount and position of the land available. We have always attempted to avoid interfering with fields and crops, and when several health camps have been formed, an attempt has always been made to select sites as near as possible to the land owned by the people in the camps, and agricultural pursuits, which keep people in the open air, have been encouraged as much as possible.

"The division of the camps is important. In my opinion the smallest number advisable is three—

"1. *Hospital camp*, in which the relatives and friends of those attacked are placed.

"2. *Segregation camp*, in which the people, though not attacked, come from infected mohallas or from the vicinity of infected houses.

"30. *One or more health camps.*—In practice we have found it impossible to have only one health camp. The Chamárs and sweepers have always had to have a separate camp, and in some places we have had to have Ráwals, Bharáís (a kind of Muhammadan beggars), Kasáís, &c., in camps by themselves. From a theoretical point of view the larger the number of camps formed the better it is for the treatment of the disease, as more room and air will be

obtained for each individual hut. Also practically we have found that camps larger than 700 people become inconvenient, as there is usually a certain amount of crowding, and the collection of cattle which necessarily takes place in agricultural villages makes the whole camp insanitary. Another important reason for not having large camps is that when the disease breaks out in the camp, we have a smaller number of people to deal with and disinfect. This was especially brought home to us in the case of Dewa Singh's camp at Khán Khanán, where we had 864 persons when a case of plague occurred in it, and we had to disinfect the whole of it and break it up into two smaller camps. Again at Mahal Gehla we had a camp containing 2,000 people, which we were obliged afterwards to disinfect and break up into four smaller camps to give the people more shelter and to stop the spread of the disease. Had we made several smaller camps in the beginning we should not have had to disinfect so many people, as only the camp in which the cases occurred would have needed treatment. The question of the actual number of camps required must be settled by the local conditions. The number of Police available to watch the camps must always be an important item in determining the number of sites taken up. But the Government order limiting the minimum to three camps is certainly a wise one.

"In laying out the camps a distance of ten paces between the huts has been usually carried out in the Banga villages. The huts have been put up in rows with a distance of from 20 to 50 paces between the huts, according to the space available."

It is impossible to lay down any hard and fast rules about camps, since the circumstances of villages differ so widely. In some villages the people arranged themselves into "pattís," in some into castes, but in all cases it is advisable to leave the villagers to decide for themselves, provided their wishes can be made to fall in with sanitary requirements.

Notice has then to be given to the villagers that they must be in camp within a certain time. Under the rules drawn up by the Commissioner, the limit of 48 hours was not to be exceeded without sanction. Huts for the villagers, for hospitals and for hospital attendants have then to be brought to the village. The villagers are told to bring out with them as much of their property as possible, and are told to provide themselves, if possible, with supplies for two months. When once the village has been evacuated, the villagers are warned that no one must return to it, and that any one found there will be prosecuted. It has been the exception to put a Police guard on the village site. It would have required more Police than were available, whilst to place the Police in that position exposes them to some danger. Such guards, except in the case of Banga and Garhshankar and one or two other villages, have not been found necessary. Few burglaries have occurred, and it may be noted that the largest burglary of all occurred in Garhshankar, where there was a Police guard. In some instances the people themselves put on chaukídárs, but generally declined to do so, saying that this was only an inducement to thieves to go into the village, meaning that they mistrusted their own chaukídárs. In a few cases villagers were found inside the village, but one or two arrests stopped this practice. This was notably the case in Kárnána.

Persons in the segregation camp have been allowed to visit their friends in hospital, but intercourse between the segregation and health camps has been prohibited.

The relief list gives a good deal of work to the Assistant Commissioner and Tahsíldárs under him. The list has been restricted as far as possible, relief being given only to old and decrepid persons, to children whose parents or supporters have died or who for other reasons are in want, to mendicants whose rounds to neighbouring villages have been stopped by the cordon, whilst it has been found necessary to give relief freely in the segregation camps to persons cut off from their means of support. The "kamíny" of the village often need relief until occupation is found for them in the disinfecting gangs.

Regarding shop supplies Mr. Gracey writes as follows:—

"Some of the smaller villages have no shop. It has been the custom in most of these cases to allow the villagers to go to the Police shops, but in the majority of villages there are shop-keepers. They do not as a rule keep up large supplies, and it was necessary for us to arrange for their stocks to be replenished. This was at first done through the Tahsíldár or Kánúngo, who would send the articles from Banga to the boundary, where they would be taken over by the shop-keeper under supervision of the Police; but when Banga itself became infected large supplies could not be obtained from it, and recourse had to be had to Phagwára or Nawashahr.

"Not infrequently it was possible to arrange for the shop-keepers to obtain supplies from their own friends in other villages; their stores would be delivered to the village in the same way as if they came from Banga, that is, on the cordon. These supplies give a little trouble, but it was always found possible to arrange for them by one of the above ways."

In much the same way as the above, the villages in the Nawashahr group obtained their supplies from the larger villages of Nawashahr and Ráhon, which were never infected, and in Garhshankar there was no difficulty, as there were several large villages near by from which supplies could be brought.

Opium, drugs and spirits had generally to be supplied through the Tahsíldárs.

Miscellaneous needs.

Under this head comes a long list of matters which have been thrown out of course by the cordoning of the village. Arrangements of bonds, nearing limitation, between creditor and debitor, one in and one out of the infected village. As far as possible these were arranged through the Tahsíldárs, but if no satisfactory arrangement could be made, and resort was necessary to a civil suit, then difficulties arose regarding writing of plaint and court-fee stamps and petition paper. These difficulties had to be overcome in each case. The stamps gave a good deal of trouble until a licensed vendor was established at Banga.

Another difficulty arose in May regarding registration of deeds.

All letters and money orders for villages inside the cordon had to be delivered through the plague officials, who in the same way collected letters and money orders from the infected villages.

Extension of leave had to be obtained for sepoys on leave in the infected area.

During the winter blankets for the people and sacks to act as covering for the cattle had to be obtained and distributed.

A matter which gave the Assistant Commissioners and the Tahsíldárs much trouble was the arranging for cultivation of land or for watching and harvesting of crops belonging to men of one village, but situated within the area of another. Thus zamíndárs of an infected village might own crops in an infected one or *vice versá*. If this could be arranged by slightly altering the cordon this was done, and sometimes friends of the owners undertook the work. In the Nawashahr villages Mr. Butler found that a custom existed by which the fellow castemen of the owners and the Kamíns of the village could be called on to look to the crops on payment of food and certain shares.

In cases where none of these methods could be made use of, appraisement was tried, but did not succeed, and finally the owners were allowed to cut and harvest the crops under the supervision of the Tahsíldárs. During the harvest this threw heavy work on to the Tahsíldárs, and their time was wholly taken up in this way. It is creditable to them that not a single instance has occurred in which compensation for damage to or loss of crops has had to be given. At one time it seemed as if damage from rain would occur to grain lying on the threshing floors, and the zamíndárs began to complain bitterly; but it fortunately happened that there was no cause for complaint, but in some instances permission was given to store the grain in the "havelís" on the outskirt of the village, and in a few instances the grain was taken right into the house and no harm ensued, though theoretically the village was not clean.

At one time the zamíndárs in the infected area complained that they could get no market for their grain, but when fair terms were arranged for them with some Phagwára traders they refused them.

Special permission had sometimes to be given to persons to irrigate their sugarcane outside the cordon. This was arranged for under special supervision of the Police, and the same way "jálá" for sugar manufacture was brought from the Beyn.

Other supplies, which the Assistant Commissioner had to arrange for, were milk, wood and such daily requirements for the hospitals, and he had also to obtain lime and convey it to the village under disinfection. This lime was at first obtained from Birámpur, an infected village in Garhshankar; but at times the supply did not equal the demand, and of late the lime for the Banga villages has been obtained through the help of the Deputy Commissioner, Jullundur, from Jullundur and elsewhere.

There are moreover the duties which the Assistant Commissioner has to perform in connection with disinfection of villages and with provision of huts, but these will be treated of separately.

The Assistant Commissioner in charge of a group has also the supply of money to all officers under him to arrange for, and also to keep the accounts for the whole group.

It will thus be seen that the Assistant Commissioner's work never ceases from the time a village is put into camp until it is declared free.

The distribution of the work during the present epidemic has been as follows :—

Up to beginning of May Mr. Leslie Jones was in charge of all of the Jullundur villages, and all the Assistant Commissioners were directly under him. On his transfer the Jullundur villages were divided into two groups,—one, the Banga group, 1 of some 40 villages under Mr. Gracey with four officers to help him, and one, the Nawashahr group, under Mr. Butler, with one Assistant Commissioner to help. The Assistant Commissioner in charge of a group had to keep the accounts of the whole group, the other officers obtaining money from him and sending in their bills to him. He had also to arrange for lime for the whole of his group, and in addition had in his own hands the supervision of the "workshop" with its carpenters, mistrís, gharámís, &c., for construction of huts for both groups in the Jullundur District. No separate workshop was started for the Nawashahr group, the supply for those villages being obtained from Banga. Mr. Butler recommended that each group of villages should have its own workshop. There is no doubt the advantage in this that each Assistant Commissioner will know his own probable wants and will see that the supply of huts ready does not fall short, but I think one general workshop is best. Owing to spread of the disease, the constitution of the village groups may have to be altered, whilst with two or three workshops open there is a danger of their competing each group can be sent from the main workshop without delay. During the present epidemic delay in supply of huts was due to the strain put on the Banga workshop through so many villages coming on to the list suddenly in April and May. Hitherto the supply of huts for Police has also been under the Assistant Commissioner, but I am recommending, in noting on Police arrangements, that it would be better to let the Police arrange for themselves, care being taken that no competition arose between them and the Assistant Commissioner for supply of materials.

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The Medical officers have been distributed amongst the different groups. At the height of the epidemic Banga had four and one private practitioner, Nawashahr two, and Garhshankar two. It is obvious that the duties of the Medical officers and the Assistant Commissioners must occasionally clash, and I think it speaks well for all the officers concerned, and shows that they were trying their hardest to get the work done in a manner conducive to the success of the operations, and to the interests of the villagers, that so little friction arose. The Medical officer must be supreme in everything affecting the hospitals and also the segregation camps. With regard to the number and position of the health camps it is by his advice that the Assistant Commissioner must be guided. Hitherto the disinfection of villages has been in the hands of the Medical officers, but I am of opinion, as has been shown later on, that the Medical officers may be relieved of this portion of the work.

In concluding this part of the report I cannot do better than quote Mr. Butler, who writes as follows :—

"The duties of an Assistant Commissioner are essentially those of supervision, and this officer should keep himself informed of everything that is going on in each village. He has to make arrangements to supply huts to the Medical and Police departments and to the villagers themselves, choose sites for camps, be invariably present to order a village to turn out, and to see that his order is obeyed. Once in camp, he has to watch that the lambardárs give a loyal support to the Medical officers in the way of showing up the sick and having them and their relatives removed from the healthy camps, and though in this he must necessarily be guided by the wishes of his Medical colleague, he should endeavour to inspire confidence in the hospitals by visiting the sick there and letting the lambardárs see him do so from outside the hospital compound. The terror inspired by the hospital is very real, and there is nothing more unfortunate from a political point of view than to make it a fortress into which no man's foot may enter save that of the doctor, and the only exit from which as seen by the people is the mournful egress of the dead. It is even a wise thing where, as in this circle, the Medical staff has raised no objection for a European officer to take the lambardárs into the hospital compound with him and let them see with their own eyes the way in which the sick are being cared for. As a rule of course the lambardár much prefers to remain outside. The Assistant Commissioner has too to keep an eye on the progress of the disinfection work, to draw attention to the fact if there is delay in commencing it, to provide and pay the coolies employed on it, and to collect and furnish a proper and timely supply of lime, brushes, &c., &c. He must also be constantly ready to listen to complaints and endeavour to repress as far as possible the exactions which he knows must be going on, and to keep his superior officers informed of the temper of the people. He will also do well to keep payments as far as possible in his own hands, and not make over a definite branch of them to native subordinates. When this gets beyond his powers, he can always depute his Tahsíldár to disburse specific sums of money. On no account should payments be made by Native or Police subordinates."

7. Huts.

The following note on this subject is taken entirely from report of Mr. Gracey who had the construction of the huts for all the Jullundur villages :—

A.—Village-made huts.

Huts have in general been supplied ready-made to the villagers. At first in the villages of Khatkar Kalán, Jhander Khurd and Khán Khanán the plan was adopted of supplying materials to the villagers, and rewards were given for huts made out of these materials, and also for huts made entirely by the villagers from their own materials; but even in these villages a large number of huts made by Government were distributed. Of these three villages the best huts were made at Khán Khanán, as was natural from a village so expert in carpentry. At Jhander Khurd and Khatkar Kalán the people used the ordinary "sirki" hut, but strengthened it against rain and wind by stacking "makki" stalks against the sides; but these stalks are not at all pleasant when saturated with rain. At Khán Khanán the people used "phus" instead, and this makes an admirable thatch. The huts at Khán Khanán were more spacious and stronger. Mr. Jones says in his diary of 1st December 1897: "The people are now ready to go out and build huts for themselves, although we have no material but string to give them; and the zamíndárs of Patti Dalel Singh began constructing huts with ladders, old sticks and new cut branches. They will thatch and wall them with Indian corn and hemp stalks."

The phús was collected by Mr. Jones' orders from the public roads round Banga.

The patterns of huts made by the villagers were practically the same as that which we have distributed, that is, an ordinary double lean-to-hut. Some of the more elaborate huts were of a square shape with more space inside.

It must not be understood that all or nearly all of the people made their own huts. I should say that only some 10 per cent. did so, and it was only in these earlier villages that so many as that were made. Sirhál Kazián may be said to be the last village in which any appreciable number of people made their own huts. In all later villages it is only an isolated hut here and there that has been made by the villagers. A few have been put up in Banga by well-to-do people.

I may note, however, that after the harvest was cut not a few villagers made themselves huts out of the straw, shaping them like the "kups" in which they place their "bhúsa." These afforded a very fair protection against sun and wind.

As a general rule it may be said that the village-made huts are stronger and more capacious than the "Sarkári" huts. Their frame work is more substantial, and they are fixed more firmly to the ground. This renders them more wind-proof, but at the same time it makes them more liable to fire, or rather it makes the probable loss much greater if fire breaks out. For if the ordinary "Sarkári" hut catches fire, the "chappar" can be at once lifted off and the fire beaten out; but the village-made hut cannot be thus readily dismembered, and when once the fire has caught, it usually burns right through the hut and destroys everything in it. This has been the case once or twice in Banga. But apart from this danger, there is no doubt about the superior comfort and accommodation of the village hut.

It is not every one, however, that has the ability or means to make his own hut and we could never hope to entirely replace the "Sarkári" hut by the village-made hut. The latter can only be supplementry.

All the segregation huts must be supplied by us, as must also the bulk of those for the Chámárs, though it is true that in Khatkar Khurd some Chamárs made their own huts. We must also supply the old and feeble with huts.

The system of paying rewards for good village-made huts was inaugurated by Colonel Massy. I have already mentioned it. Two rupees were paid for a hut made wholly by the villagers from their own materials, and one rupee for a hut made from materials supplied by us. No such rewards were paid in any but the earlier villages.

In some of the larger villages it was found impossible to supply all the people with "Sarkári" huts, and during the months of March, April and May, when the great rush of new villages took place, we could not supply even the smaller villages with their full complement of huts. Many of the villagers were driven to make rough shelters for themselves by hanging "chaddars" over poles supported on broken branches, with "charpoys" as walls. These are of very little use as a protection against sun or wind, and cannot be considered in any way satisfactory.

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B.—Sarkári huts.

Materials.

The materials that are used in the manufacture of the "Sarkári" hut are sirkís, bamboos, ballas (long poles), bán (ropes), and phús (thatch).

Bamboos, sirkís and bán were at first sent by the Commissioner of Jullundur and also by the Deputy Commissioner; some were also sent from Ludhiána. During the time of the severest strain in March and April they were got from any source we could find, from Jullundur, Ludhiána and Phagwara. The greater part of our supply has come from the contractor, Muhammad Bakhsh of Phagwára.

Ballas were obtained from Jullundur, Amritsar and Phagwára.

"Phús" was at first collected from the roadsides. S[illegible] was brought from Garhshankar. For the latter part of the time we have obtained it [illegible] Muhammad Bakhsh of Phagwára.

The "sirkís" we have obtained from Jullundur and P[illegible] ly good size; but some of those that came from Ludhiána [illegible] hun of uniform- inferior in construction. The cost of the sirkís has been Rs [illegible] smaller and 6 annas per pair.

Bamboos varied from Rs. 5 to Rs. 10 per hundred according to the thickness.

Ballas or poles were about Rs. 2-8-0 to Rs. 3 each; they measure some 15 feet in length and are 8 or 9 inches in diameter

Bán is about Rs. 2-4-0 per maund.

Phús sells about 2 maunds to the rupee.

The quantities supplied up to June 15th are as under:—

Bamboos	...	...	...	194,829
Sirkís ...	...	...	...	53,363 pairs.
Poles (ballas)	...	...	...	860
Bán ...	...	...	...	275 Mds. and 36 Srs.

Manufacture.

The method of making the ordinary sirki hut can be briefly described. The bamboos which form the frame work of the hut are first cut by the "tarkháns" so that they may fit into one another. These bamboos are then arranged by the "gharámís" and fitted and bound together by them. The sirkís are then brought by the "beldárs" ready to the gharámís, who fix them on the frame work. The gharámís and tarkháns are skilled labourers; they are paid 6 annas a day. They are not Government servants.

Beldárs are unskilled labourers; their work is chiefly that of coolies; they were in fact originally road coolies and were obtained from the Nawashahr Tahsíl. Their pay is Rs. 5 per month.

All the men working are under the supervision of Imám Bakhsh, Mistri, who came from the Nawashahr Tahsíl and managed the work from the very beginning.

To build 100 huts of the ordinary kind in one day we should require about 30 gharámís, 15 to 25 beldárs and 6 tarkháns.

This staff would make two hospitals in one day. But different distributions of labour is required for each kind of hut—sometimes gharámís, sometimes tarkháns, and sometimes beldárs predomenate. For instance for phús covered huts which are to be used during the rains the distribution is as under:—

For making four "chappars" there are required gharámís 8, beldár 1, tarkhán 1.

I have had a list made up showing the relative cost, labour and material of each kind of hut; the list is appended.

At first the huts were made close to each village. Whenever a village became infected, a number of gharámís, &c., were sent to the spot and all huts were made there; but when Khatkar Khurd was attacked, the factory was moved to the large open space between that village and the Banga road, where it has since remained.

All the work is carried on in the open air, some shade from the heat of the sun being afforded by the roadside trees. It would be almost impracticable to carry on the work except in the open air owing to the size and nature of the materials used. A work-shop of sufficient size would be a big undertaking. This is why it is so advisable to have a stock made ready before the rains, for during the rains work will come to a standstill. As the huts are finished, they are placed in stacks ready for carting to the villages. The carts are the ordinary village carts, and ten ordinary chappars can be carried on one cart.

Style and pattern of huts.

I am sending, herewith, 13 diagrams of huts which have been of use for plague work. It will be seen that they vary very much in cost, and I am of opinion that many of the more expensive styles are quite unnecessary.

I will first, however, describe the huts in detail:—

I.—The first hut is the "phús" covered hut which seems to me the best for nearly all purposes to which the more elaborate huts have been put.

It is a double lean-to hut, 13 feet square, side slope 10 feet and elevation 8 feet. It is closed in back and front, except for one door. The sides and back are thickly covered with "phús," which affords protection alike against rain and sun. It is portable, easily set up, not liable to be blown down by the wind, and cheap and commodious. It is perhaps too expensive to be supplied to the villagers in any large quantities, but for nearly all other purposes it seems to me the best.

Its cost is from Rs. 9-12-0 to Rs. 10-4-0, and it will hold three charpoys comfortably, leaving a good open space in the centre.

The side slope is good and throws off the rain easily.

II.—This is the hut we have supplied to the villagers, and it does very well for ordinary dry weather. It gives little or no protection during the rains. It is 10×8½ feet square and 7 feet high. Its cost is about Rs. 2-12-0, and it can be made rapidly and in large quantities. It is portable, and it requires no skill to erect. It is not, however, very strong, and suffers in a high wind. For the rains a hut of these dimensions will be used, but it will have a roofing of phús over it, and will be more strongly made.

The villagers themselves used to pile up all their boxes and "gharas" round these huts and thus strengthened them while on the chappar roofs they stretched "chaddars" and sometimes laid a covering of straw. With the help of these sirki chappars many villagers made themselves really good huts, and the greater part of the old and weak were given shelter. Taking into consideration the very large numbers we had to supply during March and April, I do not think this pattern can easily be improved upon.

III.—This pattern had been supplied to the Police as well as pattern No. II. It has only a single roofing of sirki and is not so good as pattern No. I. It was not supplied to the reserve camp at Mallupota, but only to men on actual cordon duty. It takes longer to make than No. II, and could not be supplied at the time of greatest strain, that is, in March and April.

IV.—This is the pattern of hut which has been supplied to Deputy Inspectors. I is not altogether satisfactory, and is always needing repair.

V.—This is the Bania's hut. It is more expensive than No. I pattern owing to the double roofing of sirkís. I would replace it by No. I, which is in every way superior.

VI.—The hospitals at present in use are very expensive, but they are generally approved of by the Medical officers.

Their dimensions are—Surface 28 feet ×18 feet and height 10 feet.

They have not a "phús" covering, but are roofed with a treble thickness of "sirki" and walled with a double thickness. It is this which makes them so expensive. They cost about Rs. 115. The substitution of "phús" would reduce this slightly.

They contain about eight patients each, and are airy and well ventilated.

Beyond the substitution of phús I can suggest no improvement.

They might perhaps be made stronger, and a good quality of rope should be used to fasten the roofs. It has occasionally happened that in a high wind the roof has become loosened and actually displaced These huts at present cannot be moved more than once; a second move knocks them to pieces and renders them useless.

VII.—This is another very expensive hut, and is really too hot for use in the hot weather. They are, however, much cooler than tents, and if it is necessary to keep nurses out in camp during the hot weather, I do not see what else we can use. They are, however, very costly and cannot well be used again for any other purpose.

They have not hitherto been roofed with "phús" but with a double thickness of sirki. This is adequate protection against the sun, as in the hot weather the sun blazes right through it, otherwise they are strong and well made, and I have no doubt that phús would improve them immensely. But they are open to the same objection as the hospital huts, and they are not portable.

VIII.—Patterns VIII, IX, X, XI, I would most certainly discontinue. They are far too elaborate and costly. I would substitute pattern No. I for all of them, and the Medical officers agree with me that it would be an improvement.

No. VIII costs over Rs. 35, and is not secure, nor does it give sufficient protection against sun and wind. Nos. IX, X, XI are all open to these objections, and it seems an excess of liberality to supply a "bawerchi" with a hut costing Rs. 37-10-0, when a 10-rupee hut would serve his purpose better.

IX.—Patterns Nos. XII and XIII are those given to Tahsíldárs and Náib Tahsíldárs. They are both very expensive, and I think it would be better to give tents to these officers I think that this course would be cheaper in the end.

X.—Remarks on the *more expensive huts.*

The large and expensive huts such as are shown in patterns VII, XII and XIII have some advantages, but they have many disadvantages. Their advantages are commodiousness and a free circulation of air. Their disadvantages are insufficient protection against the sun and rain, expense of construction, lack of portability, liability to damages in high winds. After two moves they are useless. This liability to damage from the wind is a great nuisance, as "gharámís" have to be sent to make the repairs, and skilled labour is thus taken away from the important work of making new huts; the nuisance becomes acute when hospitals at remote distances require repairing. I should therefore recommend that where large accommodation is necessary, tents should be used, but that where small accommodation will do equally well, huts of pattern No. I should be employed.

This pattern can of course be enlarged at a slight increase in cost.

As regards the medium size huts, that is Nos. IV, VIII, IX, X, XI, I recommend without any hesitation that they be discontinued. They have practically no advantages and are only a source of trouble.

Their high cost carries with it no corresponding benefits. As already stated, I would replace them by pattern No. I.

General Remarks.

I have made most of my criticisms incidentally. But one or two points still remnia to be touched on.

I have pointed out that the ordinary chappar hut can be made by the villagers to afford very fair protection against the sun. In rain, however, they are useless, and in a heavy shower they afford almost no protection, nor do they give much relief from the wind, and more complaints are heard about the wind than about the sun, and I think rightly. When a strong wind is blowing it is exceedingly difficult for the villagers to kindle a fire for cooking purposes, and if they do succeed the danger from the flying sparks is a very serious one. Especially was this the case in Jagatpur, where the camp was out on a wide sandy maidán, where the wind used to come sweeping along and cause great havoc. Mr. Johnston has put the loss in this village alone at nearly Rs. 3,310, there being no less than seven serious fires, nearly all of which may be attributed to this cause. In one fire five huts were burnt down.

There is another minor point which used to provoke many complaints, and that was that the wind spoilt the actual cooking and rendered the food uneatable. I know this to be a perfectly genuine complaint.

I think something might be done, if ever the occasion recurs, in the way of providing special enclosures in which all cooking should be carried on, and if care were taken to see that castes were separate, and that protection from the wind was afforded, I think that the people would avail themselves of them. But this is only a suggestion to be tried.

I have already commented on the peculiar liability of v[illages] to be destroyed by fire owing to their solid framework.

There is no doubt that there have been too many kinds of huts made. The fewer patterns we have the better. There is no need to discriminate between a Hospital Assistant's hut, a Náib Tahsíldár's hut, a Deputy Inspector's hut, and so on. These various kinds of huts disorganise the general work, for the different kinds require different kinds of labour, and under these conditions it is a difficult matter to prevent a lot of labour standing idle. Moreover supervision cannot be so good if many kinds of huts have to be inspected. I think three patterns are quite sufficient: they are pattern No. I, dimensions 13 feet square, pattern No. I but dimensions those of No. II, and pattern No. VI hospitals. Having these three classes of huts only to construct, we can arrange our gangs of labour with perfect ease, and there is little danger of waste. Moreover, a much more efficient check over the number of sirkís used can be maintained. So far I have the greatest difficulty in exercising any check at all on the consumption. But the chief way in which our labour is disorganized by the present style of hut is the necessity of having to send "gharámís" to all quarters of the infected area to mend huts. After a high wind work must come almost to a standstill in the Mistri Khána, or else several officials be put to continued inconvenience through the damage to their huts. This is a very great nuisance.

I have endeavoured in general to bring back old huts to Banga; but very few have come back at all serviceable, certainly not more than 7 per cent. or 8 per cent. Of the rest about 50 per cent. could be taken to pieces and their bamboos and sirkís used again. The remainder were good for nothing.

I have left out of consideration those that were left lying near the villages as useless. These were taken by the villagers for mending their roofs, and I am now of opinion that more might with advantage have been left for this purpose.

In some cases, however, it was found possible to transfer old huts from one village on its return from camp to another village still out in camp. This was done frequently among the earlier villages. I sent a number to Masáni from Sirhál Qázián, and a number went from Gunachour to Mukandpur, Gosal and Punián. In other cases, however, the people would have none of them; they were afraid of infection being spread by them. The Medical authorities had previously, however, assured us that there was absolutely no danger. Their superstitions did not meet with much encouragement, as we were too hard pressed for huts to make people two offers of them. Lidhar Kalán, Ojla and Lidhána Jhika would take none of these huts. Huts were consigned either to the lambardárs or to the Hospital Assistants. In the case of the Police they were sent to the Deputy Inspector or Sergeant in charge. It was not always easy to ensure that a lambardár would make an equitable distribution of the huts; and frequently on the arrival of the executive officer the latter would find that the wealthy men and special friends of the lambardárs had got the lion's share, and the poor and weak for whom the huts were specially intended had been left to shift for themselves. The executive officers, I am glad to say, never had any pity on such offenders. In Lehl a rumour was prevalent that the Government was charging Rs. 6 for the huts.

8. Disinfection of villages.

Surgeon-Captain James drew up the following memorandum about disinfection for officers coming new on to plague duty:—

"*A.—Establishment.*—The following establishment is necessary for disinfecting work. The number of workers employed will necessarily vary with the size of village or town and the amount of work to be done:—

"1. Water-carriers.

"2. Coolies for using pumps.

"(If possible every pump or syringe should be given into the hands of some particular man, who will be responsible that the instrument is kept in order; otherwise it will be found that the pump will very soon get out of order, and nozzles, &c., will be lost.)

"3. Coolies for white-washing.

"4. Sweepers for cleaning out rubbish, &c.

"The disinfecting gang should be in the charge of some responsible person. We have found that Hospital Assistants have been the most satisfactory persons to act as supervisors when Europeans were not available. A Police constable of good character should always be associated with the Hospital Assistant to assist him in keeping the gang in order and preventing thefts, &c.

"*Note.*—All persons working in the disinfecting gang *must* wear shoes as long as they are inside the infected village. They must all be disinfected each evening before they are allowed to return to their camp, and when taking their midday meal no person should be allowed near them.

"*B.—Materials*—The materials required for an ordinary village are the following :—

"1. Large drums of phenyle.

"*Note.*—Perchloride of mercury was at first used, but was given up as it was found to be precipitated by the water in the Jullundur District. Adding sulphuric acid overcame this to a great extent, but added to the corrosive action of the fluid which spoiled the pumps used. Phenyle has given very satisfactory results.

"2. Continuous action-hand pumps or large garden syringes.
"3. Buckets. These may be made of old kerosine tins fitted with wooden handles or, better still, old phenyle cans with iron handles.
"4. One or two "karabhs" or iron vessels in which lime can be mixed.
"5. Spades.
"6. Baskets and earthen vessels.
"7. Ladders.
"8. "Dōl" and "laj" when water has to be drawn from wells.
"9. Lime. This should be freshly prepared and unslaked ("unbujha") until the time of using.
"10. Lime-washing brushes "(kuchís)."
"11. One seer "hurmuchi rang" and common oil. These are mixed together and form an excellent and cheap coloring matter for marking the infected houses, &c.

"*Note.*—All infected houses should be marked by some distinctive mark as soon as possible to prevent mistakes taking place.

"The mark used in the Jullundur villages are a plain circle for suspicious cases. A circle with a cross within is for plague cases. A line drawn below the circle and cross indicates that the patient was attacked when out in camp and not when living in his house.

"*C. Disinfection.*—When houses have to be disinfected the following procedure, which applies to all houses whether actually infected or not, is carried out :—

"The disinfecting gang is collected in the street adjacent, and all the materials required are put out in some convenient open space, if possible, near the centre of the area to be dealt with. The owner of the house is brought in, by the Hospital Assistant or the Police constable, from the camp where he is living, and simply allowed to open the lock of his house and made to sit down somewhere near, where he can watch the operations, but he is not allowed to take any active part in the disinfecting.

"The pumps and syringes then play on the still closed door until no part of the wood work is left dry.

"The phenyle lotion is made by adding sufficient phenyle to water in the buckets to make a mixture looking very like rather thick milk. At one time an attempt was made to use measured quantities of strong phenyle and water. But owing to the ignorance of our gang and the fact that the vessels used as buckets were of various sizes, it was found that we got a much more uniform result by giving directions about color consistence than by using actual measures. The ordinary native understands these directions better than the more scientific method. The same difficulty arose when perchloride of mercury was used.

"Our experience has shown that quite weak solutions of phenyle (1 in 500) are quite sufficient for plague disinfection work. Out of a large number of plague infected houses treated up to date not a single one has shown a recurrence of the disease when the owners returned.

"The door is next thrown wide open and before any one is allowed to enter the pumps are played over as much of the room as is visible from outside. This lays all dust and makes it fairly safe for persons to enter. The pump workers then enter and thoroughly soak the ceiling, walls and floor with phenyle solution. The coolies are next allowed in and carry out all furniture and moveable articles while they are still wet with the spray and place them either in a corner of the roof or in the street where they can get the full benefit of the sun. All rags, rubbish and useless articles are burnt and destroyed. Small articles such as *dátís, rambas, dewas*, &c., are dipped bodily into phenyle kept in a suitable vessel outside the house. Owners are encouraged to take as much as possible of their property away to their camps after it has been thus disinfected. Corn and other articles such as manuscripts are put out in the sun for one day, and then returned to their respective receptacles.

"The dry places left in the room by the removal of these things are at once sprayed, and the things themselves are treated to a second spraying when they get outside in the light.

"When the Hospital Assistant is satisfied that the room is thoroughly disinfected and all inner rooms similarly treated, the doors are again shut, and the process of making a hole in the roof commenced. This hole to be of any value whatever must be large enough to allow plenty of sunlight into the rooms. An opening of less than 24 square feet is of very little use. It may be necessary to make two or more such openings. If the opening is not made in the middle of the roof it should be made on the south side of the centre, as this position allows most of the direct rays to enter. The exact

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"After white-washing the house is inspected, passed and marked by the supervising officer and allowed to remain open until the people return to the village. It will be seen that the process consists of four stages,—1 Disinfecting, 2 Cleaning, 3 Ventilating, and 4 White-washing. These each serve a special object, and when all are carried out in their entirety render the houses treated very safe, but frequent modifications have to be made. Among these may be mentioned—

"1. If the rooms are so dark that it is impossible to see clearly where the lotion is going and whether the whole room is being thoroughly soaked, it is necessary to make the opening in the roof before completing the spraying and before removing the goods and chattels and then again spraying. But it must be remembered that this is a more dangerous process, as dust, which has fallen everywhere, is much more likely to blow about. If there is one point more important than another in plague disinfection it is *the prevention of dust rising in the air.*

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Note.—On the subject of removing roofs I am making a separate communication.

"The floor is dug up to the depth of 3 inches, and the mud taken away after wetting with phenyle and buried outside the village.

"All articles such as beds, old clothes, old wooden furniture, *mohrás, pihrís,* all earthen vessels and articles difficult to disinfect should be burnt and destroyed and compensation given. Most of the articles mentioned will be found cheaper than the price of the disinfectant required to render them innocuous.

"5. In houses where there are earthen corn receptacles (*kothás*) these are phenyled inside and outside and then white-washed, taking care that the insides and tops are thoroughly done. Small *kothás* should always be moved into the centre of the room, as they often contain rubbish behind them. In cases where they offer difficulties they may be broken up and removed.

"6. Out-houses and cattle-sheds, which have irregular mud walls, cannot be satisfactorily lime-washed on account of the extreme unevenness of the surface. In these cases more phenyle is used and the lime-washing omitted. Cattle sheds should be *invariably* entirely cleaned out. Difficulties of an unexpected nature will often crop up, and it is sometimes hard to be absolutely consistent in one's treatment, but the ordinary rules which every Medical man knows will often help to solve these difficulties. In any case of doubt it is better to be too severe than too lenient when we have such a serious disease as plague to deal with.

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"When we at first began disinfection work connected with plague, we were rather inclined to try treating infected and uninfected houses on rather different methods, but further experience has shown that the more we treat the village as a whole the more satisfactory are our results. At first we treated infected houses first and the uninfected afterwards

Lately I have tried doing the uninfected houses first with a view to giving more time to the diseased rats to die in their original infected area, but as these rats seem to have a tendency to stray away from their holes, I have not obtained much benefit from the procedure. Dead rats have been found in numbers in uninfected houses in many of our villages, and in some I have been able to show that they have died of plague. The question whether infected houses should be first treated or disinfected later does not appear to be very important, as long as the gang take the usual precautions."

Surgeon-Captain James in his report has noticed some points omitted in his memorandum above.

The "Chamárs" were found to work best on the disinfecting gangs. They are the "kamíns" of the village, and the proprietors are interested in making them work, but objected to their being taken to other villages. It thus became impossible to form general disinfecting gangs.

Surgeon-Captain James thinks that the owners might be permitted to do the white-washing of their own houses, but nothing prior to this. Putting aside the danger of infection through them to the health camps, owners so much dislike disinfecting and thereby perhaps damaging their property that they will not do this thoroughly, and as Dr. James remarks "when it comes to making holes in their roofs, they feel as if they were going to commit suicide."

With regard to rat holes, Dr. James points out the necessity of closing these. He first poured down each hole 2 oz. of pure phenyle and then blocked the hole up with stones and plester, and none of the holes were found to have been re-opened.

The efficacy of phenyle as a disinfectant is doubted by some of the Medical officers but there is a difficulty about using perchloride of mercury owing to the precipitate formed owing to the lime in the Jullundur water ; but this is a point which will no doubt be taken up in the reports which are being submitted by the Medical officers to the Inspector-General of Civil Hospitals. The disinfecting work has hitherto been supervised entirely by the Medical officers. The disinfecting duties of the Assistant Commissioner have consisted in being present when houses belonging to absentees are opened, and to take charge of ownerless property. He has also to assess the value of property destroyed by order of the Medical officer.

The disinfecting work has been carried on by gangs of coolies, under the supervision of the "Sanitary Overseers." Hospital Assistants, Compounders, picked Constables, and some Kánúngos were tried, but did not prove a success. A proposal was made to obtain men from British Regiments, but fell through. The Sanitary Overseers, of whom five were employed at different times, were pensioners or men out of employment, and I cannot say that they have altogether proved a success. And I do not recommend their employment again. Mr. Goulburn, whilst employed on this duty, contracted plague and died.

The Hospital Assistants and picked Constables perhaps have done best, and I think on another occasion a trial might be given to pensioners and reservists from native regiments. They would probably understand and obey orders and exact obedience from the coolies.

In accordance with rules drawn up by the Commissioner in May disinfection was not begun in a village till ten days after evacuation. The idea was that this would give time for the rats to contract plague and die off, while fewer of the disinfecting gang would be attacked by entering freshly infected houses.

The Medical officers are generally against this 10 days' period, since it causes delay, whilst nothing is really known for certain as yet about the rat theory. Whilst Surgeon-Captain James has brought forward examples showing that members of the disinfecting gangs have been infected a long time after the ten days, in one village in which I sanctioned a relaxation of the rule, as the rains were approaching, no harm ensued. The ten days' rule undoubtedly does cause great delay, and it is always a matter of great importance to avoid delay ; but at present I myself am in favor of maintaining the rule, since such evidence as we have points to the fact that the disease must run its course amongst the rats, and it is better to leave the village alone whilst this is going on. Surgeon-Captain Smith proposes that a ten-days' interval should be given after the cleaning and before the white-washing instead of at the beginning, and that another week be given after the white-washing.

The villagers were kept in camp, as a general rule, till three weeks after the date of the last case, and also as long as any patient remained in hospital, but of late, owing to the approach of the rains, both these rules have in special cases been relaxed. The Medical opinion is, I think, generally against these rules, but in my opinion it is best to have some such rule laid down. Sanction can always in special cases be given to relax it.

After a village has been put back, the cordon is not taken off for seven days, and finally after a ten-days' interval the village is roll-called, and passes under careful inspection of the Medical officer.

I have above tried to describe the method and routine of disinfection. There are many points which are so closely connected with the purely medical side of the question that I have either left them alone altogether or only mentioned them, knowing that they will be much better dealt with by Surgeon-Captain James in his own report.

9. Police arrangements.

There were at one time close on 3,000 Police on duty in the infected area. To maintain discipline amongst so many men from almost every district in the Punjab entailed on the officers concerned constant supervison, whilst the providing of the supplies and huts, and the distribution of pay was no easy task. It is highly creditable to the young Assistant District Superintendents of Police, who were alone in charge up to the end of April, that matters went as smoothly as they did, but I think that on another occasion when a large body of Police is collected a Senior Police Officer of experience should be placed over the whole. At the begining of the outbreak the Police officers were Messrs. Macpherson, Goldney, Hadow and Wall. Later on Mr. Venrenen was added. At the beginning of May Mr. Turnbull took charge of the whole, and Mr. Macpherson was sent to the Jullundur District in his place, and about the middle of May Mr. Rundle, District Superintendent, Police, came to take charge of the Police in the Jullundur infected area, and in June Mr. John relieved Mr. Hadow, who had held charge at Garhshankar since the beginning of the outbreak.

In the Nawashahr and Garhshankar groups no difficulty arose about provisioning the Police ; but in the Banga group, owing to the cordoning of Banga town, whence most of the supplies had been obtained, difficulty arose, and at one time seemed so insurmountable that a proposal was sent up to ask aid from the Commissariat Department. Eventually a contractor was found, who for a substantial advance of Rs. 1,500, and on liberal payment of a subsidy for each shop, I opened several shops along the cordon line. I see no reason why on any future occasion the Police should not arrange for themselves.

Huts for the Police were provided by the Assistant Commissioners from their workshops. I would recommend that on any future occasion this be left in the hands of the Police themselves, who not only know their requirements, but are capable of seeing that they are met. Under the present arrangements they often thought themselves neglected, and there were occasions during the months of April and May when Police guards remained for some time without huts. The Assistant Commissioner having the villagers and hospitals to think of met these requirements first.

With respect to these two matters of supplies and huts for the Police, I quote Mr. Gracey's remarks :—

"The Police were in general supplied with huts exactly similar to those given to the villagers. A few were given some of the same pattern, but larger. Deputy Inspectors had a special hut of the Swiss cottage pattern.

"Means were taken for protecting sentries from the effects of the sun and weather. In winter blankets were given. As the sun grew stronger, some hundreds of umbrellas were distributed ; these were not sufficient protection. Later on shelters of thatch were provided, but they have not stood the strain of the weather, and if the thing is to be done thoroughly, proper sentry boxes must be provided.

"The supplies to the Police did not at first entail much difficulty. Shops were provided as a rule from Banga through the agency of the Náib Tahsíldár, but were sometimes obtained locally at the villages. It was found, however, that local "banias" did not readily come forward to supply these shops, and it was perhaps just as well not to obtain supplies from on infected source.

"But when Banga itself became infected, this source of supplies for shops was cut off, and some other means had to be found.

"A proposal to ration the Police was made, but fell through. Efforts were then made to find some large contractor who would set up shops at the camps on the cordon. One man came forward from Jullundur, but his terms were not satisfactory. Finally, after considerable trouble, a contractor, Harbans Lál, was obtained from Phagwára. The terms on which shops had previously been established were that each contractor received an advance of Rs. 50 and a monthly wage of Rs. 15. A bond was taken. Supplies were sold at the market rate. About 18 shops were worked on these terms.

"The terms made with the Phagwára contractor were as follows :—

"1. A store shop to be kept at Behram, for which Rs. 30 were to be paid by us monthly.

"2. Five shops to be maintained at places to be subsequently indicated.

"The monthly subsidy was Rs. 23 each, being Rs. 20 hire of the shop and Rs. 3 on account of the cart hire for conveying the supplies to the shops.

"3. An advance of Rs. 1,000 was to be paid on account of these five shops.

"4. Articles to be sold at Phagwára current rates on a weekly price list counter-signed by Major Inglis.

"5. The five shops to begin working on the 25th April.

"6. Ten days' notice to be given by either party before withdrawal.

"Harbans Lál agreed to these terms, which are distinctly favorable to him, and was given an advance of Rs. 1,000, a bond being taken from him for the money. Later on he set up six more shops and obtained a further advance of Rs. 500, for which he gave another bond.

"At first all the shops were supplied by the Assistant Commissioner, who was responsible for their payment.

"This plan had its disadvantages, as it was found that camps and shops were moved from place to place without information being sent to the Assistant Commissioner, and many complications arose in connection with payment. Accordingly when Mr. Rundle, District Superintendent of Police, came out to Banga, charge of the Police shops was given to him, and a Náib Tahsíldár was appointed to assist him. I understand from him that the contract system has not worked absolutely smoothly. The constables, on the one hand, complain that inferior articles are supplied, that the "ata" is mixed with sand and the like, and that the prices charged are above those charged by the local "banias." The contractor, on the other hand, complains that the Police do not go to his shops, and that he does no trade. The fact that he was willing to take up the second six shops on half the former advance rather discounts his complaints. It will be seen that our chief troubles arose when Banga became infected, but even before that shop-keepers had not come forward readily to supply the Police, and of those who came forward not a few very soon wanted to give up the contract.

"On the whole I think that the best system is to find a large contractor willing to supply shops as required, and not to rely on a number of petty shop-keepers."

Mr. Gracey has in the above remarks mentioned shelters for the Police. These are a necessity to protect the Police against the sun in May and June. Several patterns made of bamboos with "sirki" and thatch were tried, but none of them were altogether a success, and I think that if it has to be done again, it will be best to build fair-sized sentry boxes.

Maps of the infected area are very useful to show how the cordons stand day by day. We eventually obtained lithographed copies of the revenue survey map, scale one inch to the mile, from a press in Ludhiána. The cost of 200 paper copies and 50 cloth copies was under Rs. 30. The map shows the village boundaries and proved very useful.

At the end of the epidemic came the drafting of Police back to their districts. This was arranged by Messrs. Turnbull and Rundle. No Police were allowed to leave the infected area until they had been at the least 7 days off cordon duty. This meant that in almost all cases they had been much longer away from all danger of infection, since the villages are free from infection for many days before the cordon is taken off. The Police belonging to one district were collected in batches at either Mallupota or Behram till their time of quarantine was almost up, when they were brought in Phagwára and there had their clothes and belongings disinfected before being put into the train.

The Inspector-General of Police sent us also some horse and camel sowárs. One or two of the camels and horses belonging to these sowárs and also to the Deputy Inspectors died, owing, I think, chiefly to the bad quality and scarcity of the fodder available, and I think it would be fair if the expense of providing other camels and horses fell on Government rather than on the Deputy Inspectors and sowárs. The expense would not be much, and the animals died as it were on service.

In concluding this part of the report, I first quote from Mr. Gracey's report as follows:—

"On the whole I think the relations of the Police and the villagers have been fairly amicable. One or two differences have occurred: there was rather a serious *fracas* on the Jagatpur cordon with the villagers of Hakimpur in April. Both sides, I think, were to blame. Another row occurred at Mallah, and here again the blame was on both. There have been few complaints of looting. The collection of wood during the winter

The relations of the villagers and Police.

gave rise to a little friction, but no actual disturbances took place. Two constables were convicted of extortion for exacting money from villagers under threats that they would bring accusations of breaking cordon."

Sanction was given for each constable to get Rs. 1-8-0 per mensem plague allowance, while each officer received 20 per cent addition to his pay. The behavior of the Police has been uniformly good throughout, and there has never been any real trouble in connection with Police arrangements, except once, as mentioned above, with respect to supplies. The Inspectors generally, and most of the Deputy Inspectors, rose to the occasion, and with their experience and advice loyally assisted the young Assistants who were for the greater part of the time in independent charge of the Force.

It is on the cordon that our measures depend, and, though there have been instances of the cordon being broken, there is no reason to seek any other explanation of this than that the number of constables for so long a cordon were not sufficient. The Police have not failed us, and it is due to them that the epidemic has been kept from spreading over the Hoshiárpur, Jullundur and neighbouring districts. The work was new to them and not to their liking, but they have done their best amidst much discomfort and exposure cheerfully and well.

10. Subordinate Medical Staff.

Closely connected with the disinfecting measures comes in the subordinate Medical Staff. The Hospital Assistants have not earned for themselves a good name. Surgeon-Captain Smith remarks in writing about disinfection: "I understand that every village raised a special "chanda" for the purpose of bribing the Medical subordinates on disinfecting work" with a view to keeping the holes in the roof as small as possible and to keep property from being damaged by disinfection. He further on remarks:—

"There is an impresion deeply rooted in the Subordinate Medical Department that all such duty as plague and cholera are for them a sort of punishment duty, and no honor or rewards are forthcoming to them for good services or such duty. My subordinates have been in very many instances men whose character is not such as suit them for any such responsible duty, and from the manner in which they did their work and in which they got on with the people, I feel confident that they have not had clean hands in this business. There are a few men who did admirable service and got on splendidly with the people. One of such men from an effective point of view is worth half a dozen of the former class. You will understand that the power for good or for evil of the medical subordinates is great on a delicate business like plague, having the disinfecting operations to carry out. Many of these men made mischief wherever they were sent, besides taking an unnecessary amount of supervision. I would here respectfully point out that the greatest care should be taken to select men of good character. Men of indifferent character put in charge for a short time of an out-dispensary can do no little mischief. I respectfully submit that those who have done good service should be fully recognized, and we would thus dispel the idea that there is anything of the nature of punishment in such duty, and in its place implant the idea that Government regards plague duty as a most responsible duty. We would thus find on any future occasion the best men of the Subordinate Medical Establishment volunteering for it instead of regarding such duty, as they now do, as punishment."

Surgeon-Captain James writes as follows:—

"I may here be permitted to say a few words concerning the Hospital Assistants and Compounders. They have had to do a greater part of the most important and most dangerous work in connection with plague. They have treated the sick in hospital, examined cases in villages and in the various camps. The disinfection of the villages has been under their immediate supervision. Their work has been extremely hard, and they have had much responsibility thrown on their shoulders. On the whole they have acquitted themselves well and shown themselves to be quite capable to carry out the duties entrusted them. But a few blacklegs have made themselves notorious by trying to take bribes, which has brought discredit on the whole staff. I have been through a large number of the villages in our charge after all the plague operations have ceased and when the villagers have no object in giving false accounts for what has happened and when they speak up much more freely than they have done before, they have usually had nothing but good to report about the Hospital Assistants who have lately left them. I believe in many cases false reports were brought against the Hospital Assistants because the people knew that if these were go rid of the whole plague operations would become inoperative.

"The Compounders have not had the same chance as Hospital Assistants of holding responsible positions. But they have worked very satisfactorily. I think Government would be well repaid if it gave this class of officials higher pay when they are on plague

duty. They earn only Rs. 8 to Rs. 10, and get only Rs. 3 plague allowance. But this is a matter which concerns the Inspector-General, Civil Hospitals, and will be discussed in another place."

"Out of a staff of 38 Hospital Assistants and 27 Compounders, 4 have been attacked with plague. Hospital Assistant Lok Náth was attacked in the Khán Khanán Hospital, Hospital Assistant Lál Chand on disinfecting work at Gobindpur, and Basant Rám, Compounder, on hospital duty at Punián, and Ahmad Dín in Shikohpur while on disinfecting work."

I am inclined to agree with Surgeon-Captain James. Not all the medical subordinates have done badly. Some have done well, but the bad bargains have shown up more prominently and thereby the whole get a bad name.

11. Detention Camps at the Beas and at Ludhiana.

These were started to wards the end of April. Mr. Frizelle, Assistant Commissioner, was put in charge of the Beas Camp, and was placed directly under me. The Ludhiána Camp was in charge of the Deputy Commissioner of Ludhiána, though I was directed to inspect it with reference to its connection with the general schemes of plague operations.

The camp at the Beas was constructed partly of "sleepers" and partly of "sirkis," while that at Ludhiána was made of sirkis and thatch. No doubt a "sleeper" camp is best as being less liable to fire, but unless the sleepers are available, as at Khánpur, some other materials must be used.

The camp at the Beas was laid out in regular lines, but this was not possible at Ludhiána, where the ground was more confined and broken up by trees.

At first all passengers from the infected area who came under the term suspicious were detained 7 days; but later on sanction was given for their detention for one day only after thorough disinfection of their clothes in the steam apparatus provided by the railway. This alteration in the rules made the procedure much simpler, and I think the one day's detention is as good a safeguard as the longer one, as by it many more persons could be detained and their clothes disinfected, and it is I think this disinfection of clothes which is more necessary.

Mr. Frizelle has sent in a report describing in detail the arrangements and procedure in force at the Beas Camp. This report is full, and may, I think, be of use to any one who has to start a camp at some other station, and I therefore forward it in original, together with the report of the Deputy Commissioner, Ludhiána, regarding the camp there.

12. Notices of officials and non-officials.

In concluding this report, I ask permission to bring to notice the work done by the officers and members of the different establishments employed, and by non-officials.

First there are the Medical officers. There have been 14 of these on duty at one time or another. Under another head I have mentioned their work in connection with disinfection, but it was not only in this connection that their untiring energy and resource have been the means of saving many lives and of lessening the trials and hardships of the poeple. At the commencement of the outbreak we executive officers would have found ourselves again and again in difficulties if we had not had the advice of the Medical officers to rely on. I know I found this myself at Garhshankar, but had Dr. Datta to help me, and it was the same in Jullundur, where the executive officers were fortunate in having Dr. James. From amongst a body of men who have all done well, I hardly like to pick out any one of them as having excelled the others; but I believe I shall not go wrong in bringing to more prominent notice the work done by Surgeon-Captain James. He is the one officer who has remained on from the beginning of the outbreak in October to the end. He had to decide what should be done and in a great measure teach us how to do it, and has himself set an example by his energy and perseverance. He has often by his tact smoothed over difficulties between the executive and Medical officers, and by his kindness and gentle treatment has won the confidence of the people to an extent which it is seldom won by any European.

There have been 18 Assistant Commissioners and one Extra Assistant Commissioner on duty at one time or another.

Mr. Leslie Jones was the first sent to take charge of the first village in October last and remained on till early in May. He had to start the operations against a good deal of opposition. He had a weak staff to work with, few Police, and supplies were hard to get; but he was never at loss and eventually overcame all his difficulties, and whatever has been done since has been on the lines started by him. At the end of April he was transferred for a short time to Garhshankar, where difficulties had arisen, and it is greatly due to him that things settled down so quickly there.

Mr. Butler held independent charge of the Nawashahr group, and after the Kariha obstruction fell through, every thing went well there. Mr. Butler never spares himself with the result that he has had to leave just before the end.

Mr. Gracey has held charge of the Banga group, and Mr. Langley of the Garhshankar group, since early in May. Both have shown themselves reliable officers. The other Assistant and Extra Assistant Commissioners have been either in plague villages under one of the above officers or on observation duty, and I need only say that all of them have done their work well and ungrudgingly.

There have been altogether two District Superintendents of Police and six Assistant District Superintendents of Police on duty. The former, Messrs. Turnbull and Rundle, came only in May last, and on them has fallen the burden of re-arranging the cordons so as to get men of one district together, in distributing arrears of pay which gave a good deal of trouble, in arranging for shops for the Banga group, and shelters for the sentries, and finally in drafting the Police back to the districts, and in all this Mr. Turnbull's experience and Mr. Rundle's powers of organisation have been of great use. Credit is due to the young Police officers, none of whom had more than three years' service, and some had only six months, who had the control of the Police from the beginning, till in April they had under them 3,000 men.

All the European officers mentioned above generally have had to undergo much exposure to the heat of the sun, whilst the accommodation available has been cramped and uncomfortable in spite of the large barrack at Banga and the small bungalow at Apra which were run up quickly for the occasion.

There have been eight nurses on duty. They have all had a hard time, living some in native houses or Munsif's Court, but some in thatched huts away near the hospitals in the villages. They have all done well, but I wish to bring to notice Mrs. Pigott and Mrs. Pinson. These were the first nurses to join, and have since the beginning of the outbreak been at work in the hospitals, and have both, Mrs. Pigott in Jullundur and Mrs. Pinson in Garhshankar, by their unshrinking devotion to their work and their kind treatment of the patients, gained the respect of the people. Though they have had to put up with much discomfort, they have never complained or let this interfere with their duty.

The following officials have been well reported of by the officers under whom they served:—

Tahsíldár Sardár Tára Singh.—Mr. Gracey remarks that Sardár Tára Singh did excellent work all through. He has great influence with the people, whose interest he keeps well in mind. He is absolutely above suspicion. I have never heard anything but good about this official.

Náib Tahsíldár Sheikh Mahbúb Bakhsh.—Mr. Gracey remarks that Mahbúb Bakhsh has had very hard work, having to supervise the despatch of all lime and huts, whilst he bore the brunt of the executive work in Banga town. Owing to his being kept on plague duty he has been prevented from going up for his B. A. Examination, and thereby I believe also for the Examination for an Extra Assistant Commissionership.

Náib Tahsíldár Lála Kirpa Rám worked under Mr. Johnston and did well.

Náib Tahsíldár Abdul Satár worked under Mr. Butler, who reports thus of him: "Of his abilities I formed a high opinion. His work was always turned out in first rate style."

Náib Tahsíldár Amr Singh is reported by Mr. Butler as being a loyal and painstaking officer.

Náib Tahsíldár Fazal Muhammad is will reported of. He was prevented by plague operations from appearing in the Tahsíldárs' Examination last April.

Tahsíldár Bakhshi Bhagwán Singh is reported as having done good work, but not so painstaking as some others.

In Garhshankar Mr. Langley reports as follows:—

"Náib Tahsíldár Amír Bakhsh has done very good work. He is a capable man and can get people to do what he wants."

Náib Tahsíldár Fazal Karím worked well both on observation work and in plague villages.

Lála Ganpat Rái did not come under Mr. Langley's notice, as he broke down and had to go on leave; but he did very well in Birámpur last December at the beginning of the outbreak and later at Simal Mazra, and I think has earned his claim to promotion.

The following Tahsíldárs and Náib Tahsíldárs on observation duty have been well reported of :—

Náib Tahsíldár Shankar Dás.
Ditto Jánki Pershád.
Ditto Bhagwán Dás.
Ditto Lála Devi Dás.
Ditto Zain-ul Abdín.
Ditto Ishar Singh.
Ditto Muhammad Mirza.
Ditto Ranjít Gopál.
Ditto Azíz-ur Rahmán.
Ditto Shám Dás.
Ditto Sant Lál.
Ditto Shám Lál.
Ditto Devi Dyál.
Ditto Wadháwa Singh.
Tahsíldár Muhammad Nakki.
Náib Tahsildár Mitha Mal.
Tahsíldár Alla Bakhsh.

Tahsíldár Ghulám Haidar did good work on observation duty,—was later on transferred to the detention camp at Ludhiána.

The following Kánúngos on duty in plague infected villages did good work :—

Dost Muhammad of Gujránwála District. Mr. Gracey remarks that this was one of the best and most reliable officials he had under him.

And of those on observation duty the following have been well reported on :—

Kánúngo Nazír Ahmad of Gurdáspur District.
Ditto Ganda Mal, Amritsar District.
Ditto Bhág Mal, Amritsar District.
Ditto Imám-ud-dín, Ferozepore District.
Ditto Umráo Singh, Gurgaon District.
Ditto Bansi Dhar, Gurgaon District.
Ditto Mustafa Ali, Karnál District.
Ditto Partáb Singh, Umballa District.
Ditto Ghulám Ghous, Gujrát District.
Ditto Chandu Lál, Umballa District.
Ditto Gopál Singh, Lahore District.
Ditto Bahár Shah, Umballa District.
Ditto Atma Rám, Gujrát District.
Ditto Nathu Rám, Amritsar District.
Ditto Hátim Ali, Gujrát District.
Ditto Muhammad Khán, Gujrát District.
Ditto Mangat Rái, Karnál District.

The following Police officials have done well :—

Inspector Muhammad Shah has been present throughout. His duties have been heavy, and he has never shirked them.

Inspector Safdar Jang has also been present throughout and has done well.

Inspector Jalál-ud-dín has had heavy cordon duty, and has always maintained good dicipline.

Deputy Inspector Umar Bakhsh } of Banga Thá The last of these two
Deputy Inspector Muhammad Bakhsh } has had hard work and has always been ready and has consistently done his best throughout.

Deputy Inspector Hans Ráj, Hazára.
Ditto Harphál, Gurdáspur.
Ditto Ali Gauhar, Delhi.
Ditto Muhammad Hayát, Dera Ismail Khan.
Sergeant Ghulám Muhammad, Rohtak.
Ditto Muhammad Umar, Gujrát.
Ditto Prem Chand, Mooltan.
Ditto Muhammad Bakhsh, Phillour.
Ditto Naráin Singh, Jullundur.
Ditto Shah Wali, Bannu.
Ditto Sochet Singh, Gurdáspur.
Ditto Ghulám Mustafa, Gurdáspur.
Ditto Ahmad Khán, Dera Ismail Khán.
Ditto Alla Dád Khán, Gurgaon.

Of the Medical establishment the following have been brought specially to notice :—

Assistant Surgeon Jawáhar Singh. Both Surgeon-Captain Smith and Mr. Butler report well of this man who set an example to all the medical subordinates of good and honest work.

Hospital Assistant Saif-ul-Rahmán did well on disinfecting work, and has been liked by the people.

Hospital Assistant Ganga Bishan has worked well both in hospital and disinfecting.

Hospital Assistant Vaishno Rám is reported as extremely hard working.

Hospital Assistant Nathu Khán did good work of every kind when the Medical staff was short-handed.

Hospital Assistant Amír-ud-dín did good work in the Banga Hospital and in disinfection of camp.

Hospital Assistant Mushtáq Hussain. } These three are all well reported
Ditto Harnám Dás. } of by Mr. Butler as being conspicuous
Ditto Kartár Singh. } by their honesty and hard work.

Hospital Assistant Karam Chand. } These three are all brought to notice
Ditto Mangal Sain. } by Mr. Langley for good work in the
Ditto Giás-ud-dín. } Garhshankar villages.

And regarding Karam Chand Mr. Langley writes :—
" He is a quick, capable man to be depended upon." Karam Chand was by far our Hospital Assistant when Birámpur was first attacked.

Amongst the Compounders the following showed themselves by hard work to be worthy of commendation :—

1. Nand Lál.
2. Imám Ali Shah.
3. Basant Rám.
4. Khuda Bakhsh.
5. Uggar Sain.
6. Nizám-ud-dín.
7. Jai Dyál.
8. Sundar Dás.
9. Barkat Rám.

All the above have been reported by the Assistant Commissioners and Medical officers as having worked well, some of them having been placed in sole charge of large camps or of disinfecting operations and having proved themselves worthy of trust.

Non-officials.—Mr. Butler brings to notice the following non-officials who have worked well and rendered help :—

Umaid Ali Khán, Zaildár of Karyám. He has been in constant attendance. He reported plague at Katharon and Banga, and has managed to save his own village from plague by taking precautionary measures to exclude strangers.

Ghulám Muhammad, Lambardár of Karyám, also did well, and at the Bhangal riot acted on the side of Government.

Mr. Butler also brings to notice the following men :—

Pír Bakhsh, Lambardár of Kamam.

Naráin Singh, Lambardár of Katharon.

Partáp Singh, Lambardár of Katharon.

Devi Ditta, Lambardár of Lodipur.

Bulla Rám, Lambardár of Lodipur.

Gopála, Lambardár of Bajon.

And in a secondary note adds the following :—

Jiwe Khán, Lambardár of Kamam.

Báhu Khán, Lambardár of Kamam.

Hákim Khán, Lambardár of Kamam.

Búre Khán, Biswadár of Kamam.

Sondhe Shah, Syad, of Kamam.

Lábu Mal, Sáhukár of Kamam.

Chanda Singh, Lamberdár, Chahlán.

Dalel, Biswadár, Chahlán.

Ghulám Ghous, Lambardár, Karyám.

Ashraf Ali, Lambardár, Karyám.

Umr Bakhsh, Lambardár, Karyám.

I quote Mr. Gracey in full about the men in the Banga "iláka" who are worthy of recognition :—

List of non-officials deserving mention.

1. *Narain Singh*, Lambardár of Khatkar Kalán. At the very outset of the plague operations Naráin Singh used his influence on the side of Government. He persuaded the people of Khatkar Kalán to come out without resistance, and his example has done much to smooth our path in dealing with later villages. He has displayed a keen interest in the search for plague in other villages. His work is the more commendable that he gave his assistance when others were wavering and hesitating. He has been promised a reward by Colonel Massy.

2. *Sunder Dás*, Mahant of Khán Khanán, gave us great assistance in inducing the people to leave their village. When we were unable to get any hospital establishment he came forward and cooked the patients' food with his own hands. Possesses great moral influence in his villages, which he has used entirely in our favor, and has been most untiring in his efforts. Deserves special recognition.

Puran Singh, Lambardár of Mahal Gehla and son of the Zaildár, has also rendered valuable assistance. He gave an immediate report of plague in his village, and has always been ready to give us the best information in his power. Has given us great aid in the disinfection work.

Dasaunda Mal, Hakím at Mokandpur, undertook to treat the sick in his town entirely at his own expense. He gave us valuable assistance in inducing the people to come out into camp, and took an active part in the house-to-house visitation of Mukandpur. Doctor Wilkinson mentions his services very favorably.

Máli and Múla, Lambardárs of Khatkar Kalán. These with Naráin Singh set an excellent example and gave us every assistance, and together with him have already been promised some reward by the Commissioner (Colonel Massy).

Basant Singh, Lambardár of Banga. This man is conspicuous for his services in obtaining carriage for huts, lime, stores, and so forth. He has worked well under the greatest hardships. He has often gone with carts through heavy rain, and has on occasions been up all night loading huts. His efforts have been untiring, and his services deserve more than ordinary recognition.

Bishen Dás, President of Banga Municipality, took a leading part in the houses to-house visitation some time before the actual outbreak of plague in his town, and has continued to give us every assistance in his power.

Jaimal Singh, Zaildár of Mahal Gehla, is a man of great personal influence in the village, noted for badmáshes. He has great control over the people, and he has used it entirely in our service. When aiding in the disinfecting work, he unfortunately contracted the disease, and in spite of his position insisted on being treated in hospital as an ordinary patient. He refused a separate hut.

Utam Singh, Sofedposh of Mahal Gehla, also deserves special mention. Though unfortunately it was his daughter-in-law who brought the disease to the village, yet he has always acted in a straightforward manner and has done much in a quiet way to render us assistance. He was subsequently himself attacked by plague when helping in the disinfection of the town.

Umr Singh, Lambardár of Pharála, has helped us to deal with a large, and what might have been a difficult, village. He seems to have the people well in hand and has been loyal.

Sardár Sunder Singh of Baharwál is a man of property and position, and has taken an active part in the plague operations in his village. He reported the recrudescence if plague in his village with the utmost promptitude.

Gulább Singh, Lambardár of Mehrámpur, has set an excellent example to all the lambardárs of the district. Though his village was uninfected, he and his fellow villagers came voluntarily into camp, and thereby probably saved it from being attacked.

Lál Singh, Zaildár of Pharála, has helped us in many ways at Pharála. He has used his influence in inducing the people to carry out our measures.

Dunna Singh, Lambardár of Tahirpur, gave very early information of the existence of plague in his village. He gave great assistance in bringing out the villagers into camp and is deserving of special mention.

Ganesha Singh, Lambardár of Khánpur, gave first information of plague in his village and was particularly useful to Dr. Wilkinson throughout the plague operations.

Sikander Khán, Zaildar of Heeon. Though an old man, he has been energetic in tracing plague, and gave prompt information of the outbreak in his own village, and by his personal influence enabled us to turn out a large village of Rájpút Muhammadans without any difficulty.

The following also have done well :—

Deva Singh, *Rám Singh*, *Abu Shah* } of Sirhál Qázián did very good work in their village.

Deva Singh gave much assistance in the disinfecting of the houses as did also *Rám Singh*. *Qázi Abu Shah* was of great service in bringing the Qázis out into camp, and later on in providing carts for carriage of huts.

Bishamber Dás of Banga, a rich Sáhúkár in Banga. He was the first to distribute relief voluntarily, and he has since continued to give his assistance to Government when occasion arose.

Mirán Bakhsh, *Gopál Singh* } of Banga. *Gopál Singh* set the people of Banga a good example in coming out voluntarily into camp. *Mirán Bakhsh* was the first to give information of plague in Banga. He incurred some odium thereby, but he has continued to help us.

Jaidu Mal of Mukandpur is a leading Sáhúkár in the town of some influence. This town gave us no trouble whatever, showing the cases at once, and coming out into camp readily. Mukandpur is an important town and a large business centre. Its readiness to leave its houses is therefore the more commendable, and we must put this down in large measure to the attitude of the leading men.

Ghulam Ghaus, Lambardár of Gunachour, gave a good deal of assistance after the village came out and was very quick to report cases in all the camps.

Sher Jang Khán, Lambardár, } of Bhaura, gave a good deal of help all through, both in bringing out the people and in the disinfection work.
Muhammad Bakhsh, Sofedposh, }

In Garhshankar Mr. Langley brings to notice :—

Sapuran Singh of Hájipur.

Vazira of Hájipur.

I would add to these Sohne Khán. Sohne Khan, Lambardár of Birámpur. This man was the first to come over to our side when Birámpur was hesitating about coming out.

Imám Bakhsh, Zaildár of Garhi. This man did good work in Birámpur, but failed us at Garhshankar. I think he is entitled to some recognition for Birámpur.

Khem Singh, Zaildár of Padrsna. I found always ready to help.

With respect to all these non-officials I would respectfully suggest that some notice in the way of bestowal of "khillats" or "sanads" be taken of their good work.

SIMLA : } E. INGLIS, MAJOR,
The 13th July 1898. } *Deputy Commissioner,*
On Special Duty.

No. 14, dated Beas, 30th June 1898.

From—Lieutenant J FRIZELLE, Assistant Commissioner, in charge Detention, Camp, Beas.

To—The Deputy Commissioner on Special Duty, Phagwára.

WITH reference to your No. 1524, dated Phagwára, 26th June 1898, calling for a report in connection with the detention camp at Beas, I have the honor to report as follows.

In accordance with instructions received from the Commissioner and Superintendent, Lahore Division, I left Amritsar on the 26th April, arriving at Beas on the afternoon of the same day. Previous to my departure, I had been informed by the Deputy Commissioner, Amritsar that a detention camp was being built at Beas, with accommodation for 300 persons. This was to consist of huts, built of old disused sleepers, which the Railway authorities were supplying at a charge of 4 annas each ; and the construction of the camp was to be on the plan employed last year at Khánpur by Lieutenant Crosthwaite. The camp was to consist of three parts,—one for bachelors, another for females, and the third for families. The observation camp had been already constructed.

Construction detension camp.

On arrival at Beas I found that nothing had been done with regard to the actual construction of the detention camp owing to the inability of the Railway authorities to supply the sleepers required. Merely the tracing of the camp had been completed. I proceeded with the digging operations at once, and erected the sleepers as they arrived. By the 3rd of May, or a week after my arrival, only 500 had been supplied. Previously to this I had reported to you the seeming impossibility of obtaining the large number of sleepers required—it had been estimated by the District Board, Amritsar, who had charge of the construction of the camp, that 7,000 sleepers would be necessary—and sanction was given by the Deputy Commissioner, Amritsar, to my suggestion, that construction with sleepers should be discontinued and "sirki" huts erected instead. This sanction was obtained on the 3rd May, and I at once started to erect the "sirkhi" huts. A few days afterwards 500 more sleepers arrived, and with these I completed the first row of huts, which I caused to be fenced off by a "sirki" screen, and set apart for the use of women. These huts were, built on Lieutenant Crosthwaite's plan, and the roofs were covered with "sirkhána" grass and "leeped" with mud. The next row of huts, which was also screened off for the use of families, and the remaining five rows for bachelors were built of "sirki." These rows are built in "echelon" 200 feet long, with a space of 30 feet between each. Each row is divided into five "kothris" which in the "sirki" huts are each 40 feet long and 10 feet broad. The dimensions of each "kothri" in the sleeper huts are 40 feet long and 8 feet broad. The "sirki" huts have the dvantage of 2 feet in breadth. Accommodation for 8 persons is allowed in each "kothri and it is ample.

The observation camp I found on my arrival already constructed. This consisted
Construction observation camp. of "sirki" huts comprising—

Two hospital sheds.
An observation shed.
An isolation shed for friends of patients not in actual attendance on them.
A quarantine shed for convalescents.
Quarters for menial servants.
Latrines.

I had a hut made of sleepers constructed to be used as a cooking house. Dimensions as under :—

Height 10 feet, length 12 feet, breadth 8 feet.

This was a precaution against fire, as cooking in the "sirki" huts was most dangerous and would not be practicable outside the huts in rainy or inclement weather.

There was an apparatus for boiling clothes of patients very simple in design, which though I had no opportunity of testing its efficacy, I should think very excellent.

The cost of construction for these two camps is about 3,000 rupees in all. I have
Cost of construction. asked for particulars from Amritsar, but I have not yet received them.

Lieutenant Crosthwaite in his report claims less expense in construction as one of the advantages of sleeper huts. But I doubt whether this is so. I should estimate that at least 10,000 sleepers would be necessary for the construction of both camps if not many more, as, judging from the 1,000 that were supplied to me, many of them are useless. If 10,000 sleepers were used, these would alone cost Rs. 2,500, at the rate of 4 annas per sleeper, without entering into any other details.

The advantages "sirki" huts, I consider, have over sleeper huts areas follows :—

Advantages and disadvantages of "sirki" huts.

(i) Cooler, roomier and better ventilated.
(ii) Less liable to leakage in heavy rain.
(iii) The material is more easily procurable.

They labour under the disadvantage of being more liable to fire and also of requiring a certain amount of skilled labor in their construction. Under the conditions that obtained here, they were more quickly erected than sleepers would have been.

Besides the actual detention lines I had others constructed. A row 20 feet long and
Police lines. 10 feet broad, divided into three kothris for the use of the Police force at my disposal, which, as it only consisted of two sergeants and twenty constables, I found sufficent. There was a "chabil" for drinking purposes for the use of Hindus and another shed for Mussalmáns. There were also huts for menials, and others for shelter for the Police sentries on duty. These are all close to, but apart from the detention lines.

The latrines I had constructed about 200 yards from the camp, on the leeward side.
Latrines. These consist of a long trench, 6 inches deep, and the width of a "khai" in width. The trench is 50 feet in length, and partitioned off at every 2 feet, and the whole enclosed by a high screen. The trench as used is filled up with dry earth and sprinkled with carbolic powder. When the trench is full, a new one is dug, the screens being shifted at the same time. There is another latrine for women, equidistant from the camp and from the men's latrines ; it is similar to the men's except that it is not partitioned off at every 2 feet. This detail was omitted at the women's own request.

I had a party of one sergeant and four men placed at my disposal on the 30th April ;
Police arrangements. these were followed by a further reinforcement of one sergeant and sixteen men on the 8th May, making a total of two sergeants and twenty men, who were disposed of as follows :—

Sentries—Two on detention lines (day and night). Two on wells (day).

Two constables are told off to meet each train on arrival at the platform and act as an escort for detained passengers. After inspection and disinfection of clothing, &c., they accompany passengers to the river about ½ mile distant from the camp, while they bathe. After bathing they escort them back to the lines.

Two constables are also told off to act as a water-guard for passengers wishing to bathe at the river during the period of their detention.

The duties of the sentries on the wells are to see that only the iron bucket and the mushk supplied for the purpose are used for drawing water, and to prevent people from bathing at the well.

The general duties of the Police are to assist in maintaining order, preventing the commissions of nuisances, &c., in the camp—duties which they have had no difficulty in carrying out, as all the passengers detained have been well behaved and contented. A few have, however, managed to elude their vigilance and escape from the camp. I found it impossible to catch them, as they were beggars or vagrants, and their supposed destination was no guide. There is also a sentry, day and night, on the observation camp. His duties are to see that cooking is alone carried out in the cooking-house, and to allow no fires in or near the huts; to keep the camp clear of unauthorized persons; and to generally maintain order when necessary. Apart from the necessity of these duties, it was found expedient to have a sentry in this camp, because fever patients who were detained by the Medical officer for observation became impatient at their detention and attempted to break out of camp.

Method of detention.

On arrival of each up-train the Assistant Surgeon and Female Hospital Assistant are present on the platform. First and second class carriages are first examined, then the inspection of passengers from the suspected area takes place, and is conducted on the platform. After this the passengers in the remaining carriages are examined in the carriages. Any persons other than 1st and 2nd class passengers who are suffering from fever, or whom, owing to their sick appearance, it seems advisable to detain, are detained and taken to the observation camp, where there are huts ready for their use. Their companions, if any, are allowed to remain with them, and they also have separate huts As soon as fever, &c., has abated and no suspicious symptoms appear, these passengers are subsequently allowed to proceed on their journey.

Examination of passengers from suspected area.

The examination of passengers from the suspected area, who are conveyed in a special carriage and provided with a specially punched ticket, takes place on the railway platform. Women who object to being examined on the platform are examined behind a "kanát" erected for the purpose. But this is not done, except at their own request, and no female passenger is examined behind the "kanát" against her will.

Examination of passengers from suspected area.

Those passengers from the suspected area who are detained are detained for any one of the following reasons:—

(i) Those who seem to be suspicious by reason of their appearance.
(ii) The dirty condition of their clothes.
(iii) The fact that they are travelling in gangs or belong to classes likely to spread the disease.
(iv) Those who cannot be traced on arrival at their destination.
(v) Those who cannot be depended on to give information, should plague occur among them after arrival at their destination.

This gives the Medical officer and myself a wide discretion, and any persons falling under this category are detained. I attend at the platform on the arrival of the trains accompanied by my clerk with a register in which names, numbers of tickets and other details of passengers detained are entered. The persons detained are taken to the detention lines by the Police. The remaining passengers remain on the platform until the examination of the whole train is completed, when they are allowed to go into any carriage they like. The special carriage is supposed to be cut off at Beas, but this is not done.

Disinfection.

A passenger register is kept showing the number of ticket, name of passenger, father's name, caste, residence, destination, and date of detention and final discharge. The number of passengers detained daily varies largely. The number of passengers who have travelled from the suspected area between the dates of 1st May and 29th June is 20,735, of whom 4,080 are women, which gives an average of 345 persons travelling daily from the infected area. Of this total, up to date, 1,331 have been detained.

When the detention for seven days was in force, it was possible to detain only a few daily, but now that passengers are detained only 24 hours, I am enabled to detain a much larger number.

Between the 13th May (when the detention was first started) and the 24th June (when the detention for seven days commenced) the number of passengers detained was 916, of whom 33 were women and children. From the 24th June to date 415 have been detained, of whom 20 are women and children, making the total of 1,331 above mentioned.

The total number of passengers between 26th April and 30th June detained in the observation camp for purposes of observation is as follows:—

Fever cases	...	...	...	39
Phthisis	...	...	...	1
			Total ...	40

After being kept under observation for a few days, and no symptoms suspicious of plague having shown themselves, they were discharged.

Disinfection is carried out twice a day, after the arrival of the 9-57 in the morning and the 17-57 in the evening. Persons detained in trains previous to the 9-57 are disinfected at the same time as passengers detained in the 9-57; those detained subsequently are disinfected on the arrival of the 17-57.

It will be seen that some passengers have accordingly to be kept in camp before they can be disinfected, but they are kept apart from those who have been already disinfected. Male passengers are escorted to the lines by the Police by one route, the female Hospital Assistant accompanying the females by another.

The method of disinfection is as follows:—Clothes, bedding and bundles of arrivals are opened out for inspection. Clothes, which are so filthy and useless as not to need disinfection, are burnt at once in my presence, and compensation either in money or kind is awarded to the owner. The remaining bundles, &c., are then disinfected. These are laid out lengthwise and tied in the middle with a tin label stamped with a number attached. The owner keeps the duplicate. This for purposes of identification. This was not found necessary during the period detention was carried on for seven days, as so few passengers were detained daily that identification of clothing after disinfection was not difficult. But now that detention is for only 24 hours, this plan has been found useful. Before taking off their clothing, passengers are supplied with others—langochás, dhotís and kachhs for those who want them, and chadars and kurtás for the women. The disrobing of the male passengers is carried out at the disinfection tank; that of the women in their quarters, their clothes being brought to the tank by the dháí. Passengers then proceed to bathe in the river about ½ mile distant,—the men under a Police escort, the women escorted by the dháí. This is done at different times. After bathing they return to the lines, where their own clothes after being steamed are returned to them. The clothes supplied to them during this process are also disinfected twice daily. No objections have been made by the women to have their clothing steamed in the boiler, but in case of objections being made the female Hospital Assistant is supplied with a corrosive sublimate solution in which to soak the clothes. Clothing subsequently hung up to dry. No necessity has arisen as yet to do this.

Any persons unwilling to bathe in the river are not forced to do so, and water is supplied them; but bathing at the wells is prohibited. Passengers as a rule prefer to keep their money and valuables (if any) in their own possession, but they are told that they can give them up to safe keeping if they so like.

The steam boiler employed is of a special pattern supplied by the Railway authorities. It has a very high pressure of 51 lbs. to the square inch, which would, I think, effectively destroy the plague bacillus.

Stone coal is used and a large quantity is expended daily—8 maunds. The boiling apparatus is in use six hours daily, as it requires two hours to get steam up and another hour to steam the clothing, disinfection being carried out twice a day. The men employed are supplied by the railway.

Compensation.

A compensation register is kept for the award of compensation to owners of clothes, &c., destroyed. This is given to them at once either in cash or kind, and the amount awarded entered in the register. No objection was made to any of my awards, and the owners appeared pleased to receive anything in exchange for the filthy articles destroyed.

Clothing.

The men's clothing is made up of "khadar" at 12 yards per rupee and "márkín" at 7 yards the rupee. The women's of "márkín" at the same price. "Sussi" is also kept in store, but is not used. "Kachhs" are made up at the cost of 4 annas each. "Dhotís" and "langochás" require no making. I have had twenty kachhs and 50 kurtás and 50 chadars made up. Each chadar costs 11 annas and each kurta 6 annas to make up. These I have found more than sufficient, langochás being all the men require as a rule, only Nának Panth Sikhs requiring the kachh.

Two chadars and a kurta are supplied to each woman. None of them ask for pyjamas. The small children are always naked. Pyjamas are kept in stock for those requiring them.

One bania and two cooks are supplied for the camp. One cook being found sufficient for Hindús and Muhammadans alike, another cook for Brahmans and orthodox Hindús. The cooking wages of each cook are 3 pies for every seer of atta cooked. When detention for seven days was in force, it was found necessary to supply food at the public expense to a large number of persons. The majority of passengers detained are of the lowest classes, being principally "Chamárs" and "Churás," and very often penniless. Others again with only one or two rupees, who had tickets for distant stations, and who, though they had sufficient funds to pay for their food while in camp, would have been landed at their destination penniless. These were fed at the public expense.

Food-supply.

The food found sufficient for each person is as follows :—

1 seer ata at 1 anna 3 pies.

1½ tolas ghee at 3 pies.

2 chittáks dál at 3 pies.

There was also a cooking charge as mentioned before at 3 pies for each seer of ata cooked. This makes a cost of 2 annas a head per diem. This, though it seems a small quantity, was found more than sufficient, and I have received no complaints on this score.

Altogether 949 men, women and children were supplied with food free. The total cost is as under :—

	Rs.	A.	P.
For May ...	86	11	3
For June ...	249	4	2
making a total of ...	335	15	5

Since the detention of a period of 24 hours commenced it has not been necessary to supply passengers with food. The food supplied by the bania is inspected daily by the Medical officer and myself. On one occasion only was it found bad, and the bania was fined 8 annas. He had been warned previously that he would be liable to fine if the food was bad.

A "nirkh" of food is obtained from the Tahsíldár, Amritsar, weekly and posted on the walls of the serai where the cooking is done. No cooking is allowed in the camp owing to the danger of fire, and persons who desire to cook their own food have to do so at the serai, which, as the serai is only 100 yards distant from the camp, entails no great hardship. For the observation camp a cook is employed at Rs. 6 per mensem, and a cooking shed, made of sleepers, has been erected for the purpose.

Meat and vegetables are obtainable in the bazár, but of a very inferior quality, for those desiring them; but no one has asked for them, as they have been mostly Hindús and non-meat-eating Muhammadans.

A register is kept up in which are entered the numbers of persons supplied daily with food. I used myself to attend the distribution of food and check the numbers and hear complaints, if any, about the food supplied. This distribution of food takes place at the serai; in the case of families, the women are supplied with food by their men-folk. Women detained by themselves have their food taken to them by the dháí. No objection has been made to this procedure.

Liquor was not allowed. Opium was at first allowed, but I was besieged with so many demands that I had to discontinue the practice. Nor was it reasonable to supply tobacco to all those who demanded it.

I experienced great difficulty in keeping many of the servants employed owing to their fear of being attacked by plague. The lampman and two bhistís were the first to go, and for a long time I could get no one in their places. None would come from Amritsar, but Zaildár Gurdit Singh of Chime Bath procured me some locally. These went off too, but I have had no difficulty since.

Establishment, menial and subrodinate.

The following is the establishment :—

DETENTION CAMP.

Men's line.	*No.*	*Rate of pay for each per mensem.* Rs.
Bhistís (Hindu)	2	6
Do. (Muhammadan)	3	6
Lampman...	1	6
Sweepers	4	6
Women's line.		
Dháí	1	25
Dháí	1	8
Sweeper woman	1	6

The dháís would also be employed in the observation camp for tending female patients.

OBSERVATION CAMP.

	No.	*Rate of pay per mensem.* Rs.
Cook	1	6
Chaukídár	1	6

The bhistís and sweepers employed in the detention camp are also employed in this camp, as the work in both camps is not too much for them to do. And, if necessary, others can be entertained. It has not been necessary to employ a water-carrier for the women. When they require water, they prefer to fetch it themselves from either of the huts erected for drinking purposes.

There are two wells, one near each camp. These on my arrival I had cleaned out by tobas. The amount of filth and decayed matter, as well as hundreds of broken water-pots that were extracted from their depths, was astonishing. After they had been thoroughly cleared out I had them disinfected with permanganate of potash, and no one was allowed to use the water for two days. A sentry was placed over each well, and it was one of his duties to see that only the iron bucket supplied for Hindús and the 'mushk' for Muhammadans were used. I had a small windlass erected at the wells to facilitate the drawing of water. People were not allowed to draw water indiscriminately with their own vessels. Water was supplied to them in the lines by the bhistís. Two "gharvies" or brass vessels and two brass cups were supplied in the "chhabíl" for Hindús and tin ones for Muhammadans. There were also two "tutís" or wooden stand-pipes. The total cost of these was about Rs. 4.

No cooking was allowed in or near the huts owing to the danger of fire. In front of each kothri are placed one or more "gharras" constantly kept filled with water. There is no fire-engine in the station, nor are buckets obtainable.

Fire arrangements.

Only once did a fire occur. This was in the observation camp and was occasioned by the carelessness of a sweeper (subsequently fined and discharged) by leaving his hookah burning in his hut. There was a high wind blowing at the time, and in a short time three sheds were burnt to the ground. But I had no difficulty in putting out the fire and saving the remainder. This occurred on the 28th May.

Very strict precautions have to be taken, as the "sirki" huts are veay liable to fire and very inflammable.

The lighting is done by means of road lamps which I obtained from the Amritsar Municipality. Twelve I found sufficient for the detention camp, and one is all that is required in the observation camp. A lamp man paid at the rate of Rs. 6 a month is employed to look after them.

Lighting.

These I found it cheaper to buy outright. I had them made in Amritsar at the rate of 10 annas 3 pies a charpoy. I could not get them on hire under 6 pies for the 24 hours. It was impossible to buy any here, and until their arrival from Amritsar I supplied each passenger with matting 3½ yards long and 1½ yards broad. The cost of this was 4 annas. One hundred pieces of this matting were purchased at a cost of Rs. 25. The same number of charpoys were sufficient.

Charpoys.

OBSERVATION CAMP.

Cost of construction of both camps.

	Rs.	A.	P.
11 Sheds near railway station	320	6	3
Three of above sheds burnt down and rebuilt ...	102	2	0
Total ...	422	8	3

Detail of 11 sheds—

Two hospital sheds, 1 observation shed, 1 isolation shed, 1 quarantine shed, 4 menial sheds and 2 privy sheds.

DETENTION CAMP.

	Rs.	A.	P.
19 Sheds near serai	2,931	11	9

Detail of 19 sheds—

Seven rows of quarantine sheds, 1 police barrack, 2 sentry sheds, 2 sweepers huts, 2 privy sheds, 1 cooking shed (included in this by mistake and ought to have been included in observation camp), 2 sheds or rather screens for females and families in detention camp and 1 kanát on railway station platform.

Total cost Rs. 3,354-4-0.

Detention.

The detention was throughout carried out as ordered. Passengers from Ludhiána and Jullundur and intermediate stations are locked up in a special carriage. Three policemen (not among those under my charge) accompany the train to see that passengers do not attempt to escape, and to see that at the various stations they enter into the special carriage only. When detention was first started this was not always done, and on occasions occurring I reported the matter to you. Passengers from the suspected area are provided with specially punched tickets (this was not always done at first, and the instances occurring were brought to your notice). After each person is inspected on the platform, and if he be not detained, his ticket is stamped with a stamp supplied for the purpose on which is shown the name of the station and the date of the inspection. This is to ensure that no passenger from the suspected area has escaped observation. Those who are detained have their tickets similarly stamped when allowed to proceed on their journey. This stamp bears the date of their discharge, and acts as the fresh issue of a ticket.

When the 7 days' detention was in force passengers were allowed to continue their journey by the 9-57 A. M. train irrespective of the time the arrival of the train in which they were stopped. Accordingly some passengers were detained 7½ days—a few hours longer than necessary—but unnecessary confusion in the manner of keeping up the register was avoided. Now that 24 hours' detention is being carried out passengers are discharged by the same train as they were detained in on the day following their detention.

I heard several reports that passengers from suspected areas were eluding the precautions being taken, and were travelling by road to Butári and Jandiála,* there entraining for their destination. But though I made investigations personally and through the Police, I was unable to ascertain the truth or otherwise of these reports.

* The next two stations beyond Beas.

People were said to be crossing the river in large numbers at the various ferries, but in the absence of any examining post there, it was impossible to do anything.

No. 1490, dated 2nd July 1898.

From—W. A. LEROSSIGNOL, Esquire, Deputy Commissioner, Ludhiána,

To—MAJOR E. INGLIS, Deputy Commissioner, on Special Plague Duty, Phagwára.

IN compliance with your No. 1523, dated 26th ultimo, I have the honor to reply *seriatim* to each query asked in your letter with regard to the detention camp at Ludhiána:—

1. HOW DETENTION HAS BEEN CARRIED OUT.

Inspection.

2. Assistant Surgeon Nand Lál and female Hospital Assistant Hydari Begam, who were appointed Inspecting Medical Officers at Ludhiána by Government, attended at the railway station a few minutes before the arrival of each down-train.

3. All the passengers from the stations between Jullundur and Ludhiána were provided by the Railway Department with tickets with a circular punch mark with a view to facilitate inspection. All such passengers, whether travelling in special 3rd class carriages attached to each train or found travelling in any other carriage, were carefully examined on the platform, and those with suspicious symptoms or extra dirty clothes were detained and sent to the detention camp.

4. Passengers from other stations also who were deemed *primâ facie* suspicious were examined on the platform.

5. All passengers with punched tickets were paraded in two rows on the platform. In the first line stood all the passengers proceeding beyond Ludhiána. They were examined first and allowed to continue their journey if not detainable after their tickets had been stamped with a stamp supplied for the purpose by the Railway Department. In the second row those passengers were made to stand whose destination was Ludhiána.

6. Bundles of clothing in the possession of passengers from the infected area were carefully examined, and whenever they were found to contain extra dirty clothes their owner was sent to the detention camp.

7. A kanát was erected on the platform for the inspection of female passengers but it was very seldom called into requisition.

8. Female passengers were examined by the Female Hospital Assistant in the same manner as the male passengers.

Detention.

9. At the commencement of operations only passengers of category 2 were detained for seven days, but the minimum period of detention was reduced to 24 hours with effect from 22nd June 1898, and all passengers from the infected area not having passes from medical or other authorized officers were detained for 24 hours.

10. Persons suffering from fever were kept in the observation sheds erected for the purpose and allowed to proceed when their temperature returned to the normal. They were discharged after disinfection both of their bodies and clothes.

11. Passengers were always escorted from the station to the detention camp by two or more constables told off for the purpose.

Disinfection.

12. Before the steam boiler for disinfection was ready for use, clothes of passengers were boiled in a strong solution of phenyle (not less than 1 per 100 strength) in large iron caldrons, and passengers themselves were bathed in a weaker solution.

13. Worn out and very dirty clothing were destroyed by fire, and new clothing was supplied to the owners from the Government stock.

14. The following articles were supplied to poor passengers in lieu of dirty clothes destroyed:—

Kurtás	10
Caps	11
Waistcoats	3
Trousers	4
Chádars	3
Langoti	19
Total ...	50

15. Disinfection was always carried on under the supervision of the Medical officer.

16. The disinfecting apparatus supplied by the Railway Department was worked from the 22nd May.

17. Clothes were hung vertically on the bars inside the tank and steam played over them under a pressure of 20 to 35 lbs. per square inch. They were taken out after half an hour and then exposed to the rays of the sun.

18. The passengers in the detention camp were made to bathe daily, and were thoroughly disinfected before being discharged on the termination of the period of their detention.

2. METHOD OF CONSTRUCTION AND ARRANGEMENT OF HUTS.

19. I annex a rough sketch showing the side and position of huts in the detention and observation camps separately.

20. The huts in the detention camp were constructed of bamboos and sirkís covered with a layer of grass one inch in thickness. Eight of these huts were of the flap pattern and six of the flat pattern. The dimensions of the flap pattern huts were 16 × 12 × 12. Each was placed at a distance of about 5 feet from the other. The flat shape measured 12 × 10 × 8.

21. The cost of each hut amounted to Rs. 10 on the average. The female camp was located at a distance of about 120 yards from the male camp. It comprised eight huts enclosed and shut off from the public gaze by a wall of sirkís.

22. Latrines and bathing places were provided in each camp, together with accommodation for the dháí and other servants. In the camp there were two wells for supply of potable and other water, and one Hindu and one Muhammadan water-carriers were employed to supply water to the detenues.

23. The observation camp contained four huts with a large shed for the Medical officer.

3. Cost of huts.

24. The huts cost Rs. 790-5-3 in all, of which Rs. 75 were spent last year.

4. Establishment.

25. The establishment for the detention camp was as follows:—

	Rs.
1 Muharrir	10
1 Watchman	6
1 Cook (Hindu)	7
1 Kahár	6
1 Female Kahár	5
1 Coolie for drawing water for the disinfecting apparatus ...	6
1 Matron	5
2 Beldárs at Rs. 6 each	12
2 Coolies at Rs. 6 each	12
1 Sweeper	6
1 Sweperess	5
Total ...	80

5. Number of persons detained.

26. The annexed statement shows the number of persons detained daily from 19th May to 30th June 1898.

27. The details of the total of 951 persons, exclusive of infants, detained up to 30th June are as follows:—

Males	781
Females	120
Children	50
Total ...	951

28. Most of these were detained on account of their dirty clothing. Only 11 men were detained because of fever.

6. Cost of maintenance.

29. Persons unable to pay for their food were provided for from the camp kitchen. The amount expended on this account has amounted to Rs. 175-10-0. The average cost of maintaining each person per diem was about annas 2.

30. The detention camp was in charge of Munshi Ghulám Hyder, Tahsíldár who, in addition to other duty, now and then attended at the railway station in order to watch the inspection proceedings.

31. There were no complaints of any kind from the public or the passengers.

Reports by Civil Officers in charge of Executive Plague Operations.

APPENDIX A.

Report on Plague Operations in the Banga Circle, by Mr. Gracey, Assistant Commissioner.

Introductory.

1. The plague is generally reported to have been brought to the Punjab by a Brahmin coming from Hardwár. Another rumour says that it was brought from Bombay.

2. The first village attacked was Khatkar Kalán. The operations there adopted. have formed a model for all we have done subsequently. This model has not been closely followed in all details, but the main outlines have remained. There have been the cordon, the segregation of the sick, and the evacuation and disinfection of the village. But some of the details have been different. In the earlier villages, such as Khatkar Kalán and Khán Khanán, the villagers were allowed back in sections after completing the disinfection of their quarters. In later villages the people have returned *en masse*. In some of the earlier villages the inhabitants were allowed to mend their roofs previous to their return, but this has not been since allowed.

Method of operations.

3. The strength of the Police cordon has varied from time to time, but it has always been recognized that the cordon must form our chief means of stopping the spread of plague. At first we had the cordon on the boundary; latterly we kept it within the boundary and contracted it to strengthen it.

Cordons.

4. The whole of the cordon arrangements have been made on the idea that human agency is the chief, though it may not be the only, agency by which plague is spread. This idea has not been shaken by our present experience; for even though it be definitely proved that in one or two cases plague infection has been conveyed by rats, yet these cases are few, and cannot affect the general policy to be adopted.

Reason for cordons.

Surgeon-Captain James is taking up the question of the spread of infection, and I am giving him any information I obtain; but so far as I know he has no definite instance in which a rat has been caught conveying infection from one village to another, and until the case is fully proved in favour of the rate I do not think we are called upon to alter our methods.

I have dealt with the actual working of our plague measures later on, but I wish here to make some remarks on our subordinate staff.

5 The Hospital Assistants and Compounders have been attacked and abused by outsiders all through the operations; they have been accused of bribery, of extortion and ill-treatment; but I am sure that with but few exceptions this abuse has been most undeserved. As a body they have worked splendidly; they are poorly paid, especially the Compounders; and, though open to the most trying temptations, the majority of them have come out with clean hands. In the course of their duties they have been exposed to the risk of dealing with a most infectious disease, and *three* of their number have been attacked, though I am happy to say none ended fatally. They have had to carry on disinfection work through the hottest weather of the year. They have been completely cut off from intercourse with their family and relatives, and have had no temporary respite from their work. They have in most cases been liked by the villagers, and in only one or two instances, where I am persuaded the villagers have been exposed to some malicious influences, have the villagers treated them badly. I doubt whether there is any other class of Indian officials who would have come out of such trying operation with so few failures and so many successes.

The Subordinate Plague Staff—Medical.

6. I have mentioned the Medical subordinates first as they have borne the brunt of the work. Next to them I think the Police have had the most arduous duties. Many of these men have been in camp since the beginning of October. They have had to do sentry duty exposed at one time to cutting winds, at another to the fierce heat of the Indian summer sun. They have had their huts standing in three or four inches of rain; they have not even been supplied with "charpoys;" they have had to put up with many hardships in obtaining food, and during the time of greatest stress had sometimes to be without any shelter whatever. With few exceptions, they have had no leave, and practically all the reward they have got so far has been the slander of biassed tongues accusing them of extortion and tyranny.

Police.

I have spoken to Mr. Rundle, and I am sure there is nothing the men would like so much for a reward as some kind of decoration of merit, and the hardships which they have undergone have been far greater than in many a campaign.

7. Though having no easy task, the Civil staff have not had to undergo the actual hardships of the Medical or Police officers. But their duties have been very arduous. Tahsíldárs and Kánúngo alike have often been out from early morning to late evening travelling from village to

Civil.

village under the burning sun. They have had to put up with the most rough and ready accommodation. The case of Kánúngos has been particularly hard. They have had to do as much work as a Tahsíldár drawing nearly ten times their pay; but, unlike him, they have had no special and no travelling allowance. On the contrary, they have been deprived of the special allowances they would have had in their own districts. They have had to ride their ponies for miles across a country as hard as iron and under a pitiless sun—ponies for which they have been unable to obtain proper food except at the most exorbitant rates, and often not at all. They have had to go close to the centres of infection. The Kánúngos employed on actual plague work in the Banga group have without exception done most excellent work.

Munshís

8. Of the Munshís, Chhajju Rám, clerk to Dr. James, and Bálmokand, clerk to the Assistant Commissioner, have had to work day and night to keep work from falling into arrears.

Attitude of the people.

9. Turning from the staff to the people, we find that in most cases they have submitted willingly to our operations. There has been little active opposition, but at the same time there has been little co-operation. There have been exceptions, and the names of those who have done good work are being submitted separately to Government. But the people on the whole lack initiative, and are too prone to leave everything to the Sirkár. Only three or four villages took any active measures to help their poor, and the suggestion of a subscription had to be made to even these few. The attitude of the people during the greater part of the operations has been one of passive acquiescence, changing to a temporary feeling of half gratitude, half relief, before they sinkback into the slow limited monotony of the village to which they have returned.

10. In writing the following notes on the plague operations I have had to draw largely on other experience for information, as I did not take over charge of the Banga group till the middle of May, and previously had had no reason to expect that it would fall to my lot to submit a report.

Up till the middle of March the head-quarters of the Banga group was outside the cordon, but after that date Banga became infected and was cordoned, and our head-quarters fell inside the cordon. To have the head-quarters inside a cordon is no doubt a great disadvantage, but it seems to me that under the circumstances it could not be avoided There was no other place at all centrally situated which could be chosen as a base. Theoretically, of course, it is advisable to have the base outside the cordon, but in our case it was not practicable.

What seems to me more essential is that each base should be connected with headquarters by telegraph.

The field wire from Phagwára to Banga and from Banga to Garhshankar was found most useful, and the want of a wire to Nawashahr was much felt. The advantages are too obvious to need mentioning.

The daily and weekly returns that had to be sent in from Banga were no slight item in the day's work. Four "Daily Statements" were sent, to the Deputy Commissioner, Jullundur, to the Commissioner. Jullundur, the Junior, Punjab, and to Mr. Butler, Assistant Commissioner, Nawashahr. Three daily telegrams were sent, to Deputy Commissioner, Jullundur, to Commissioner, Jullundur, and Home Secretary; one telegram to Junior Punjab in cases of new villages; two daily diaries,—one to Deputy Commissioner, Jullundur, one to Commissioner, through Major Inglis.

Weekly, two copies of all accounts,—one to Major Inglis, one to Deputy Commissioner, Jullundur. A Weekly Statement has to be sent showing the progress of disinfection, and the Weekly Statement showing the Civil, Medical and Police staff employed.

Fortnightly a copy of acccunts under major heads to the Commissioner, Jullundur.

Monthly a statement of magisterial work to the Deputy Commissioner, Jullundur.

Spread of Plague.

(See separate Table appended.)

Spread of plague.

11. If we look at the way in which plague spread at the beginning, the first thing that we notice is the distance between the infected villages. From Khatkar Kalán we go to Jhander Khurd, then to Khán Khanán, then to Shikohpur, then Sirhál Kázián, and so on. Not until later do

we find that the plague spreads out from village to village, and that we get one broad area of infection. The great rush of new villages took place when the corn was standing. This fact has been made much of to show that the spread was due to rats, but it must also be remembered that it is exactly at this time that persons can most easily break cordon. The fact indeed is as much an argument in favour of persons as it is of rats. But I have left the chief discussion of this point to Dr. James, and have passed on my information to him.

Rats and persons.

Customs likely to spread infection.

12. The custom in this country that all the relatives of a sick or dying person should come and sit round him has had a lot to do with the spread of plague, and it is particularly important that all the relatives of an infected person should be immediately traced and if necessary segregated. The family gatherings at marriages have also been a means of spreading infection, and cordons have been broken by many to attend these gatherings. The outbreak at Pharála may have been due to this cause.

Rewards.

Payment of Rewards.

13. The system of giving rewards for information of plague was introduced early in the year. It was I am sure a very useful aid to the efforts of the observation staff. It is by no means a difficult task to conceal plague from outsiders if all the villagers are bent on doing so, but it is very difficult indeed to conceal it from the villagers themselves, and the offer of Rs. 50 is pretty sure to bring forward some informer. At first we had many cases where villagers reported plague, but there was often a considerable delay in paying the reward, and the idea got abroad that we had no intention of paying any rewards, and we then had to rely on the Inspecting staff alone. But the Inspecting staff clearly cannot work if the villagers are not co-operating. The reward of Rs. 50 is large enough to attract Zaildárs and even Sardárs, and it offers a very keen incentive indeed to the Chaukídár, Patwári or Lambardár.

Causes of delay in evacuation.

14. The chief causes of delay in villages coming out were the wants of huts want of Police, and stress of weather. In several villages only one case appeared at first, and it was not then deemed necessary to turn out the whole village. In most instances, however, the whole village had in the end to come out. A successful attempt was that of Aur, where, strange to say, the infected case was in the very heart of the town.

In Banga and Mokandpur and Jagatpur the plan of evacuation by mohallas was tried; it met with some success, but did not stop the plague from going through. The village of Mokandpur gave the best results.

Causes of delay in return.

15. The chief causes of delay in returning were the continuation of dropping cases, the want of lime and adequate disinfecting staff, and the withdrawal of coolís from disinfecting work for harvest purposes. In Mazári and Mahal Gohla the first disinfection was not satisfactorily done, and had to be done again. In the earlier villages people were allowed to return by sections, but this plan was not continued, the only later instance being that of the Laláris in Banga; their quarter has been walled off from the rest of the town.

HUTS.

A.—Village-made huts.

Huts made by villagers.

1. Huts have in generalbeen supplied ready made to the villagers. At first in the villages of Khatkar Kalán, Jhander Khurd and Khán Khanán the plan was adopted of supplying materials to the villagers, and rewards were given for huts made out of these materials and also for huts made entirely by the villagers from their own materials; but even in these villages a large number of huts made by Government were distributed.

Of these three villages the best huts were made at *Khán Khanán*, as was natural from a village so expert in carpentry. At *Jhander Khurd* and *Khatkar Kalán* the people used the ordinary *sirki* hut, but strengthened it against rain and wind by stacking *makki* stalks against the sides; but these stalks are not at all pleasant when saturated with rain. At *Khán Khanán* the people used *phus* instead, and this makes an admirable thatch. The huts at Khán Khanán were more spacious and stronger. Mr. Jones says in his diary of 1st December 1897: "The people are now ready to go out and build huts for themselves, although we have no material but string to give them; and the zamíndárs of Patti Dalel Singh began constructing huts with ladders, old sticks and new-cut branches. They will thatch and wall them with Indian corn and hemp stalks." The *phús* was collected by Mr. Jones' orders from the public roads round Banga.

2. The pattern of hut made by the villagers was practically the same as that which we have distributed, that is an ordinary double lean-to-hut. Some of the more elaborate huts were of a square shape with more space inside.

Style and pattern.

3. It must not be understood that all or nearly all of the people made their own huts; I should say that only some 10 per cent. did so, and it was only in these earlier villages that so many as that were made. *Sirhál Káziân* may be said to be the last village in which any appreciable number of people made their own huts. In all later villages it is only an isolated hut here and there that has been made by the villagers. A few have been put up in Banga by well-to-do people.

I may note, however, that after the harvest was cut not a few villagers made themselves huts out of the straw, shaping them like the *kups* in which they place their *bhusa*. These afforded a very fair protection against sun and wind.

4. As a general rule it may be said that the village-made huts are stronger and more capacious than the Sarkári hut. Their framework is more substantial, and they are fixed more firmly to the ground. This renders them more wind-proof, but at the same time it makes them more liable to fire, or rather it makes the probable loss much greater if fire breaks out. For if the ordinary Sarkári hut catches fire, the *chappar* can be at once lifted off and the fire beaten out; but the village-made hut cannot be thus readily dismembered, and when once the fire has caught, it usually burns right through the hut and destroys everything in it. This has been the case once or twice in Banga. But, apart from this danger, there is no doubt about the superior comfort and accommodation of the village hut.

Remarks on village-made huts and the system.

5. It is not every one, however, that has the ability or means to make their own huts, and we could never hope to entirely replace the Sarkári hut by the village-made hut. The latter can only be supplementary.

Can only be supplementary.

All the segregation huts must be supplied by us, as must also the bulk of those for the Chamárs, though it is true that in *Khatkar Khurd* some Chamárs made their own huts. We must also supply the old and feeble with huts.

6. The system of paying rewards for good village-made huts was inangurated by Colonel Massy. I have already mentioned it. Two rupees were paid for a hut made wholly by the villagers from their own materials, and one rupee for a hut made from materials supplied by us. No such rewards were paid in any but the earlier villages.

Rewards for huts.

7. In some of the larger villages it was found impossible to supply all the people with Sarkári huts, and during the months of March, April and May, when the great rush of new villages took place, we could not supply even the smaller villages with their full complement of huts. Many of the villagers were driven to make rough shelters for themselves by hanging *chaddars* over poles supported on broken branches with *chárpoys* as walls. These are of very little use as a protection against sun or wind, and cannot be considered in any way satisfactory.

Substitutes for huts.

8. In Mokandpur I understand that some of the more well-to-do townsmen had *katcha* houses made for them in camp, but this is the only village where this plan has been adopted.

Pakka huts.

B.—Sarkári Huts.

9. The materials that are used in the manufac ture of the Sarkári hut are *sirkís* bamboos, *ballás* (long poles) *bán* (rope) and *phús* (thatch). Bamboos, *sirkís* and *bán* were at first sent by the Commissioner and Deputy Commissioner of Jullundur; some were also sent from *Ludhiána*. During the time of the severest strain in *March* and *April* they were got from any source we could find, from Jullundur, Ludhiána or Phagwára. The greater part of our supply has come from the contractor Muhammad Bakhsh of Phagwára.

Materials.

Ballás were obtained from Jullundur, Amritsar and Phagwára.

Phús was at first collected from the roadsides. Some was brought from Garhshankar. For the latter part of the time we have obtained it from Muhammad Bakhsh of Phagwára.

The *sirkís* we have obtained from Jullundur and Phagwára have been of uniformly good size; but some of those that came from Ludhiána have been both smaller and inferior in construction.

The cost of the *sirkís* has been Rs. 37-8-0 per hundred, or six annas per pair.

Bamboos varied from Rs. 5 to Rs. 10 per hundred according to the strength and thickness.

Ballás or poles were about Rs. 2-8-0 to Rs. 3 each; they measure some 15 feet in length and are 8 or 9 inches in diameter.

Bán is about Rs. 2-4-0 per maund.

Phús sells about 2 maunds to the rupee.

The quantities supplied up to June 15th are as under:—

Bamboos 194,829.

Sirkís 53,363 pairs.

Poles 860.

Bán 275 maunds 36 seers.

10. The method of making the ordinary *sirki* hut can be briefly described. The bamboos which form the framework of the hut are first cut by the *Tarkháns* so that they may fit into one another. These bamboos are then arranged by the *Ghurámís* and fitted and bound together by them. The *sirkís* are then brought by the *Beldárs* ready to the *Ghurámís*, who fix them on the framework.

Manufacture.

The *Ghurámís* and *Tarkháns* are skilled labourers; they are paid six annas a day. They are not Government servants

Beldárs are unskilled labourers; their work is chiefly that of coolies; they were in fact originally road coolies and were obtained from the Nawashahr Tahsíl. Their pay is Rs. 5 per month.

All the men working are under the supervision of Imám Bakhsh, Mistri, who came from the Nawashahr Tahsíl and has seen the work from the very beginning.

To build 100 huts of the ordinary kind in one day we should require about 30 *Ghurámís*, 15—25 *Beldárs* and 6 *Tarkháns*.

This staff would make two hospitals in one day.

But different distribution of labour is required for each kind of hut; sometimes *Ghurámís*, sometimes *Tarkháns* and sometimes *Beldárs* predominate. For instance for the *phús*-covered huts which are to be used during the rains the distribution is as under:—

For making four *chappars* there are required—

Ghurámís.	*Beldárs.*	*Tarkháns.*
8	1	1

I have had a list made up showing the relative cost, labour and material of each kind of hut. The list is appended.

11. At first the huts were made close to each village. Whenever a village became infected a number of *Ghurámís*, &c., were sent to the spot and all huts were made there; but when Khatkar Khurd was attacked, the factory was moved to the large open space between that village and the Banga Road, where it has since remained.

Place of manufacture.

All the work is carried on in the open air, some shade from the heat of the sun being afforded by the roadside trees. It would be almost impracticable to carry on the work except in the open air, owing to the size and nature of the materials used. A workshop of sufficient size would be a big undertaking. This is why it is so advisable to have a stock made ready before the rains, for during the rains work will come to a standstill. As the huts are finished they are placed in stacks ready for carting to the villages. The carts are the ordinary village carts, and ten ordinary *chappars* can be carried on one cart.

12. I am sending, herewith, 13 diagrams of huts which have been in use for plague work. It will be seen that they vary very much in cost, and I am of opinion that many of the more expensive styles are quite unnecessary.

Style and pattern of huts.

I will first, however, describe the huts in detail :—

I.—The first hut is the *phús*-covered hut, which seems to me the best for nearly all purposes to which the more elaborate huts have been put.

It is a double lean-to hut 13 feet square, side slope 10 feet and elevation 8 feet. It is closed in back and front, except for one door. The sides and back are thickly covered with *phús*, which affords protection alike against rain and sun. It is portable, easily set up, not liable to be blown down by the wind, and cheap and commodious. It is perhaps too expensive to be supplied to the villagers in any large quantities, but for nearly all other purposes it seems to me the best. Its cost is from Rs. 9-12-0 to Rs. 10-4-0, and it will hold three *chárpoys* comfortably, leaving a good open space in the centre. The side slope is good and throws off the rain easily.

II.—This is the hut we have supplied to the villagers, and it does very well for ordinary dry weather. It gives little or no protection during the rains. It is 10 × 8½ feet square and 7 feet high. Its cost is about Rs. 2-12-0, and it can be made rapidly and in large quantities. It is portable, and it requires no skill to erect. It is not, however, very strong and suffers in a high wind. For the rains a hut of these dimensions will be used, but it will have a roofing of *phús* over it and will be more strongly made.

The villagers themselves used to pile up all their boxes and *gharás* round these huts] and thus strengthen them, while on the *chappar* roofs they stretched *chaddars* and sometimes laid a covering of straw. With the help of these *sirki chappars* many villagers made themselves really good huts, and the greater part of the old and weak were given shelter. Taking into consideration the very large numbers we had to supply during March and April, I do not think this pattern can easily be improved upon.

III.—This pattern has been supplied to the Police as well as pattern No. II. It has only a single roofing of *sirki* and is not so good as pattern No. I. It was not supplied to the reserve camp at Mallupota, but only to men on actual cordon duty. It takes longer to make than No. II, and could not be supplied at the time of greatest strain, that is in March and April.

IV.—This is the pattern of hut which has been supplied to Deputy Inspectors. It is not altogether satisfactory and is always needing repair. A high wind always damages it. It is expensive, and requires skilled labour to erect it. I would abolish this pattern.

V.—This is the " Bania's " hut. It is more expensive than No. I pattern owing to the double roofing of *sirkis*. I would replace it by No. I, which is in every way superior.

VI.—The hospitals at present in use are very expensive, but they are generally approved of by the Medical Officers. Their dimensions are surface 28 feet × 18 feet and height 10 feet. They have not a *phús* covering, but are roofed with a treble thickness of *sirki* and walled with a double thickness. It is this which makes them so expensive. They cost about Rs. 115. The substitution of *phús* would reduce this slightly.

They contain about 8 patients each, and are airy and well ventilated.

Beyond the substitution of *phús* I can see no improvement.

They might perhaps be made stronger and a good quality of rope should be used to fasten the roofs. It has occasionally happened that in a high wind the roof has become loosened and actually displaced. These huts at present cannot be moved more than once; a second move knocks them to pieces and renders them useless.

VII.—This is another very expensive hut, and is really too hot for use in the hot weather. They are, however, much cooler than tents, and if it is necessary to keep nurses out in camp during the hot weather, I do not see what else we can use. They are, however, very costly and cannot well be used again for any other purpose. They have not hitherto been roofed with *phús*, but with a double thickness of *sirki*. This is not adequate protection against the sun, as in the hot weather the sun blazes right through it; otherwise they are strong and well made, and I have no doubt th[at *phús*] would improve them immensely. But they are open to the same objection as t[he hospital] huts, and they are not portable.

VIII.—Patterns 8, 9, 10, 11 I would most certainly discontinue. T[ey are far too] elaborate and costly. I would substitute pattern No. I for all of them, [and the Medical] Officers agree with me that it would be an improvement.

No. VIII costs over Rs. 35 and is not secure, nor does it give sufficient protection against sun and wind.

Nos. 9, 10, 11 are all open to these objections, and it seems an excess of liberality to supply a *bawarchi* with a hut costing Rs. 37-10-0 when a 10-rupee hut would serve his purpose better.

IX.—Patterns Nos. 12 and 13 are those given to Tahsíldárs and Náib Tahsíldárs. They are both very expensive, and I think it would be better to give tents to these officers. I think that this course would be cheaper in the end.

X.—Remarks on the *more expensive huts*.

These large and expensive huts such as are shown in patterns 7, 12 and 13 have some advantages, but they have many disadvantages. Their advantages are commodiousness and a free circulation of air. Their disadvantages are insufficient protection against the sun and rain, expense of construction, lack of portability, liability to damages in high winds. After two moves they are useless. This liability to damage from the wind is a great nuisance, as *Ghurámís* have to be sent to make the repairs, and skilled labour is thus taken away from the important work of making new huts; the nuisance becomes acute when hospitals at remote distances require repairing. I should therefore recommend that where large accommodation is necessary tents should be used, but that where small accommodation will do equally well, huts of pattern No. I should be employed.

This pattern can of course be enlarged at a slight increase in cost.

As regards the medium-size huts, that is Nos. 4, 8, 9, 10, 11, I recommend without any hesitation that they be discontinued. They have practically no advantages and are only a source of trouble. Their high cost carries with it no corresponding benefits. As already stated, I would replace them by pattern No. I.

13. I have made most of my criticisms incidentally. But one or two points still remain to be touched on.

General Remarks.

I have pointed out that the ordinary *chappar* hut can be made by the villagers to afford very fair protection against the sun. In rain, however, they are useless, and in a heavy shower they afford almost no protection. Nor do they give much relief from the wind, and more complaints are heard about the wind than about the sun, and I think rightly. When

Fires.

a strong wind is blowing it is exceedingly difficult for the villagers to kindle a fire for cooking purposes, and if they do succeed the danger from the flying sparks is a very serious one. Especially was this the case in Jagatpur, where the camp was out on a wide sandy *maidán*, where the wind used to come sweeping along and cause great havoc. Mr. Johnston has put the loss in this village alone at nearly Rs. 3,310, there being no less than seven serious fires, nearly all of which may be attributed to this cause. In one fire five huts were burnt down.

There is another minor point which used to provoke many complaints, and that was that the wind spoilt the actual cooking and rendered the food uneatable. I know this to be a perfectly genuine complaint.

I think something might be done, if ever the occasion recurs, in the way of erecting special enclosures in which all cooking should be carried on, and if care were taken to see that castes were separate and that protection from the wind was afforded, it is possible that the people would avail themselves of them. But this is only a suggestion: it was not tried.

I have already commented on the peculiar liability of village-made huts to be destroyed by fire owing to their solid framework.

14. There is no doubt that there have been too many kinds of huts made. The fewer patterns we have the better. There is no need to discri-

car[advantages of few patterns of]

minate between a Hospital Assistant's hut, a Náib Tahsíl-dár's hut, a Deputy Inspector's hut, and so on. These [ca]rious kinds of hut disorganize the general work; for the different kinds require different kinds of labour, and under these conditions it is a difficult matter to prevent a lot of labour standing idle. Moreover, supervision cannot be so good if many kinds of huts have to be inspected. I think three patterns are quite sufficient: they are—pattern No. I, dimensions 13 feet square, pattern No. I, but dimensions those of pattern No. II, and pattern No. VI,

Hospitals. Having these three classes of huts only to construct, we can arrange our gangs of labourers with perfect ease, and there is little danger of waste. Moreover, a much more efficient check over the numbers of *sirkis* used can be maintained. So far I have had the greatast difficulty in exercising any check at all on the consumption. But the chief way in which our labour is disorganized by the present style of hut is the necessity of having to send *Ghurámis* to all quarters of the infected area to mend huts. After a high wind work must come almost to a standstill in the Mistri Khána, or else several officials be put to continued inconvenience through the damage to their huts. This is a very great nuisance.

Old huts.

15. I have endeavoured in general to bring back old huts to Banga; but very few have come back at all serviceable—certainly not more than 7 per cent. or 8 per cent. Of the rest about 50 per cent. could be taken to pieces and their bamboos and *sirkis* used again. The remainder were good for nothing.

I have left out of consideration those that were left lying near the villages as useless; these were taken by the villagers for mending their roofs, and I am now of opinion that more might with advantage have been left for this purpose.

Moving huts from one village to another.

16. In some cases, however, it was found possible to transfer old huts from one village on its return from camp to another village still out in camp. This was done frequently among the earlier villages. I sent a number to Masáni from Sirhál Qázián, and a number went from Gunáchaur to Mukandpur, Gosal and Punián. In other cases, however, the people would have none of them; they were afraid of infection being spread by them. The Medical authorities had previously, however, assured us that there was absolutely no danger. These superstitions did not meet with much encouragement, as we were too hard-pressed for huts to make people two offers of them. Lidhar Kalán, Aujla and Lidhána Jíka would take none of these huts.

Despatch of huts.

17. Huts were consigned either to the Lambardárs or to the Hospital Assistants. In the case of the Police they were sent to the Deputy Inspector or Sergeant in charge. It was not always easy to ensure that a Lambardár would make an equitable distribution of the huts; and frequently on the arrival of the Executive officer the latter would find that the wealthy men and special friends of the Lambardárs had got the lion's share, and the poor and weak for whom the huts were specially intended had been left to shift for themselves. The Executive officers, I am glad to say, never had any pity on such offenders.

In Lail a rumour was prevalent that the Government was charging Rs. 6 for the huts.

CAMPS.

Number of camps.

1. For every village, however small, three camps at least are necessary—

1. The Segregation Camp.
2. The General Health Camp.
3. The Chamár's Camp.

Together with the Segregation Camp must be taken the Hospital. But it is only in small villages, such as Dhahan, Lálpur, Malah, Bisla and the like, that these three camps are sufficient; in the larger villages the number is increased until in Banga we had as many as 18 camps.

Advantages and disadvantages of few camps.

2. In fact the number of camps depends chiefly on the number and character of the population of the village. The advantages of having few camps are that the Medical Officers can visit them more easily and keep them under close supervision; there is less liability of a plague case passing undetected, and the roll-call can be made more easily. But these are advantages which in some cases cannot always be obtained, and in others could only be obtained at the sacrifice of other and more important considerations. It often happens in a large village that the plague appears at first only in one mohalla. The best course then is to arrange the camps according to *mohallás* or *pattis*.

Turning out according to *mohallás*.

This is almost equivalent to segregating the infected *mohalla*; and the other separate *mohallás* have a far better chance of escaping plague than if all the people had been in one large camp. The advantage of this plan was seen very plainly at Sirhál Qázián, where the Qázís' Camp had not one case of plague. Surgeon-Captain Buist has also adopted it with much success in Pharála, and in fact it has been most successful all through.

This plan commends itself not only to the Medical Officer, but also to the Executive officer. With the camps divided according to *mohallás* or *pattis*, the latter is better able to fix the responsibility for any laxness in carrying out orders; and a certain emulation can be stirred up between the heads of the separate camps, which is not without benefit. In the case of a large village it would be extremely difficult to find a place large enough to hold all the people in one camp.

Chamárs' Camp.

3. The Chamárs' Camp must be separate from the others, but there is little or no necessity to have more than one Chamárs' Camp. The above arguments for separating out the different camps do not apply in this case. In a large village it is only necessary that the Chamárs' Camp should occupy a fairly central position.

Grouping according to caste.

4. Beyond separating the Chamárs into a separate camp, it has not been found necessary to make special arrangements for grouping the different castes. It is found that the people do this of their own accord, and no intervention is required here. It not infrequently happens that by allowing the people to form themselves into camps according to *mohallás* or *pattis* we at the same time group them roughly according to castes.

Segregation camp.

5. Only one segregation camp is necessary. In it are all persons either actually infected or suspected of being infected. No separate segregation camps are made or required for different castes or *pattis* or *mohallás*. The hospital is virtually a part of the segregation camp, and people from the segregation camp can go and see their friends in the hospital. The hospital is merely regarded as a large *chappar*, but which is specially convenient for the treatment of patients.

It is not possible to lay down any hard-and-fast rule; for different villages different arrangements are necessary.

Location of Camps.

Choosing of the site.

6. The fixing of the site of the camps has been decided to be primarily a matter for the Medical Officer. It seems to me better that the camp should be fixed by the Medical Officer in consultation with the Executive officer; in cases of difference the opinion of the Medical Officer being final, and this has been the course generally pursued. It is by far the best; I do not think it advisable that the Executive officer should be altogether unconsulted on the point, as he has nearly as much to do with the people when in camp as the Medical Officer.

Qualities of a site.

7. The first thing that has to be looked to in choosing a site for a camp is the water-supply. This is the first essential. For the Chamárs a special well has to be set aside. Until a good well has been found, all other considerations must remain in abeyance.

The other considerations vary in importance with the season of the year. In the cold weather shade is not of much importance, while in summer it is of great moment, and a good camp should have plenty of shade, not only for the villagers themselves, but also for their cattle. In the rains it is of course important to choose an elevated site. A *bágh* is a very fair site for a camp in the hot weather, but it would not do for the cold weather, as by staying in it the people would lose the very benefits of coming out into camp, namely, heat and air.

The character of the soil must not be neglected; a damp soil must be avoided.

The position of a camp once pitched is never changed except on the recommendation of the Medical Officer.

Compensation.

8. In nearly every case the land chosen for the camp has been land either not culturable or likely to lie fallow during the period of encampment. So far I know of no case in which compensation for open land has been awarded or been necessary. It may turn out that compensation will have to be given in cases where camps have been pitched in *bághs* owing to the loss incurred by damage to fruits; but this is not certain.

Laying out of the camps—Hutting.

Laying out.

9. When the sites for the camps have been fixed it is the duty of the Executive officer to bring the people out into camp and to arrange them within their camp. The general rule is to draw up the camp in fairly straight lines not less than twenty paces apart. Fifty paces would be better. The households take up their position along these lines at intervals of not less than fifteen paces. These distances are chosen so as to allow a free circulation of air, and also with a view to minimise the danger from fire. In a crowded camp such as the Mazari Camp an outbreak of fire might easily have burnt down the whole camp. It requires a

little insistence on the part of the Executive officer to keep the people from crowding together, but a lot is done by a good beginning. It is a good thing to have a number of Sarkári *chappars* ready for the village immediately it comes out; they can be set down in given spots, and they serve to fix the outline of the camp. If the village is allowed to become disarranged at the outset, it is a difficult matter re-forming it. There were good camps at *Katt*, Mallupota, Lálpur, Masáni, Malah, Lidhána Jíka, Bhaura and many other villages.

Chappars should be at once sent to the spot.

10. Hospitals and the huts auxiliary to them are supplied on the indent of the Medical Officer, and all huts in the segregation camp are thus supplied. The huts in the other camps are supplied by the Executive Officer as he thinks fit; and the Executive Officer is responsible for the proper distribution of the huts he supplies, and it is his duty to see that all the weak and aged who are unable to supply themselves should be provided with huts, and that the more influential of the villages should not appropriate all the huts to themselves.

Indents for huts.

Communication between the camps.

11. Free communication is allowed in most cases between the people in the infected camp and the patients in hospital. No communication whatever is allowed between the people of the segregation camp and the general bulk of the people in the healthy camp. A bania comes half way to the segregation camp for the purpose of providing supplies, but this is all. Communication between the various health camps is prohibited, but the prohibition is very difficult to enforce; and a considerable amount of intercourse must always take place.

Communication.

12. All ingress into the village site from any camp is strictly forbidden, and this prohibition is, if necessary, enforced by a criminal prosecution. This is done with two objects,—to prevent persons becoming infected by going into the village, and to prevent the removal of property whether by theft or with a view to prevent its being disinfected. It has not always been possible to place a cordon round the village site.

Ingress to the village site.

13. In only one case, that of Banga, has a guard been put on to prevent communication between the segregation and health camps.

Cordons on segregation camp.

In that village there was a sentry always standing to stop all people coming from the health camps or leaving the segregation camp.

Health.

14. The general health of the people in camp was undoubtedly good. In the February rains people suffered, and in the winter the cold killed off some of the cattle. It is far more difficult to choose a site which will keep off the cold than a site which will keep off the heat.

Health.

The duties of Executive officers in connection with village when out in camp.

15. On receiving information that there is a reasonable suspicion of plague in a village, the Assistant Commissioner should issue orders for a police guard to be placed round the village site until the Medical Officer confirms the report. On the report being confirmed he should then issue orders for a police cordon to be thrown round the village area. These duties belong to the Assistant Commissioner in charge of a group of villages. The Assistant Commissioner in actual executive charge of the village then begins his work.

Cordoning the village.

16. The first duty of the Assistant Commissioner who is in charge of an infected village is to remove the people from the village to the camping-grounds chosen by the Medical Officer. He should see that they bring out as much of their property as possible, and that they bring with them supplies for at least two months. He should warn the Lambardárs that when once the people are out in camp they must not go back to the village under any pretext whatever without first obtaining proper permission, and that any one disobeying this warning is liable to a criminal prosecution.

Evacuation of the village.

17. Having got the people out from the village, the Assistant Commissioner should see to the arrangement of the camps. These he must lay out so far as possible in regular order, taking care that there is no overcrowding or straggling. The arrangement of a Cantonment bazár is a very good example to follow. It is his duty to see that a well is set aside for the Chamárs. He should also arrange for the supply of huts to all the people in the hea[illegible] camps, and must give huts for the segregation camp and for the hospitals on the inde[illegible] of the Medical Officer.

Arranging the people in camp.

The requirements of the villages when out in camp.

18. The requirements of the villagers when out in camp are numerous.

The distribution of some relief is perhaps the first thing that is necessary, and it is no easy matter rightly to distinguish when to give relief and when not. It is perhaps better to err on the side of liberality. As a general rule, it may be laid down that relief should be given only in those cases where the need for it is occasioned by the evacuation or by the cordoning of the village. Under the first head will come those whose means of livelihood are shut up in the houses, *e.g.*, telís, lohárs and the like, and those who, like some Chamárs, go from house to house earning their wages. There are also old women who need extra relief to enable them to obtain proper shelter. The cordoning of the village throws a large number of people out of employment. It must be remembered that no village is entirely self-supporting. Every village depends on other villages just as they in some measure depend on it, and there are a certain number of travelling tradesmen and artisans who earn their living by passing from one village to another. These when shut in a cordon are proper subjects for relief. The faqírs and mirásís have also to be given something, though I am very loth to do it. It is a bad thing to encourage these idlers. We cannot very well, however, watch them starve, and as they are no longer able to follow their trade of wandering mendicants, some relief, has to be given them. Old and feeble men and women, as well as orphans, whose poverty is not due to the plague restrictions, are not perhaps strictly entitled to plague relief, but it has been the custom, and rightly so, to give them relief. The need for it, however, is but a poor tribute to the boasted Indian village community,—a community which prides itself on its self-sufficiency, and yet will not raise a finger to shelter the aged or feed the poor.

(*a*) Relief.

Standing in a separate category from the preceding are the people in the segregation camp. It is nearly always necessary to give them relief. They are absolutely isolated from the rest of the village and must perforce depend on Government for their maintenance. It not unfrequently happens that a family of orphans is left in the segregation camp, both father and mother being carried away by the plague. These cases must clearly be given relief.

Some of the smaller villages have no shop. It has been the custom in most of these cases to allow the villagers to go to the police shops. But in the majority of villages there are shop-keepers; they do not as a rule keep up large supplies, and it was necessary for us to arrange for their stocks to be replenished. This was at first done through the Tahsíldár or Kánúngo, who would send the articles from Banga to the boundary where they would be taken over by the shop-keeper under supervision of the Police; but when Banga itself became infected, large supplies could not be obtained from it, and recourse had to be had to Phagwára or Nawashahr. Not infrequently it was possible to arrange for the shop-keepers to obtain supplies from their own friends in other villages; their stores would be delivered to the village in the same way as if they came from Banga, that is, on the cordon. These supplies give a little trouble, but it was always found possible to arrange for them by one of the above ways.

(*b*) Shop supplies.

With one exception, spirits, opium and drugs were also supplied through the agency of Tahsíldár or Kánúngo. Sardár Tára Singh, whose arrangements in these matters were always excellent, used to take the opium personally and dispose of it to the people, and this was found to be the best plan. The exception was in the case of a man called Bhagwán Dás of Sirhal Qázián who held an opium license and who was allowed to travel from one infected village to another. This arrangement saved us a good deal of trouble. He used to come every now and then to have his supply replenished from Banga, where I used to arrange for a chaprási to bring what he wanted. All spiritous liquors were supplied through the agency of Tahsíldárs and Kánúngos.

(*c*) Spirits and drugs.

I will include under this general head of supplies the miscellaneous needs of the people which had to be met. The adjustments of bonds between creditor and debtor had to be arranged. This presented little difficulty when creditor and debtor were both in infected villages separated by no cordon. But if they lived in villages which were divided by a cordon, the matter had to be settled through the agency of Tahsíldár or Kánúngo, who would, if possible, call both debtor and creditor to the boundary and let them adjust the matter personally under his supervision, or, if this was not possible owing to the distance separating the two parties, he would first ascertain what terms both the parties were agreeable to, and would then carry out these terms by himself taking the money between the parties. If no terms could be agreed to, a civil suit had to be filed. One or two difficulties arose in connection with plaints. There was often no proper "plaint paper" obtainable and no arzinavis; and the matter of court-fees was rather troublesome until a licensed vendor was appointed for Banga. All court-fees stamps had to be obtained from Nawashahar.

(*d*) Miscellaneous needs.

Bonds.

The Civil Courts were closed except for the reception of plaints. Plaints had to be received to avoid being barred by limitation. A suggestion was made in my diary that itwould not be a bad thing to allow plaints from the infected area to be received provisionally, say for a term of six months, without any court-fees whatever. At the expiry of that period the plaint, if no suit had been already instituted, would be dismissed in default; but the plaintiff was to have liberty to take up the suit at will before the expiry of that period on payment of the court-fees. The plaint before being sent to the District Judge was to be endorsed with a note by the Assistant Commissioner in charge to the effect that the plaintiff or defendant, as the case might be, was in an infected village. My reason was that though we can arrange in some cases for the plaintiff and defendant to meet and endeavour to settle the case between themselves without resorting to the courts, yet in the majority of cases no such arrangement was practicable; and the plaintiff was of necessity driven into filing a suit and incurring the expense of court-fees in order to save himself being barred by limitation. As between debtor and creditor the burden of the court-fees, though at first borne by the creditor, would in the end of course fall on the debtor, whose debt would thus be increased by no fault of his own. The legal fiction now proposed would obviate this.

Filing of plaints.

The registration of deeds presented little difficulty till the month of May, and then many petitions were sent in asking that arrangement should be made for the registration and renewal of bonds and other deeds. A large *chappar* hut was erected on the Banga road for the Sub-Registrar to carry on his work, and written permits were given to all applicants for registration, allowing them to come and register their deeds. If necessary, a pass was also given. Most of the applications were thus disposed of, but the office had to be closed subsequently owing to an order from the Deputy Commissioner, I understand, that the office cannot be moved in this way without permission from the Inspector-General of Registration.

Registration of deeds.

Besides these legal wants of the people there are many others. In nearly all the villages there was a demand for *jála* for the use of Khanchís. This demand was more or less groundless, and I do not think much attention need be paid to it. The Khanchís can not very well be worked while the people are out in camp, and seeing that in general the cordon is taken off a week after the people return, they may very well be left to arrange for themselves. Only in those villages which, though declared free, were enclosed by a circle of plague-infected villages was it necessary to provide this *jála*. The plan was to let the men go to the Behn Nullah, where the *jála* was obtainable, accompanied either by a chaprási or a constable who saw that they did not mix with the people of other villages The *jála* itself is a kind of river weed, and was only obtainable from the Behn Nullah.

Jála.

There were a few sepoys on leave in the infected villages. Notices had to be sent to their Commanding Officers asking for an extension of leave. A general notice was issued at an early date through the Lieutenant-General of the Punjab to all Commanding Officers requesting them not to give men leave to come to the infected area. This saved a good deal of bother, but was not always complied with.

Sepoys on leave.

Money orders were usually sent through our agency.

Money orders.

Letters were delivered through the Police. All Deputy Inspectors in charge of camps were instructed to receive letters from the villagers and all letters for the villagers were left by the postman at the police camp. It was not advisable to let the dâkwálás go actually into the infected areas. The Hospital Assistant used very often to take the letters to and from the police camp for the villagers.

Letters.

During the cold weather and the February rains we had to distribute blankets for the people and *boris* or sacks for their cattle. Notwithstanding this a large number of cattle died at Khán Khanán, some at Gunachaur and some at Sirhál Qázián.

Sacks and blankets for cattle.

Agricultural needs.

19. I have reserved for a special head the questions of how we meet the agricultural needs of the people. No difficulties were experienced till the time of harvesting. As is well known, the area (*rágba*) of any one village is not owned entirely by the inhabitants of that village. Just as there are people in that village owning land in the other villages so there are people in other villages owning land in the former. The plan of appraising the crops was at first tried. This was by no means satisfactory and would have led to innumerable law suits.

Harvesting difficulties.

Appraisement.

The method adopted was to make an appraisement of the crops entrusting it to the Lambardárs of the village in which the crop was cultivated and to file the "supardnáma" in the tahsíl. The owner

would then be able to recover his grain after the quarantine was removed. Instead of this the plan was adopted of making the people cut their crops which were not in their own villages under the supervision of Tahsíldár or Kánúngo. This was of course rather tedious work for these officers, but this course was by far the best. It then happened that the fields in question lay along the boundary; there was then the very simple device of extending or contracting the cordon so as to include or exclude the fields as the case might be. It was often possible to arrange for friends of the owner to cut the harvest. The great aim was to avoid any plan which would give the parties a pretext for a law suit. It was only in cases where the fields were quite close to a segregation or other camp that the method of appraisment had to be resorted to. The irrigation of the fields presented little difficulty. All persons desiring to water their fields outside the cordon were directed to send in written petitions. An order permitting the applicant to cross the cordon for irrigation purposes only was endorsed on the petition and information sent to the Deputy Inspector in charge of the cordon. This plan worked without hitch. Occasionally it happened that the Police had pitched their camp near a well which was required for irrigation purposes. The best plan then was to fix two or three hours a day during which the zamíndár could have sole use of the well. The want of accommodation for storing grain and protecting it from the wind and rain was at one time the loudest complaint of the people in camp. Like most of their complaints, however, they began to ventilate it a very long time before any real danger arose. And I think that in the end they had little right to complain. The plan generally adopted was to have the outside cattle houses or "hawelís" disinfected first; permission was then given to the people to put their grain there. The people, however, were very selfish about these hawelís, and an owner would never let any one share this protection with him. A large quantity of grain and bhúsa was stored in *kops* or stacks. The people would not bury their grain, partly because they were unused to the custom and partly because there was a danger of white ants. So far as I could discover, no real damage was done to the grain either by rain or wind. Another very prevalent complaint at one time was the demand for a market for the grain. The people were almost as persistent about this as they were about storing their grain. The temporary high prices then ruling were the cause. Arrangements were made with some baniás at Phagwára to take over grain from the cordoned villages at the rate of 20 seers per rupee delivered at the cordon boundary at Bahrám. This offer was not taken up. It had one effect, however; it put a complete stop to all complaints on this head. The people were foolish not to accept, as the price of grain soon fell nearly to what was offered.

A more satisfactory plan.

Another plan.

Irrigation.

Wells at police camps.

Accommodation for storing grain.

Hawelís.

Demand for a market to sell grain.

20. Supplies required by Medical Officers for Hospitals, &c.

Medical supplies for hospitals, &c.

The Assistant Commissioner in charge has to arrange for the supply of milk, wood groceries and the like for the patients in hospital. The Lambardárs supply the milk. There was occasionally a little bother about this supply, and the Lambardárs would say they had no milk to give; this was a favourite way of bothering an unpopular Hospital Assistant; a little schooling of the Lambardárs, however, had the desired result.

Wood.—Not unfrequently had to be sent from Banga.

Miscellaneous supplies were obtained from the local baniás or the police shops The Hospital Assistant had to give a receipt for all articles obtained; it was the duty of the Executive officer to collect these receipts and check them with the bill sent in by the Hospital Assistant. It is very important that all payments should be made direct by the Assistant Commissioner or his subordinates and *not* through the Hospital Assistants. If the latter course is adopted, it furnishes a very ready and obvious means of fraud to the Hospital Assistant or his Compounder. I do not say that this would be taken advantage of, but it is far better to have these men placed beyond suspicion. It is usual also for the Medical Officer to indent on the Executive officer for providing him with menial servants for the hospital.

21. The Assistant Commissioner has to make all payments to hospital menials, disinfecting gangs and the like. The Hospital Assistant or Compounder in charge submits bills through the Medical Officer to the Assistant Commissioner, who should only pay them when countersigned by the Medical Officer. As before mentioned, all payments for miscellaneous stores are made by the Assistant Commissioner. To check these payments a register is kept by the Assistant Commissioner for each village.

Payments.

22. The disinfection of villages is dealt with under a separate head.

Disinfection.

Special duties of Assistant Commissioners, Tahsíldárs and Kánúngos.

23. The relative duties of Assistant Commissioners, Tahsíldárs, and Kánúngos.

The Assistant Commissioner in charge is responsible for his villages. He has to visit them personally and listen to the complaints of the people. A knowledge of Urdu writing is very useful for this work, as a petition may often be disposed of on the spot. He should also be present when unlocked houses have to be opened during the disinfection, and should assess compensation in cases where property has to be destroyed. The Tahsíldárs carries out the directions of the Assistant Commissioner. A good Tahsíldár is of course a great help to the Assistant Commissioners, and his suggestions may be of great value. It is best to leave all questions of crop appraisement to be carried out by him. His opinion is also of great service in enabling the Assistant Commissioner to estimate what relief should be paid. He can do this owing to his more intimate knowledge of the people's habits. The Tahsíldár is also employed to make the actual payment to the disinfecting gang and the like.

The Kánúngo does very similar work to the Tahsíldár. Of course he has not the authority of a Tahsíldár and cannot be entrusted with settling the more serious disputes, but if he is a good man, he can be extremely useful. A good Kánúngo is better than slack Tahsíldár, and I personally have obtained some of my most useful information about internal factions in villages from Kánúngos. This information is of great service, as it enables us to play off one Lambardár against another. In fact, a Kánúngo can do nearly all the work of the Tahsíldár, except that he cannot be employed in the more serious matters.

Disinfection of Banga villages.

24. I can only describe the disinfection of villages as it appears to a lay mind. I have not had myself very much experience in disinfecting work. It is true that at first the Civil Officers did some of the actual supervision of the disinfecting work, but this clearly belongs to the Medical Branch, and after the first two or three villages the Civil Officers ceased to take part in it.

I have got my acquaintance with it by being present while locked houses have been opened, and will roughly describe the disinfection as it appeared to me.

The outer door and surrounding wood work of the house are, before anything else is done, well syringed with phenyle lotion. The lock was then broken and the door thrown open. All the interior of the ante-room or courtyard as the case may be is well syringed with phenyle before any one enters. The coolies then go inside and take out all the property and disinfect it. Meantime other coolies are at work making the *mo-ha* or large hole in the roof. As the property is disinfected it is spread out on the roof and is exposed to the direct rays of the sun. When all the phenyling has been done the house is lime-washed, and after being passed by the Medical Officer, all the property is replaced in the house. When the whole village has been thus disinfected and passed, it is ready for receiving the people back. The time of their admission rests with the Medical Officer, but before being admitted all the persons and property in camp are thoroughly disinfected, the people being bathed in a weak phenyle bath, and the property, clothes, etc., being phenyled and exposed to the sun. The return must be accompanied by auspicious omens. Bisla refused to go back till the moon rose, and had in consequence to wait till nearly midnight.

The presence of the Assistant Commissioner is necessary only when a house has to be opened in the absence of the owner. He should be careful to see that all the tied up corners and knots in pieces of cloth are undone in his presence, as it is in these places that notes and jewels are often hidden. He has at the same time to assess the value of the property destroyed by order of the Medical Officer. It not unseldom happens that valuable property is discovered in houses whose owners are absent. It would be unsafe to leave this property in the house, and it is the Assistant Commissioner's business either to entrust it to the Lambardár or some relative of the owner or to deposit it in the Government Treasury. If the owner is traceable a notice should be sent to him at once enquiring what he wishes to be done with the property.

Except for these three duties, the opening of locked houses, the assessment of property to be destroyed, and the safe custody of valuable property, the Assistant Commissioner need not be present at the actual disinfection.

Auxiliary duties.

25. In the disinfection of the village, therefore, the Assistant Commissioner takes little active part, and he has but little to do with the disinfection of the villagers previous to their return. He should, however, be present, as he alone has power to assess any property to be destroyed.

But there are one or two auxiliary duties of the Assistant Commissioner. Though the actual owner of a house may not be present, his relative may be, and it is often advisable to obtain the owner's consent that the relative should be present when the house is opened. This is arranged through the Assistant Commissioner, and has the advantage of taking all responsibility off the Government. The Assistant Commissioner pays for all coolies on the disinfecting gang. The bills are submitted by the Hospital Assistant through the Medical Officer to the Assistant Commissioner, who pays direct to the coolies. A proper control is thus maintained over these bills.

Lime.

The Assistant Commissioner in charge of the group has also to arrange for the supply of lime, and it is very important that a full supply be kept up. The supply of lime has not been obtained without difficulty. Most of it has been obtained locally, but this supply often failed us; and on many occasions the disinfection came to a standtill through want of lime. The chief local source was Behrámpur in the Hoshiárpur District, but a considerable quantity was obtained through the Deputy Commissioner, Jullundur. Surgeon-Captain James said this was the best lime we had, but I understand it was not so much liked in Nawashahr. The lime used is unslaked. So far as I could judge the Jullundur lime was by far the best.

I think it inadvisable to rely on the local supply except for small quantities. All large quantities should be obtained from some source, such as Pind Dádan Khan, where the supply can be maintained regularly. The railway freight is very small.

Storing of lime.

The lime has been stored so far under a big *chappar* shed, and a chaprási has been put to guard it.

Indents for lime.

The cartage of lime has been arranged by the Náib Tahsíldár at Banga. He has been much assisted by Basant Singh, Lambardár of Banga, who has been most untiring in his efforts. The amount of lime supplied to each village is roughly about a maund per house. In large villages where the houses are larger it exceeds this rate; in small villages where houses of one or two rooms predominate it falls below it. But the amount of lime required is for the Medical Officer to determine, and I am guided in my supplies by his indents.

Mending of roofs.

The mending of roofs has in general been left to the people themselves. In a few of the earlier villages, *e. g.* Khán Khanán, *phús* and grass were given, but this has not been the practice. Nor have I given compensation for damage done to roofs. In one or two cases only I have had roofs mended where the owners were too feeble to do it for themselves.

Compensation.

The people invaribly ask for compensation, but it is a mere piece of bluff, and I have always found that within ten days after the return to the village there is very little left for us to do in the way of mending roofs. There is now plenty of grass straw and twigs, and as in most cases the big beams have been left uninjured repairs can very easily be done.

26. *Cordoning the village in relation to disinfection.*—During disinfection, as I have already pointed out, a large number of clothes, razáis, etc., are left out on the roofs exposed to the sun. It is clear that it is of great importance that an adequate guard should be placed round the village. During the greater part of the time,* however, we had in the Banga group of villages to dispense with a police guard on the village sites for the simple reason that the police could not be obtained. They had to do the more urgent work of cordoning the village area. In Banga and Pharála, however, it was absolutely necessary to put a police guard on the site, and this was done. Efforts have always been made to induce the villagers to appoint a guard from among themselves, but the villagers very rarely did so. In many cases they would not take the trouble; in others they said that to put a guard of villagers was equivalent to putting a guard of thieves, for they knew

* *i. e.* from the beginning of March.

exactly where all the valuables were. I don't know what truth there was in this, but it was a common excuse. Undoubtedly the best guard is one of police. In a small village no special rules have to be issued to the Police stating whom they are to admit. But in places like Banga or Pharála some orders are necessary. It is clear that the system of passes will not readily apply. What was done in Banga was this. The actual disinfecting coolies wore wooden tickets round their necks, so that they could be readily distinguished and were allowed to pass freely in and out while disinfection was going on. With this exception, no one was allowed to pass in or out of the town, except in company either with one of the officials in charge of the disinfecting work or the Sergeant who was lent by Mr. Rundle, District Superintendent of Police, for the purpose of helping them in bringing owners of houses into the town. The police were informed that these officials were authorized to take persons into the city for disinfection work without passes.

The same plan was adopted at Pharála.

General Remarks.

27. Next to the breaking of cordons, obstruction to the disinfecting of the village has been the most fruitful source of prosecutions. Obstruction can take many shapes. The chief offence is perhaps the concealment of property to prevent its being disinfected. Another is to refuse to attend when the house is to be opened. Another is active resistance to the making of *moghás* in the house, and so on. These offences are punishable under Section 186 or Section 188 of the Indian Penal Code. Several constables have been employed on disinfecting work as supervisors. They have on the whole given very good results and have received extra pay.

Prosecutions.

Constables on special disinfecting work.

The disinfection of a village by the villagers themselves was tried in the earlier villages, but later it has been the plan to employ experienced gangs of, if possible, inoculated coolies. There is not only less danger of their being attacked with plague, but they do the work better and more economically. It is never possible to ensure that villagers do the work thoroughly, or that they use any phenyle, for the phenyle itself itself leaves no stain. At first disinfecting work was left to the people at Sirhál Mandi under the supervision of native hakím. The attempt was a failure, and the work had to be re-done by proper officials.

The Executive officer was always glad to hear that the *hawelís* had been disinfected in a village, as the people were then able to put their grain into them and protect it from loss through rain or wind.

I understand from Dr. James that there is not much harm in allowing the people to do their own white-washing if they have a competent Hospital Assistant to supervise.

POLICE CORDONS.

(On the village sites.)

1. I have already dealt with cordons on the actual sites.

It appeared that in the majority of cases we were unable through lack of men to place cordons on the village sites. The exceptions were Banga and Pharála. In other villages the site was either left unprotected or was placed under the guard of some local watchmen paid and appointed by the villagers themselves.

The cordon on the village site, however, is most important. It would, I am sure, have been better to reduce the strength of the boundary cordon slightly to save men for site cordons. It is perhaps the one place where the police can act effectively, and it was perhaps a pity to take them away from this duty in order to put them on work, the effectiveness of which was not so certain.

Its importance.

The absence of the site cordon has many disadvantages. It not only lays the whole villages open to thefts (and thefts have been not infrequent), but it allows the people to go back into the village and expose themselves to infection, and it also gives them an opportunity of concealing property to avoid disinfection.

(Cordons on the boundaries.)

2. The means on which we have chiefly relied for stopping the spread of plague by persons from one village to another has been the system of boundary cordons.

So soon as plague is suspected in a village a guard is placed round the site to prevent any egress till the Medical Officer gives his opinion. If the suspicion of plague is confirmed, the outside boundary of the villages is cordoned.

It is the outer cordon which has taken up all the police.

At first each village was cordoned separately. This was necessary owing to the position of the villages. Khatkar Kalán, Jhander Khurd, Khán Khanán, Shikohpur, Sirhál Qázián are none of them adjacent to one another.

The early system.

These isolated cordons had many advantages, not the least being that the police could draw in at night close round the camps and so keep a much better guard than when right out on the boundary.

But later on this system had to be abandoned. The villages attacked were no longer isolated but contiguous villages, and the number of constables available was not enough to admit of cordons being placed between two adjoining villages, and as more and more villages became included in one large cordon, it was quite clear that the police could not be brought in round the camps of each village. There was also another reason for giving up this system. With the approach of the harvest it became necessary for the people to stay out at night to watch their crops, and we should in any case have been forced to make some provision for guarding the crops. Under the circumstances indeed we had no alternative and were compelled to keep up only the outer cordon.

Why abandoned.

The plan of maintaining only one large outer cordon is open to many theoretical objections, but it has many practical advantages from the Executive Officer's point of view.

The recent system.

The objections are that it must often happen that several villages at different stages of infection will be enclosed together, and that to include a highly infected village and an almost convalescent village in the same general cordon is to expose the latter to an unjustifiable risk. But this assumes that the people of one village do in fact go to other villages and are admitted, and I do not believe that this takes place to any large extent. To be on the safe side, an order was issued to all the villages concerned that no one could pass from one village to another except with written permission.

Its objections.

So far as I could ascertain people were very averse to receiving strangers to their villages, and very little intercourse took place.

The advantages are chiefly that it enables the Executive Officer to meet the wants of the people far more easily. The question of supplies is simplified; there is no difficulty about cutting the crops, and there is no difficulty in the matter of passes.

Its advantages.

The strength of the Cordon.

3. Until the order that the strength of cordons was not to be less than 8 men to the mile was given, the strength of the cordon depended on the ratio between the men available and the mileage of the outside border. The sentries were in general posted right on the outer border, and not, as subsequently, at some distance within it.

For this reason, and also because sentries were in early days maintained on the Village site, the strength of the cordon was much less than it has recently been, but at the same time it was very necessary that the cordon should be on the border in order to let the zamíndárs attend to their crops.

The number of sentries on the village area at Khán Khanán was about 22 or 23. The border is some seven miles. This gives only three sentries to the mile. In Khatkar Kalán, Jhander Khurd and the other early villages it was about the same, and in Sirhál Qázián and Mallupota it was no better. It would be easy to condemn the plan of keeping the cordons out on the boundary at the expense of their strength, or a fatal mistake if we were sure that by raising the strength of the cordon to 8 a mile we made it absolutely efficient, but we are by no means sure of it. On the contrary, we know, it is not a question of

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conjecture, we know that a determined man will get through a cordon of eight to the mile quite as readily as through one of three to the mile. A cordon of eight to the mile at night with crops standing or with no moon shining is *not* effective. It can be crossed with absolute safety if only a little care be taken. It is not want of efficiency on the part of the police, but they cannot perform an impossible task.

Of the moral effect of the cordon there can be no doubt. The presence of the cordon does deter people from leaving the village, and a cordon of three to the mile has nearly as much moral effect as a cordon of eight to the mile. It is the actual presence, not the strength, of the cordon that tells.

The cases in which plague has been carried across a cordon are unfortunately not few. Surgeon-Captain James has supplied me with the following at random:—From Khatkar Kalán to Shikohpur in November, from Khán Khanán to Jagatpur, Lakhpura and Gunachaur, and from Mallupota to Baharwál. The Khatkar Kalán and Khan Khánán cases occurred before I came on plague duty. The Baharwál case I heard of independently of Dr. James. A more recent case is the taking of plague from Mahl Gohla to Bhaura. The people of Bhaura are expert thieves and found no difficulty in coming through the boundary cordon and going right into Mahal Gohla village site to steal from the empty houses. In face of these facts it is idle to maintain that our cordon up to the present has been effective. As it is generally admitted that plague is spread principally by persons, it is clear that the efficiency of our cordon is of supreme importance, and the question of making our cordon reliable deserves the closest attention.

Means of cordon are three.

There are three principal ways of preventing persons leaving an infected area—There is the erection of some physical obstruction such as a fence wall or iron railing; this I think may be set aside as neither practicable nor effective. The second is a cordon of police, and the third is a military cordon, and the choice rests between these two.

I incline to the third. There are many reasons why the police should not be used; they cannot be sent in sufficient numbers without seriously impairing the efficiency of the police in the rest of the Province; they have not the requisite training in special sentry work, and there is a great difficulty about providing them with supplies. There are also one or two other reasons.

Two or three regiments on the contrary can be sent on plague duty without affecting in any appreciable degree the military strength of the Province; they are trained to picket work. They could be easily rationed, and their presence would have deeper moral effect.

Providing the police with supplies, huts, &c.

4. The police were in general supplied with huts exactly similar to those given to the villagers; a few were given some of the same pattern, but larger. Deputy Inspectors had a special hut of the Swiss Cottage pattern.

Means were taken for protecting sentries from the effects of the sun and weather. In winter blankets were given. As the sun grew stronger, some hundreds of umbrellas were distributed; these were not sufficient protection. Later on shelters of thatch were provided, but they have not stood the strain of the weather, and if the thing is to be done thoroughly, proper sentry boxes must be provided.

The supplies to the police did not at first entail much difficulty. Shops were provided as a rule from Banga through the agency of the Náib Tahsíldár, but supplies were sometimes obtained locally at the villages. It was found, however, that the local bania did not readily come forward to supply these shops, and it was perhaps just as well not to obtain supplies from an infected source. But when Banga itself became infected this source of supplies for shops was cut off, and some other means had to be found

Police shops. Early system.

A proposal to ration the police was made, but fell through. Efforts were then made to find some large contractor who would set up shops at the camps on the cordon. One man came forward

Later system.

from Jullundur, but his terms were not satisfactory. Finally, after considerable trouble a contractor, Harbans Lál, was obtained from Phagwára. The terms on which shops had previously been established were that each contractor received an advance of Rs. 50 and a monthly wage of Rs. 15. A bond was taken for the Rs. 50. Supplies were sold at the market rate. About 18 shops were worked on these terms.

The terms made with the Phagwára contractor were as follows:—

(1) A store shop to be kept at Bahrám for which Rs. 30 were to be paid by us monthly.

(2) Five shops to be maintained at places to be subsequently indicated. The monthly subsidy was Rs. 23 each, being Rs. 20 as hire of the shop and Rs. 3 on account of cart hire for conveying the supplies to the shops.

(3) An advance of Rs. 1,000 was to be paid on account of these five shops.

(4) Articles to be sold at Phagwára current rates on a weekly price list countersigned by Major Inglis.

(5) The five shops to begin working on the 25th April.

(6) Ten days' notice to be given by either party before withdrawal.

Harbans Lál agreed to these terms, which are distinctly favourable to him, and was given an advance of Rs. 1,000, a bond being taken from him for the money. Later on, he set up six more shops and obtained a further advance of Rs. 500, for which he gave another bond.

At first all the shops were supplied by the Assistant Commissioner, who was responsible for their payment. This plan had its disadvantages, as it was found that camps and shops were moved from place to place without information being sent to the Assistant Commissioner, and many complications arose in connection with payment. Accordingly, when Mr. Rundle, District Superintendent of Police, came out to Banga, charge of the police shops was given to him, and a Náib Tahsíldár was appointed to assist him. I understand from him that the contract system has not worked absolutely smoothly. The constables on the one hand complain that inferior articles are supplied, that the "ata" is mixed with sand and the like, and that the prices charged are above those charged by the local banias. The contractor on the other hand complains that the police do not go to his shops, and that he does no trade. The fact that he was willing to take up the second six shops on half the former advance rather discounts his complaints.

Defects.

It will be seen that our chief troubles arose when Banga became infected, but even before that shop-keepers had not come forward readily to supply the police, and of those who came forward not a few very soon wanted to give up the contract.

On the whole, I think that the best system is to find a large contractor willing to supply shops as required, and not to rely on a number of petty shop-keepers.

The removal of the cordons.

5. The orders regarding the putting on of the cordons and their removal are contained in letter No. $\frac{1285\text{-U.}}{\text{X. U. U.-43}}$ from the Commissioner, Jullundur Division, to the address of Major Inglis, dated April 28th, 1898. They are briefly to the effect that no cordon may be removed except on the written order of the Assistant Commissioner in charge; that the cordon shall remain on at least six days after the village has returned, and that at the time of its removal a complete roll-call of the inhabitants shall be made.

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At first all the shops were supplied by the Assistant Commissioner, who was responsible for their payment. This plan had its disadvantages, as it was found that camps and shops were moved from place to place without information being sent to the Assistant Commissioner, and many complications arose in connection with payment. Accordingly, when Mr. Rundle, District Superintendent of Police, came out to Banga, charge of the

Defects.

police shops was given to him, and a Náib Tahsíldár was appointed to assist him. I understand from him that the contract system has not worked absolutely smoothly. The constables on the one hand complain that inferior articles are supplied, that the "ata" is mixed with sand and the like, and that the prices charged are above those charged by the local banias. The contractor on the other hand complains that the police do not go to his shops, and that he does no trade. The fact that he was willing to take up the second six shops on half the former advance rather discounts his complaints.

It will be seen that our chief troubles arose when Banga became infected, but even before that shop-keepers had not come forward readily to supply the police, and of those who came forward not a few very soon wanted to give up the contract.

On the whole, I think that the best system is to find a large contractor willing to supply shops as required, and not to rely on a number of petty shop-keepers.

The removal of the cordons.

5. The orders regarding the putting on of the cordons and their removal are contained in letter No. $\frac{1285\text{-U.}}{\text{X. U. U.-43}}$ from the Commissioner, Jullundur Division, to the address of Major Inglis, dated April 28th, 1898. They are briefly to the effect that no cordon may be removed except on the written order of the Assistant Commissioner in charge; that the cordon shall remain on at least six days after the village has returned, and that at the time of its removal a complete roll-call of the inhabitants shall be made.

conjecture, we know that a determined man will get through a cordon of eight to the mile quite as readily as through one of three to the mile. A cordon of eight to the mile at night with crops standing or with no moon shining is *not* effective. It can be crossed with absolute safety if only a little care be taken. It is not want of efficiency on the part of the police, but they cannot perform an impossible task.

Of the moral effect of the cordon there can be no doubt. The presence of the cordon does deter people from leaving the village, and a cordon of three to the mile has nearly as much moral effect as a cordon of eight to the mile. It is the actual presence, not the strength, of the cordon that tells.

The cases in which plague has been carried across a cordon are unfortunately not few. Surgeon-Captain James has supplied me with the following at random:—From Khatkar Kalán to Shikohpur in November, from Khán Khanán to Jagatpur, Lakhpura and Gunachaur, and from Mallupota to Baharwál. The Khatkar Kalán and Khan Khánán cases occurred before I came on plague duty. The Baharwál case I heard of independently of Dr. James. A more recent case is the taking of plague from Mahl Gohla to Bhaura. The people of Bhaura are expert thieves and found no difficulty in coming through the boundary cordon and going right into Mahal Gohla village site to steal from the empty houses. In face of these facts it is idle to maintain that our cordon up to the present has been effective. As it is generally admitted that plague is spread principally by persons, it is clear that the efficiency of our cordon is of supreme importance, and the question of making our cordon reliable deserves the closest attention.

There are three principal ways of preventing persons leaving an infected area—

Means of cordon are three.

There is the erection of some physical obstruction such as a fence wall or iron railing; this I think may be set aside as neither practicable nor effective. The second is a cordon of police, and the third is a military cordon, and the choice rests between these two.

I incline to the third. There are many reasons why the police should not be used; they cannot be sent in sufficient numbers without seriously impairing the efficiency of the police in the rest of the Province; they have not the requisite training in special sentry work, and there is a great difficulty about providing them with supplies. There are also one or two other reasons.

Two or three regiments on the contrary can be sent on plague duty without affecting in any appreciable degree the military strength of the Province; they are trained to picket work. They could be easily rationed, and their presence would have deeper moral effect.

Providing the police with supplies, huts, &c.

4. The police were in general supplied with huts exactly similar to those given to the villagers; a few were given some of the same pattern, but larger. Deputy Inspectors had a special hut of the Swiss Cottage pattern.

Means were taken for protecting sentries from the effects of the sun and weather. In winter blankets were given. As the sun grew stronger, some hundreds of umbrellas were distributed; these were not sufficient protection. Later on shelters of thatch were provided, but they have not stood the strain of the weather, and if the thing is to be done thoroughly, proper sentry boxes must be provided.

The supplies to the police did not at first entail much difficulty. Shops were provided as a rule from Banga through the agency of the Náib Tahsíldár, but supplies were sometimes obtained locally at the villages. It was found, however, that the local bania did not readily come forward to supply these shops, and it was perhaps just as well not to obtain supplies from an infected source. But when Banga itself became infected this source of supplies for shops was cut off, and some other means had to be found

Police shops.
Early system.

A proposal to ration the police was made, but fell through. Efforts were then made to find some large contractor who would set up shops at the camps on the cordon. One man came forward

Later system.

from Jullundur, but his terms were not satisfactory. Finally, after considerable trouble a contractor, Harbans Lál, was obtained from Phagwára. The terms on which shops had previously been established were that each contractor received an advance of Rs. 50 and a monthly wage of Rs. 15. A bond was taken for the Rs. 50. Supplies were sold at the market rate. About 18 shops were worked on these terms.

The terms made with the Phagwára contractor were as follows:—

(1) A store shop to be kept at Bahrám for which Rs. 30 were to be paid by us monthly.

(2) Five shops to be maintained at places to be subsequently indicated. The monthly subsidy was Rs. 23 each, being Rs. 20 as hire of the shop and Rs. 3 on account of cart hire for conveying the supplies to the shops.

(3) An advance of Rs. 1,000 was to be paid on account of these five shops.

(4) Articles to be sold at Phagwára current rates on a weekly price list countersigned by Major Inglis.

(5) The five shops to begin working on the 25th April.

(6) Ten days' notice to be given by either party before withdrawal.

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The composition and arrangement of the cordon rests with the Police Officer, and he has to see that the strength of the force is not wasted in cordoning outlying lands which may be put outside the cordon without difficulty. It will, however, be impossible for the Police Officer to judge what lands can be excluded without inconvenience as he has no official relations with the villagers. It would be better that this be done in consultation with the Executive Officer.

Plague among the police.

6. A list is appended of the police constables who have been attacked with plague. It will be seen that there have been ten cases, two of which have recovered. One fatal case was that of Hákim Beg, who became infected at Lehal while guarding the Hospital Assistant. The rest of the cases have, so far as can be ascertained, occurred through the constables associating with the villagers and going into the camps.

List of Policemen seized with plague.

No.	District.	Name.	Constabalary No.	On what duty.	Result.
1	Ferozepore ...	Wilayát Shah ...	151	Shikohp Cordon ...	Died 14th March 1898.
2	Ludhiána ...	Tára Singh ...	414	Lodipur Cordon ...	Died 22nd March 1898.
3	Ditto ...	Idu ...	145	Ditto ...	Died Ditto.
4	Muzaffargarh ...	Allahdád Shah ...	7	Kamam Cordon ...	Died 26th March 1898.
5	Gujrát ...	Ghulám Farid ...	236	Lakhpur „ ...	Died 29th March 1898.
6	Hissar ...	Mam Ráj ...	124	Heeon Cordon ...	Died 26th April 1898.
7	Ditto ...	Amr Singh ...	212	Ditto ...	Recovered.
8	Jullundur ...	Hákam Beg ...	350	Disinfecting Lehal ...	Died 14th May 1898.
9	Gujránwála ...	Kásim Shah ...	432	Sirhál Qázián Cordon ...	Recovered.
10	Gurgaon ...	Khuda Bakhsh ...	291	Lidhar Kalán „ ...	Ditto.

NOTE.—Does not include Garhshankar Circle nor chaukídárs and town police.

The relations of the villagers and police.

On the whole, I think the relations of the police and the villagers have been fairly amicable. One or two differences have occurred. There was rather a serious fracas on the Jagatpur cordon with the villagers of Hákimpur in April. Both sides I think were to blame. Another row occurred at Malah, and here again the blame was on both. There have been few complaints of looting, and so far as I know none at all of raping. The collection of wood during the winter gave rise to a little friction, but no actual disturbance took place. Two constables were convicted of extortion for exacting money from villagers under threats that they would bring accusations of breaking cordon.

The pass system.

7. Previous to the new pass rules made by Mr. Silcock, the Commissioner, it was the general practice for any European officer, whether Civil, Medical or Police, to grant written passes to any one whom it was necessary to send across a cordon. The Police were instructed to allow any one carrying such a pass to cross the cordon. Also all officers on public duty, such as Tahsíldárs, Kánúngos, Hospital Assistants, were entitled to pass by virtue of their office. Passes were not taken by the police constables.

This system worked very well, but it had one or two defects. The chief defect was that it was very open to abuse, especially as many of the constables are illiterate and unable to read. Passes were written and signed by persons who had no authority, and as they were not taken by the police, it was only when the bearer happened to meet a constable who could read English that the abuse was detected. I doubt, however, whether the abuses were at all frequent, and in no case does any harm appear to have resulted.

In the early part of May, however, new rules were issued by the Commissioner as under :—

1. No one but European officers will be allowed to pass the cordon without a written pass.

2. Passes will be of three kinds :—

(*a*) Permanent.

(*b*) Temporary.

(*c*) Quarantine.

And no pass of any kind can be given by any official other than the Assistant Commissioner in charge of a group of villages.

3. Permanent passes may be given only to Tahsíldárs, Náib Tahsíldárs and Assistant Surgeons whose duties must take them continually in and out of the cordon.

4. Temporary passes may be given to officials of all other ranks whose duty takes them across the cordon. These passes must be given up at the police post on the cordon and returned by the police to the Assistant Commissioner who issued them.

5. Passes to go into quarantine camp at Behrám may be given to every one wishing to go into quarantine. The police will arrange to escort these persons from the cordon line to the quarantine camp.

6. A list of all temporary and quarantine passes must be sent by the Assistant Commissioner to Major Inglis in the evening of the day of issue.

These rules were subsequently modified in a few particulars. The third rule was changed to "Permanent passes may be granted to all Government officials whose work necessitates their constantly crossing the cordon." This modification was a very useful one, as under the original rule no provision was made for Kánúngos on plague work nor for chaprásís and permanent messengers.

Other modifications were that—

(1). A permanent pass granted by one Assistant Commissioner will enable holders to cross the cordon line of any group of villages.

(2). Civil, Medical and Police Officers may be provided with some of the printed passes, which in cases of necessity they can give to persons whom they have, during their day's work, to send on urgent business across the cordon lines.

(3). The Hospital Assistants in charge of hospitals may be provided with printed passes which they can give to messengers whom they have to send across the cordon line either to head-quarters or elsewhere on urgent messages. These passes should be marked "Hospital Assistants' passes," and the Hospital Assistants must report the number of passes issued by them.

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7. In devising a system of passes we have to remember that a large number of constables on cordon duty are unable to read. This is a very important fact, as it makes it necessary for one temporary pass to be given for each cordon to be passed. For instance, if I have to send a man through Banga and wish him to return, he must be given four passes. The mere signing of all these passes involves a lot of trouble on the Assistant Commissioner, whose signature alone is at present valid.

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I have spoken to Dr. James and other officers, and wish to make the following suggestions :—

All European officers and all nurses should be allowed to cross a cordon without a pass.

Any European officer and nurse may take any one across any cordon under their personal supervision.

Quarantine passes should be granted by the Medical Officer alone.

There should be *permanent* passes, of card-board, granted to all officials whose duty requires it.

There should be *temporary* passes of paper which may be granted by any Civil, Medical and Police Officer to persons to whom it is necessary to give them, *e.g.* witnesses and others.

There should be *semi-permanent* passes of card-board for Medical Officers and others to give to coolies, cartmen and the like who have to go across the cordon. These passes will be for "Bearer" and should be recovered on return of the person concerned. Each officer should have a number of these by him. Similar passes stamped "Hospital Assistants' pass" should be supplied in limited quantities to Hospital Assistants at village hospitals.

The passes should be of different colour, and should be supplied freely to officers.

These suggestions are meant to guide officers when to issue passes ; they must not be considered as absolutely binding. Cases are certain to arise which are not covered by the rules. It is essential that there should be some officer on the spot with power to sanction any deviation from these rules if he thinks it necessary.

For the lower officials, such as chaprásís and orderlies, it might be advantageous to have a badge or sash instead of a pass, so that he could be readily recognised and not be obliged to show his pass each time he crossed the cordon.

The Quarantine Camps.

8. There have always been some arrangements for quarantine since the time of Khatkar Kalán, but no regular quarantine camp was established until May.

In the earlier villages persons who were obliged to leave the village were placed in quarantine at the police camps, but this is not altogether satisfactory, as it exposes the Police to risks. This was done up to the time when Mallupota became infected.

On the eastern side of Mallupota village are some large expanses of uncultivated land, and on this land was placed our first regular quarantine camp. It was, however, only a small affair.

The large quarantine camp was established in the beginning of May at Behrám. It was under the control of Surgeon-Captain Davidson, who was assisted by Iláhi Bakhsh, Assistant Surgeon. Passes were issued by the Assistant Commissioner in charge at Banga for admission every fifth day, and persons underwent ten days' quarantine. They were then given a pass bearing their thumb marks and certifying that they had undergone ten days medical observation.

The quarantine camp was not much used except by Government officials, such as Kánúngos and Policemen who were going off duty. It was not much used by the villagers.

At the same time I think it a good thing to have a quaratine camp of some sort, however small. It is not necessary to have a special staff for it, unless it assumes large dimensions. It is clear that there will always be some non-officials who will require it, students and the like. The public would never consider any plague arrangement complete unless some provisions were made for quarantine, and they are I think right.

Admission to the quarantine camp should be granted by the Medical Officer and not by the Executive Officer. It would be dangerous to admit a man from an active village to associate with men from villages in which the infection is almost extinct, and the degree of infectiousness is a matter for the Medical Officer. Admission to the camp cannot be absolutely free, for it must be remembered that the camp is not one of absolute quarantine ; it is one of quarantine by groups, and a man from an active village might develope plague and infect the whole group. The quarantine camp is intended for those who are to all intents and purposes free from infection, but about whom there may be some doubt. After the ten days' observation they are granted certificates and are thus saved all fear of being detained after leaving the camp.

Only one camp is necessary. People from the whole infected area can undergo quarantine there. If any person wishes to go to any place which involves his recrossing an infected area, he may do so under escort of police. There is no danger from merely being employed along a road which runs through the infected area.

It seems to me that the selection of the camp should be left to the Medical Officer.

The Establishment necessary for each Assistant Commissioner.

1. For the Assistant Commissioner in charge of any circle of villages I think the following staff is necessary :—

(1). One good English Clerk, experienced in accounts.

(2). An Assistant Clerk who should be a good Copyist.

(3). An experienced Muharrir, well acquainted with Judicial routine.

2. For the Assistant Commissioner in charge of a sub-circle or group of villages—

(1). One good clerk with a knowledge of English and acquainted with Judicial routine.

In addition to the above there should be some Police Officer appointed to act as Naib Court Inspector.

I have been sharing my Vernacular Clerk with Mr. French.

The above satff I consider to be the minimum with which the work for any considerable number of villages can be carried on.

S. W. GRACEY,
Assistant Commissioner.

Statement showing course of plague

No.	Name of village.	Population.	Date of discovery of plague.	Date on which people came into camp.	Date of return.	Total number of cases.	Total deaths.	Date of last case.	Cause of infection.	Predominating castes.
1	Khatkar Kalán ...	1,400	17th Octr. 1897.	30th Octr. 1897.	26th Decr. 1897.	79	45	3rd Decr. 1897.	Persons ..	Hindu Játs, also Bharáis, in fair numbers.
2	Jhander Khurd ...	800	9th Novr. 1897.	13th Novr. 1897.	19th Jany. 1898.	29	19	18th Decr. 1897.	Ditto ...	Hindu Játs ...
3	Khán Khanán ...	2,300	23rd Novr. 1897.	6th Decr. 1897.	7th March 1898.	175	96	28th Jany. 1898.	Ditto ...	Hindu Játs, Tarkháns.
4	Khatkar Khurd ...	377	29th Decr. 1897.	29th Decr. 1897.	12th Feby. 1898.	10	6	10th Jany. 1898.	Ditto ...	Hindu Játs ...
5	Sirhál Qázián ...	2,026	4th Feby. 1898.	13th Feby. 1898.	25th April 1898.	82	63	8th April 1898.	Ditto ...	Játs, Muhammadans, Qázís.
6	Mallupota ...	1,399	13th Feby. 1898.	21st Feby. 1898.	3rd May 1898	91	60	24th March 1898.	Ditto ...	Hindu Játs; also Aráins and Jainís.
7	Gunachour ...	3,624	14th Feby. 1898	1st March 1898.	21st May 1898.	147	97	28th March 1898.	Diito ...	Mussalmán Rájpúts.

in villages of the Bunga Circle.

Class of inhabitants attacked.	Whether disease went right through or not.	Cause of delay in going out to camp.	Cause of delay in return.	Remarks.
The Bharáis were not attacked; and some Ját quarters were uninfected.	The disease was worst in Chamárs' quarters and in certain Brahmins' quarters.	The delay of 13 days was due to the want of huts and to the time taken in bringing out furniture, &c. The suspected persons and their relatives alone were first segregated.	This village did not return all at once; it went in by sections. The Bharáis went back on November 30th. The others were delayed by a late case which occurred on December 3rd, terminating fatally. On December 10th the Chamárs returned, and on December 26th all people from segregation camp had returned.	In this village people were allowed to come in and mend their roof before they themselves finally returned. As in most of the earlier villages, the villagers took an active part in the disinfection and white-washing, though there was also a regular gang of coolies on disinfecting work.
Chiefly Chamárs, Tarkháns and Brahmins.	Confined principally to Chamárs' quarters.	The evacuation was made as quickly as the supply of huts admitted: infected persons segregated at once.	The Chamárs returned on the 18th December, the Játs began their disinfection later and did not return till January 14th, the segregation camp following on January 19th.	Here again villagers were allowed to mend their roofs before finally returning.
...	Chiefly affected Dalel Singh's mohalla; afterwards during disinfection 8 cases occurred in Deva Singh's "patti," which was quite remote from the original centre of infection in which no cases had previously occurred.	At first people refused to come out; but under Colonel Rennick's influence they were induced to come out. They were also frightened by the rapid progress of the disease in their village.	This village also went back by sections. On January 7th, however, during disinfection cases occurred in Deva Singh's Patti: this delayed the return. Also on January 18th the first case occurred among the sweepers, and was another source of delay.	Dropping cases continued among the Tarkháns till the end of January. People did not mend their roof before returning. The people made most excellent huts for themselves.
The Chamárs escaped infection in this village until the later recrudescence.	This is only a small village.	No delay ...	There was practically no delay; the people were fortunate in returning just before the February rains.	This village is close to Banga, but, so far as can be seen, did not spread the infection into Banga. The case of the Chamárs is curious. People did not mend their roof before returning.
No Qázís attacked; principally Rám Singh's Patti and Aráins.	The Qázís' quarter unaffected.	The delay in coming out was due to want of police sufficient to cordon the whole village area. At first the site and segregation camp were at once cordoned. There were also insufficient huts.	There was no delay in returning; the whole village went back within 3 weeks of the last case.	Special arrangements for "purdah" were made here. The people were coming out just about the time of the February rains; they were offered the opportunity of returning, but they did not take it. The wind even blew down the "purdah" screen that had been erected.
There are 4 "pattís," but the Aráins were little affected.	...	There were rumours of plague from February 5th in this village, and there is no doubt that plague was concealed. After the actual discovery the delay in coming out was due to the very heavy rainy weather then prevailing; also huts were insufficient.	There was no delay, but as in many other villages, so here the disinfection was delayed through harvesting operations, coolies not being obtainable.	The Lambardárs were convicted by Colonel Rennick for concealing plague. There were five wide places for camps here, but the rains caused a lot of trouble, the camping ground being all under water.
General ...	General ...	The delay in coming out was due to the rains. It was regrettable as people spread plague during that time in the village by moving from mohalla to mohalla. The people began to come out on February 22nd.	The town was a difficult one to disinfect owing to its steep position, but at the same time the disinfection was at first done badly, and in parts had to re-done. This caused some delay. A further delay was caused through want of lime.	The village is situated on a high eminence; it has a very large area; and the cordon had to be removed at a somewhat early date to cordon other villages; only main approaches were cordoned.

Statement showing course of plague

No.	Name of village.	Population.	Date of discovery of plague.	Date on which people came into camp.	Date of return.	Total number of cases.	Total deaths.	Date of last case.	Cause of infection.	Predominating castes.
1	Khatkar Kalán ...	1,400	17th Octr. 1897.	30th Octr. 1897.	26th Decr. 1897.	79	45	3rd Decr. 1897.	Persons ..	Hindu Játs, also Bharáis, in fair numbers.
2	Jhander Khurd ...	800	9th Novr. 1897.	13th Novr. 1897.	19th Jany. 1898.	29	19	18th Decr. 1897.	Ditto ...	Hindu Játs ...
3	Khán Khanán ...	2,300	23rd Novr. 1897.	6th Decr. 1897.	7th March 1898.	175	96	28th Jany. 1898.	Ditto ...	Hindu Játs, Tarkháns.
4	Khatkar Khurd ...	377	29th Decr. 1897.	29th Decr. 1897.	12th Feby. 1898.	10	6	10th Jany. 1898.	Ditto ...	Hindu Játs ...
5	Sirhál Qázián ...	2,026	4th Feby. 1898.	13th Feby. 1898.	25th April 1898.	82	63	8th April 1898.	Ditto ...	Játs, Muhammadans, Qázís.
6	Mallupota ...	1,399	13th Feby. 1898.	21st Feby. 1898.	3rd May 1898	91	60	24th March 1898.	Ditto ...	Hindu Játs; also Aráins and Jainís.
7	Gunachour ...	3,624	14th Feby. 1898	1st March 1898.	21st May 1898.	147	97	28th March 1898.	Ditto ...	Mussalmán Rájpúts.

in villages of the Bunga Circle.

Class of inhabitants attacked.	Whether disease went right through or not.	Cause of delay in going out to camp.	Cause of delay in return.	Remarks.
The Bharáis were not attacked; and some Ját quarters were uninfected.	The disease was worst in Chamárs' quarters and in certain Brahmins' quarters.	The delay of 13 days was due to the want of huts and to the time taken in bringing out furniture, &c. The suspected persons and their relatives alone were first segregated.	This village did not return all at once; it went in by sections. The Bharáis went back on November 30th. The others were delayed by a late case which occurred on December 3rd, terminating fatally. On December 10th the Chamárs returned, and on December 26th all people from segregation camp had returned.	In this village people were allowed to come in and mend their roof before they themselves finally returned. As in most of the earlier villages, the villagers took an active part in the disinfection and white-washing, though there was also a regular gang of coolies on disinfecting work.
Chiefly Chamárs, Tarkháns and Brahmins.	Confined principally to Chamárs' quarters.	The evacuation was made as quickly as the supply of huts admitted: infected persons segregated at once.	The Chamárs returned on the 18th December, the Játs began their disinfection later and did not return till January 14th, the segregation camp following on January 19th.	Here again villagers were allowed to mend their roofs before finally returning.
...	Chiefly affected Dalel Singh's mohalla; afterwards during disinfection 8 cases occurred in Deva Singh's "patti," which was quite remote from the original centre of infection in which no cases had previously occurred.	At first people refused to come out; but under Colonel Rennick's influence they were induced to come out. They were also frightened by the rapid progress of the disease in their village.	This village also went back by sections. On January 7th, however, during disinfection cases occurred in Deva Singh's Patti: this delayed the return. Also on January 18th the first case occurred among the sweepers, and was another source of delay.	Dropping cases continued among the Tarkháns till the end of January. People did not mend their roof before returning. The people made most excellent huts for themselves.
The Chamárs escaped infection in this village until the later recrudescence.	This is only a small village.	No delay ...	There was practically no delay; the people were fortunate in returning just before the February rains.	This village is close to Banga, but so far as can be seen, did not spread the infection into Banga. The case of the Chamárs is curious. People did not mend their roof before returning.
No Qázís attacked; principally Rám Singh's Patti and Aráins.	The Qázís' quarter unaffected.	The delay in coming out was due to want of police sufficient to cordon the whole village area. At first the site and segregation camp were at once cordoned. There were also insufficient huts.	There was no delay in returning; the whole village went back within 3 weeks of the last case.	Special arrangements for "purdah" were made here. The people were coming out just about the time of the February rains; they were offered the opportunity of returning, but they did not take it. The wind even blew down the "purdah" screen that had been erected.
There are 4 "pattís," but the Aráins were little affected.	...	There were rumours of plague from February 5th in this village, and there is no doubt that plague was concealed. After the actual discovery the delay in coming out was due to the very heavy rainy weather then prevailing; also huts were insufficient.	There was no delay, but as in many other villages, so here the disinfection was delayed through harvesting operations, coolies not being obtainable.	The Lambardárs were convicted by Colonel Rennick for concealing plague. There were five wide places for camps here, but the rains caused a lot of trouble, the camping ground being all under water.
General ...	General ...	The delay in coming out was due to the rains. It was regrettable as people spread plague during that time in the village by moving from mohalla to mohalla. The people began to come out on February 22nd.	The town was a difficult one to disinfect owing to its steep position, but at the same time the disinfection was at first done badly, and in parts had to re-done. This caused some delay. A further delay was caused through want of lime.	The village is situated on a high eminence; it has a very large area; and the cordon had to be removed at a somewhat early date to cordon other villages; only main approaches were cordoned.

Statement showing course of plague

No.	Name of village.	Population.	Date of discovery of plague.	Date on which people came into camp.	Date of return.	Total number of cases.	Total deaths.	Date of last case.	Cause of infection	Predominating castes.
8	Jagatpur	1,729	28th Feby. 1898.	10th March 1898.	16th May 1898.	63	43	13th April 1898.	Persons...	Ját Hindús ...
9	Balon	282	3rd March 1898.	4th March 1898.	24th April 1898.	28	11	2nd April 1898.	Ditto ...	Muhammadan Gujars.
10	Lakhpur	445	6th March 1898.	14th March 1898.	5th May 1898	31	23	26th March 1898.	Ditto ...	Hindu Játs ...
11	Mahla Gohla ...	2,548	15th March 1898.	17th March 1898.	4th June 1898	101	57	3rd May 1898	Ditto ...	Ditto ...
12	Núrpur	443	8th March 1898.	9th March 1898.	3rd May 1898	19	11	15th April 1898.	Ditto ...	Ditto ...
13	Sahl Kalán	356	9th March 1898.	15th March 1898.	25th April 1898.	12	10	26th March 1898.	Ditto ...	Játs and Arains ...

in villages of the Bunga Circle—continued.

Class of inhabitants attacked.	Whether disease went right through or not.	Cause of delay in going out to camp.	Cause of delay in return.	Remarks.
...	One block of houses was at first attacked, but disease then became general.	When plague was first discovered there were 5 cases altogether. Only the infected people and their relatives were segregated. Cases continued in the segregation camp till March 7th, but until that date no case occurred in the village, and it was hoped that it would be unnecessary to turn out the whole village; after that cases became general and the whole village had to come out.	There was no delay in returning beyond what was caused by the withdrawal of coolie labour for harvest purposes.	This village nearly all went out into one big camp; the camp was consequently crowded, and this may account for the numerous fires which occurred. The camping ground was on a wide sandy maidán without shelter, and the people suffered greatly from the heat. The people in this village behaved extremely well.
Gujars	The village is a small one.	No delay	No delay	Rumours of plague were received as early as February 27th, but they proved to be false. Plague was brought from the Hoshiárpur District.
General ...	General ...	There had been a suspected case of plague some weeks before March 6th, and a cordon had been put round, but the case was not diagnosed as plague. On March 5th one case was reported, and the village again cordoned, only the sick person and his relatives being segregated. On March 10th cordon was removed owing to want of police, but as cases occurred again on March 13th it had to be replaced. All the village then came out.	Any delay that occurred was due to want of disinfecting staff and want of lime.	
On February 23rd there was an imported case of a Jat from Mallupota. After this the Chamárs were first attacked; afterwards general.	Only the *Chamárs* were attacked while in the village. All others became infected while in camp	Setting aside the first case on February 23rd, which was at once isolated, there was no delay.	Delay due to the disinfection at first being done unsatisfactorily.	In this village the people put a guard round the village site, but this could not prevent the "badmáshes" of Bhaura, the adjoining village, from coming to steal from the empty houses. The plague spread from the Jati—Utam Singh's daughter-in-law—to the Chamárs attached to Utam Singh's house, but the case did not appear till some 3 weeks afterwards.
Began among Chamárs and spread to Játs.	General ...	No delay	No delay	This village became infected owing to the close proximity of the Sirhál Qázián segregation camp.
General ...	Ditto ...	At first only one case was discovered; this was removed to Balon Hospital, and relatives segregated; one or two cases occurred among the segregated, but not till the 14th March was hope given up of saving the village without turning it out.	No abnormal delay ...	About this time disinfection could not be carried on very rapidly owing to want of staff and want of lime.

Statement showing course of plague

No.	Name of village.	Population.	Date of discovery of plague.	Date on which people came into camp.	Date of return.	Total number of cases.	Total deaths.	Date of last case.	Cause of infection.	Predominating castes.
14	Masáni	1,380	10th March 1898.	10th March 1898.	2nd June 1898.	33	24	6th May 1898	Persons...	Mussalmán, Rájpúts, Aráins, Játs.
15	Banga	5,010	Ditto ...	20th April 1898.	...	103	65	20th June 1898.	Ditto ...	Hindu Játs, Khatrís, Brahmins and Aroras &c.
16	Katt	759	13th March 1898.	16th March 1898.	23rd May 1898.	29	20	25th April 1898.	Ditto ...	Hindu Játs ...
17	Hapowál	587	12th March 1898	29th March 1898.	28th May 1898.	13	3	4th April 1898	Ditto ...	Ditto ...
18	Chak Bilga	829	14th March 1898	15th March 1898.	31st May 1898.	33	22	14th April 1898.	Uncertain	Ditto ...
19	Dhahan	574	Ditto ...	Ditto ...	7th May 1898	47	35	2nd April 1898.	Persons...	Ditto ...
20	Táhirpur	530	18th March 1898.	24th March 1898.	3rd June 1898	31	22	9th April 1898.	Ditto ...	Ditto ...
21	Mazara Nawabad ...	548	21st March 1898.	21st March 1898.	9th May 1898	3	2	27th March 1898.	Ditto ...	Ditto ...
22	Sotran	302	24th March 1898.	24th March 1898.	28th May 1898.	17	12	30th April 1898.	Ditto ...	Ditto ...
23	Lidhar Kalán ...	671	30th March 1898.	30th March 1898.	22nd May 1898.	26	14	28th April 1898.	Ditto ...	Ditto ...
24	Khánpur	628	31st March 1898.	1st April 1898.	Ditto ...	22	15	26th April 1898.	Ditto ...	Ditto ...
25	Baharwál	713	1st April 1898.	2nd April 1898.	2nd June 1898.	22	14	Ditto ...	Ditto ...	Ditto ...
26	Mazári	457	2nd April 1898.	3rd April 1898.	28th May 1898.	8	4	10th April 1898.	Ditto ...	Ditto ...
27	Salh Khurd... ...	180	4th April 1898.	6th April 1898.	7th May 1898.	16	8	Ditto ...	Ditto ...	Muhammadan Gujars.
28	Heeon	1,283	Ditto ...	4th April 1898.	24th April 1898.	2	1	3rd April 1898.	Ditto ...	Muhammadan Rájpúts.
29	Langeri	1,331	5th April 1898.	5th April 1898.	7th June 1898	24	18	4th May 1898	Ditto ...	Muhammadan Rájpúts and Aráins.

in villages of the Bunga Circle—continued.

Class of inhabitants attacked.	Whether disease went right through or not.	Cause of delay in going out to camp.	Cause of delay in return.	Remarks.
General, but chiefly Chamárs.	Scattered, but the bulk were in the Chamárs' quarters.	No delay	No abnormal delay ...	About this time disinfection could not be carried on very rapidly owing to want of staff and want of lime. Dropping cases continued for a long time.
Beginning with Liláris, spread to all classes.	Beginning from Liláris' quarter it spread with intervals from mohalla to mohalla, becoming general, but nothing south of Banga road was attacked.	In this town the system of evacuation and disinfection by mohallas was tried, each mohalla as it became infected being walled off. The Liláris were turned out on March 10th, but no delay took place in turning out any individual infected mohalla. On April 20th the whole town was turned out.	The Liláris returned on 15th April 1898. The subsequent delay is due to the very great difficulties encountered in disinfecting a large business centre like Banga.	The case which occurred on June 20th was an old case; the previous last case was on 17th May. In this town house-to-house visitation was carried on from December 28th, 1897, under a Committee of 5, and daily reports were sent in. A large exodus of people took place, but after about a week most of them returned.
Chiefly Játs, a few Brahmins and Chamárs.	Confined to north-east corner of town.	No delay	No delay	This is one of the villages in which rats may have brought plague.
General ...	General ...	At first only one case, a baby, was attacked; it was segregated: no other case till 28th March, when whole village went out.	Delay due to want of sufficient disinfecting staff and want of lime.	The fewness of deaths is noticeable.
Ditto ...	Ditto ...	No delay	No delay	People began moving into camp of their own accord.
Ditto ...	Ditto ...	Ditto	Delay due to difficulty in obtaining disinfecting coolies owing to their being employed on harvesting operations.	Plague was undoubtedly concealed here, as an infected corpse was found locked up in some room; this village may have been a centre of infection.
Chiefly Játs and one Jhiwar.	Chiefly Játs' quarters	At first only one case found: infected people segregated. No other case till 21st March: people began to come out on the 23rd. Evacuation finally completed on 24th March.	Delay in returning due to the close proximity of Sirhál Mandi, which was not ready to return.	
Only one mohalla right in the centre of the town was attacked.		No delay	No delay	The small number of cases is remarkable.
General ...	General ...	Ditto	Ditto.	
Ditto ...	General, beginning from Chamárs' quarters.	Ditto	Ditto.	
Játs	Confined to a few houses in the north-east quarter.	Ditto	Ditto.	
Játs and Telís ...	In a portion of the village leading from centre to north.	Ditto	Ditto	Plague had probably existed for about a fortnight before detection.
Játs and Jhíwars ...	The north-west corner.	Ditto	Delay due to defects in disinfection.	
General ...	General ...	Ditto	No delay.	
A Sánsi and his child	alone attacked.	Ditto	Ditto	The villagers did their own white-washing; no phenyie-washing was done.
General ...	Confined to one or two localities.	Ditto	Ditto	The villagers began moving into camp of their own accord.

Statement showing course of plague

No.	Name of village.	Population.	Date of discovery of plague.	Date on which people came into camp.	Date of return.	Total number of cases.	Total deaths.	Date of last case.	Cause of infection.	Predominating castes.
41	Gosal	494	22nd April 1898.	25th April 1898.	10th June 1898.	11	8	5th May 1898.	Persons...	Hindu Játs ...
42	Malah	443	26th April 1898.	26th April 1898.	14th June 1898.	11	9	30th April 1898.	Ditto ...	Ditto ...
43	Aujla	630	27th April 1898.	13th May 1898.	7th June 1898.	5	4	18th May 1898.	Ditto ...	Ditto ...
44	Chokran	847	10th May 1898.	Ditto ...	15th June 1898.	10	4	25th May 1898.	Ditto ...	Ditto ...
45	Pharála	3,214	19th May 1898.	19th May 1898.	...	17	6	19th June 1898.	Ditto ...	Hindu Játs, Chamárs; various.
46	Ladhan Jíka ...	1,249	21st May 1898.	21st May 1898.	17th June 1898.	9	5	24th May 1898.	Ditto ...	Sehnís ...
47	Bhaura	1,004	25th May 1898.	25th May 1898.	18th June 1898.	4	2	27th May 1898.	Ditto ...	Rájpúts ...
48	Turan	233	Ditto ...	Ditto ...	15th June 1898.	4	2	Ditto ...	Ditto ...	Hindu Játs ...

in villages of the Bunga Circle—concluded.

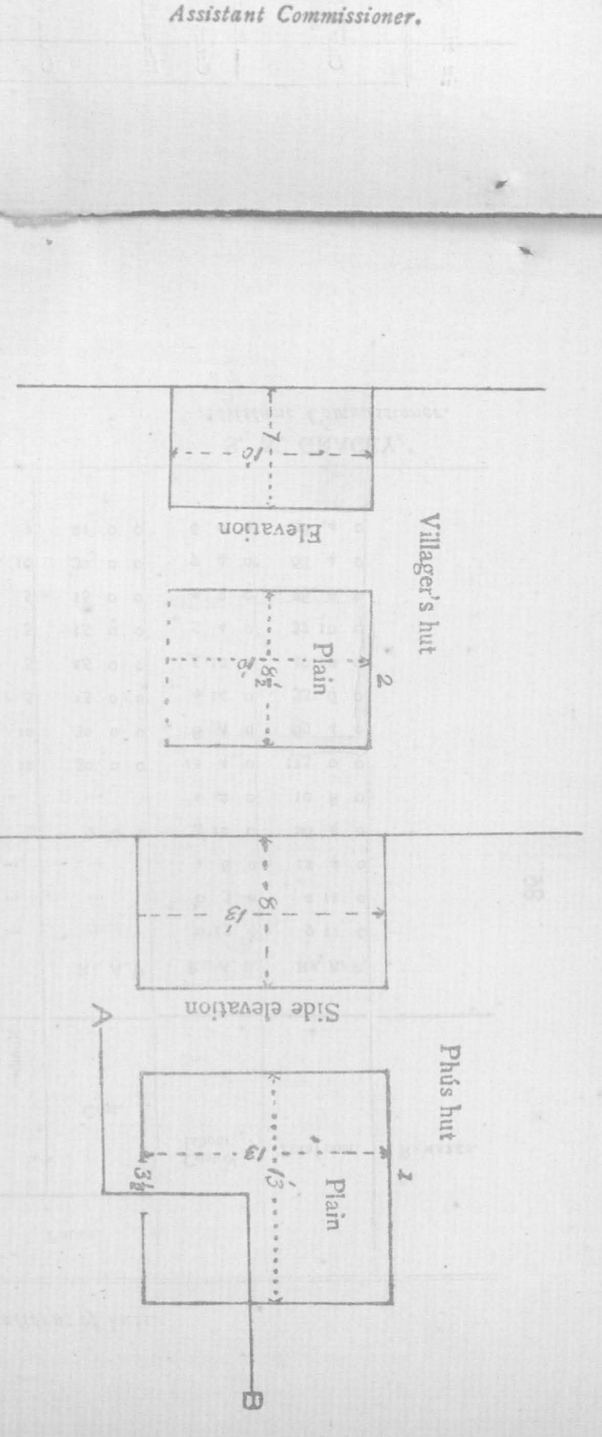
Class of inhabitants attacked.	Whether disease went right through or not.	Cause of delay in going out to camp.	Cause of delay in return.	Remarks.
General ...	General ...	No delay	No delay.	
Játs and Chímbas ...	In two localities ...	Ditto	Ditto	The disease rapidly ceased after evacuation, though our medical treatment was entirely refused. The mortality is heavy.
Chamárs and Játs ...	General ...	At first only one women, a Chamári, was attacked: no other cases occurred till just before the evacuation.	Ditto	It is possible that cases were concealed here.
General ...	Ditto ...	Plague was suspected earlier, but not confirmed. The people were rather unwilling to go out at first, but came to reason in a day or two.	Ditto	People put back through fear of rains.
One Chamár; rest Játs	Confined to special localities.	No delay	...	
Sehnís and Játs attacked.	One locality only ...	Ditto	No delay	This village was put back very quickly owing to the rainy weather.
Chamárs only ...	One locality ...	Ditto	Ditto	This village was put back very quickly owing to the rainy weather.
Játs and Brahmins ...	Special locality ...	Ditto	Ditto	People put back through fear of rains.

S. W. GRACEY,
Assistant Commissioner.

Statement showing the dimensions, materials and cost of different patterns of huts.

No.	Patterns.	Dimensions.			Bamboos.		Sirkis.		Phus.		Ban.		Poles.		Cost of labour.	Total cost.	Remarks.
		Length.	Breadth.	Height.	Number.	Cost.	Number of pairs.	Cost.	Amount.	Cost.	Amount.	Cost.	Number.	Cost.			
		Ft.	Ft.	Ft.		Rs. A. P.		Rs. A. P.	Mds.	Rs. A. P.	Srs.	Rs. A. P.		Rs. A. P.	Rs. A. P.	Rs. A. P.	
1	Phús hut ...	13	13	8	50	3 12 0	8	3 0 0	3	2 0 0	2	0 2 0	...	...	0 13 6	9 11 6	
2	Villager's hut ...	10	8½	7	15	1 2 0	3½	1 5 0	...	...	1	0 1 0	...	...	0 3 0	2 11 0	
3	Police hut ...	15	12	8	60	4 8 0	16	6 0 0	...	...	2	0 2 0	...	...	1 8 0	12 2 0	
4	Deputy Inspector's hut	10	10	8	40	3 0 0	27	10 2 0	...	...	6	0 6 0	3	9 0 0	3 12 0	26 4 0	
5	Bania's hut ...	12	12	7½	35	3 4 0	16	6 0 0	...	...	2	0 2 0	...	...	1 2 0	10 8 0	
6	Hospital hut ...	28	18	10	200	15 0 0	150	56 4 0	...	...	40	2 8 0	10	30 0 0	11 4 0	115 0 0	
7	Nurse's hut ...	26	11	10	100	7 8 0	60	22 8 0	...	...	16	1 0 0	10	30 0 0	8 4 0	69 4 0	
8	Hospital Assistant's hut	13	10	8	50	3 12 0	30	11 4 0	...	...	8	0 8 0	5	15 0 0	4 14 0	35 6 0	
9	Dispensary hut ...	14	10	8	60	4 8 0	40	15 0 0	...	...	10	0 10 0	5	15 0 0	5 10 0	40 12 0	
10	Kitchen hut ...	12	10	8	50	3 12 0	35	13 2 0	...	...	8	0 8 0	5	15 0 0	5 4 0	37 10 0	
11	Bath hut ...	10	10	8	40	3 0 0	15	5 10 0	...	...	4	0 4 0	5	15 0 0	4 2 0	28 0 0	
12	Tahsíldár's hut ...	24	10	10	100	7 8 0	60	22 8 0	...	...	16	1 0 0	10	30 0 0	7 4 0	68 4 0	
13	Náib Tahsíldár's hut ...	17	10	10	70	5 8 0	40	15 0 0	...	...	12	0 12 0	7	21 0 0	6 0 0	48 4 0	

S. W. GRACEY,
Assistant Commissioner.



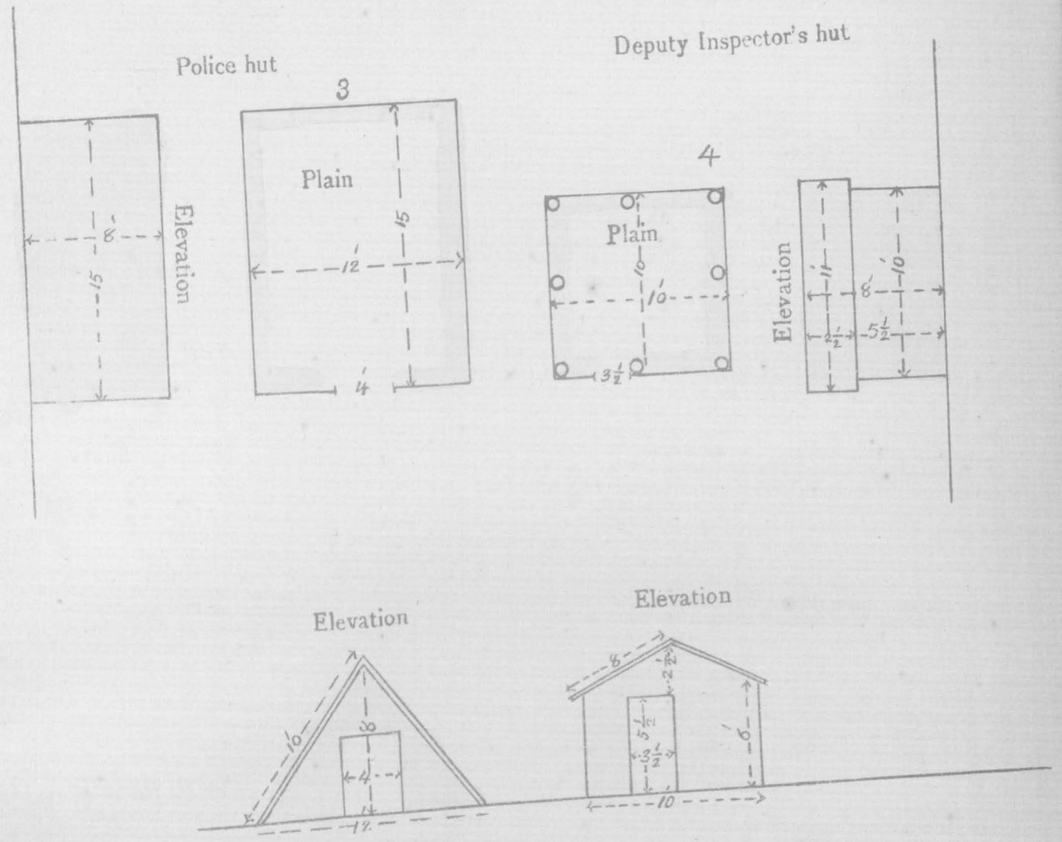
Scale 1 foot to 100 feet.

Estimate of cost for Villager's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos ...	15	7 8 0 per cent.	1 2 0
2	Sirkís ...	3½	37 8 0 „	1 5 0
3	Bán ...	1 str.	0 1 0 per seer.	0 1 0
4	Cost of labour.	...	...	0 3 0
			Total ...	2 11 0

Estimate of cost for Phús hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos ...	50	7 8 0 per cent.	3 12 0
2	Sirkís ...	8	37 8 0 „	3 0 0
3	Bán ...	2 srs.	0 1 0 per seer	0 2 0
4	Cost of labour.	...	...	0 13 6
5	Phús ...	3 mds.	1 8 0 per md.	2 0 0
			Total ...	9 11 6



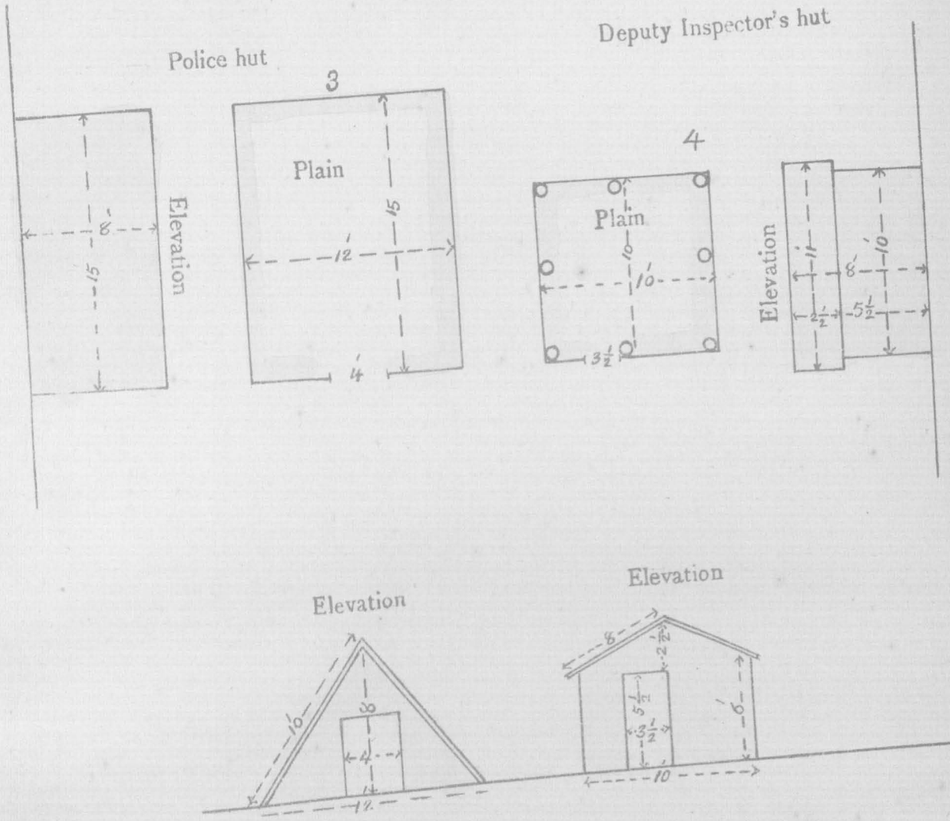
Scale 1 foot to 100 feet

Estimate of cost for Police hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos ...	60	7 0 0 per cent.	4 8 0
2	Sirkís ...	16	37 8 0 ,,	6 0 0
3	Bán ...	2 srs.	0 1 0 per seer	0 2 0
4	Cost of labour.	...	...	1 8 0
			Total ...	12 2 0

Estimate of cost of Deputy Inspector's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos ...	40	7 8 0 per cent.	3 0 0
2	Sirkís ...	27	37 8 0 ,,	10 2 0
3	Bán ...	6 srs.	0 1 0 per seer	0 6 0
4	Poles ...	3	3 0 0 per pole	9 0 0
5	Cost of labour.	...	...	3 12 0
			Total ...	26 4 0



Scale 1 foot to 100 feet

Estimate of cost for Police hut.

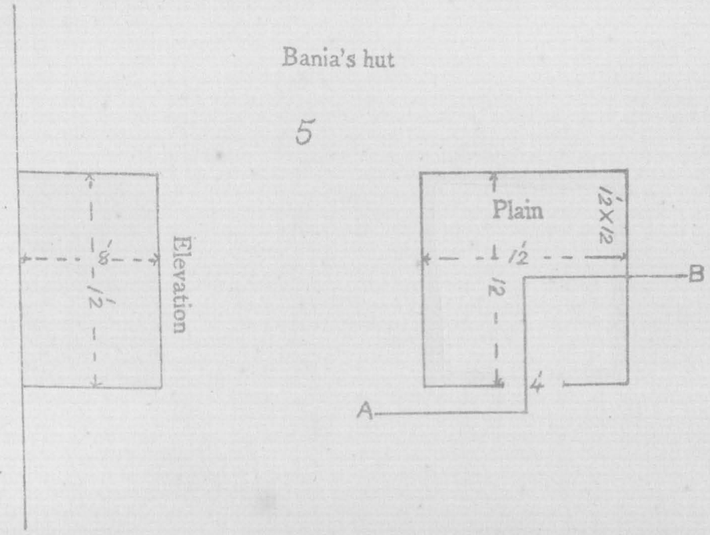
No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos ...	60	7 0 0 per cent.	4 8 0
2	Sirkís ...	16	37 8 0 „	6 0 0
3	Bán ...	2 srs.	0 1 0 per seer	0 2 0
4	Cost of labour.	...	...	1 8 0
			Total ...	12 2 0

Estimate of cost of Deputy Inspector's hut.

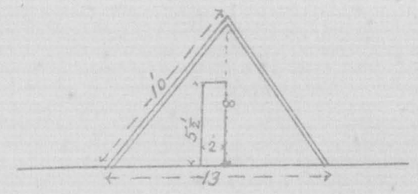
No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos ...	40	7 8 0 per cent.	3 0 0
2	Sirkís ...	27	37 8 0 „	10 2 0
3	Bán ...	6 srs.	0 1 0 per seer	0 6 0
4	Poles ...	3	3 0 0 per pole	9 0 0
5	Cost of labour.	...	...	3 12 0
			Total ...	26 4 0

Bania's hut

5



Cross section



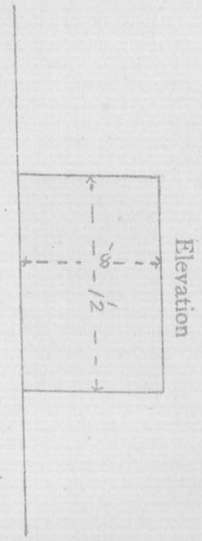
Scale 1 foot to 100 feet

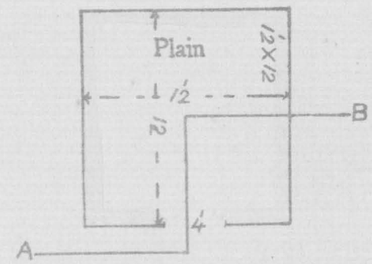
Estimate of the cost of Bania's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	35	7 8 0 per cent.	3 4 0
2	Sirkís	16	37 8 0 „	6 0 0
3	Bán	2 srs.	0 1 0 per seer	0 2 0
4	Cost of labour	...	...	1 2 0
			Total ...	10 8 0

Bania's hut

5





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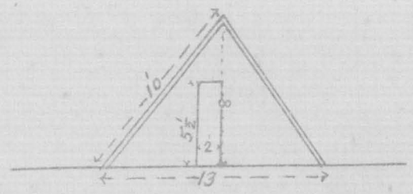
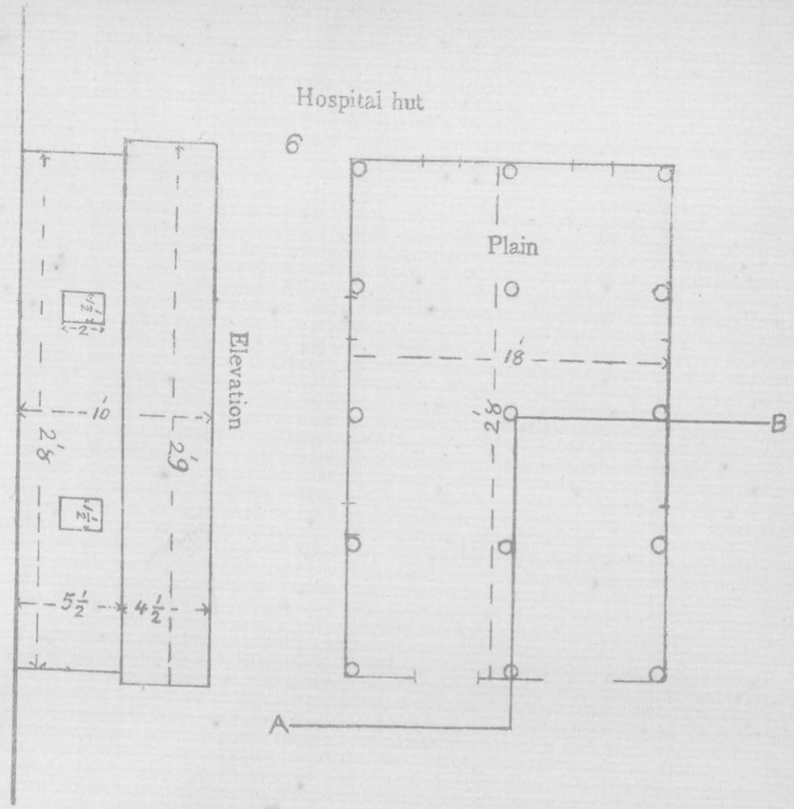


Scale 1 foot to 100 feet

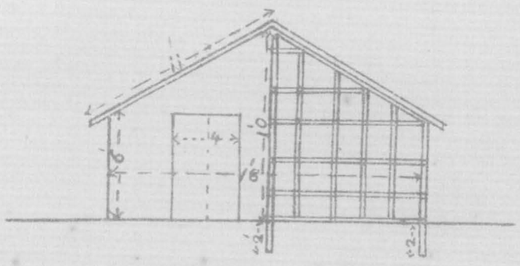
Estimate of the cost of Bania's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	35	7 8 0 per cent.	3 4 0
2	Sirkís	16	37 8 0 „	6 0 0
3	Bán	2 srs.	0 1 0 per seer	0 2 0
4	Cost of labour	...	...	1 2 0
			Total ...	10 8 0

Hospital hut



Cross section A to B



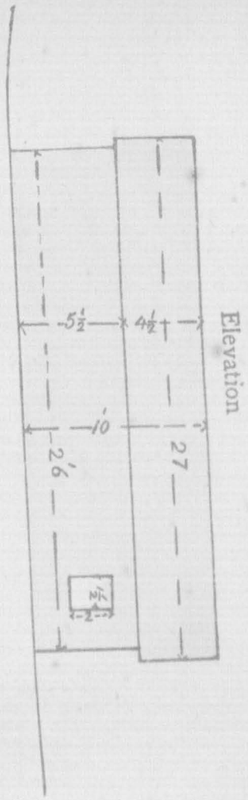
Scale 1 foot to 100 feet

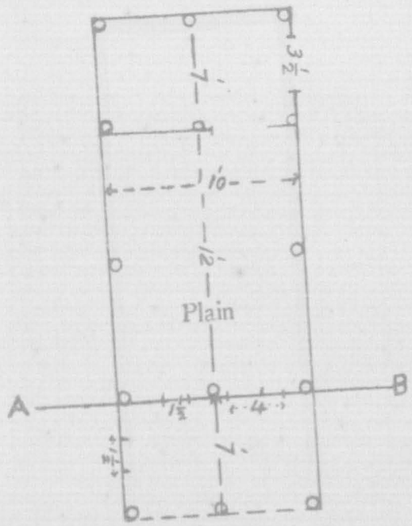
Estimate of cost for the Hospital hut.

No.	Name of article.	No.	Rate.	Amount.	
			Rs. A. P.	Rs. A. P.	Rs. A. P.
1	Bamboos	200	7 8 0	15 0 0	7 8 0 per cent.
2	Sirkís	150	36 8 0	56 4 0	37 8 0 for 100 pair of sirkís.
3	Bán	40 srs.	2 8 0	2 8 0	2 8 0 for one maund.
4	Poles	10	3 0 0	30 0 0	3 0 0 per pole.
5	Cost of labour	...	...	11 4 0	
			Total ...	115 0 0	

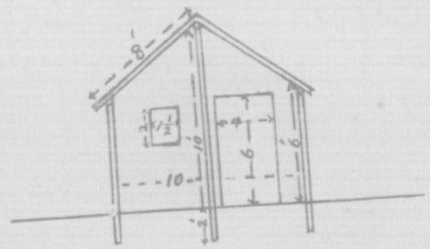
Nurse's hut

7





Section A to B



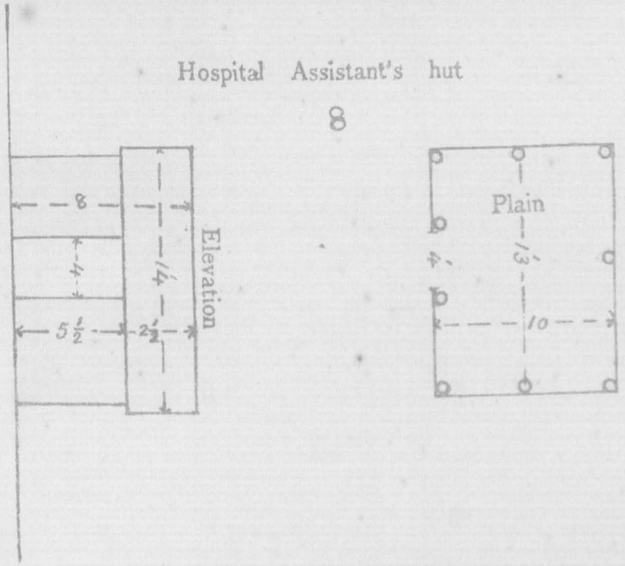
Scale 1 foot to 100 feet

Estimate for the cost of Nurse's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	100	7 8 0 per cent.	7 8 0
2	Sirkis	60	37 8 0 „	22 8 0
3	Ján	16 srs.	0 1 0 per seer	1 0 0
4	Poles	10	3 0 0 per pole	30 0 0
5	Cost of labour	...	...	8 4 0
			Total ...	69 4 0

Hospital Assistant's hut

8



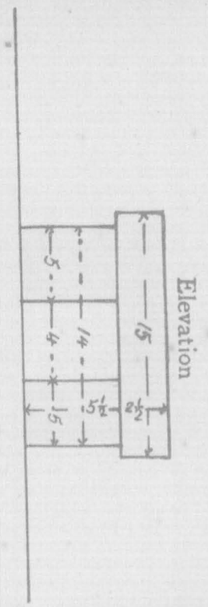
Scale 1 foot to 100 feet

Estimate of cost for the Hospital Assistant's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	50	7 8 0 per cent.	3 12 0
2	Sirkís	30	37 8 0 „	11 4 0
3	Poles	5	3 0 0 per pole	15 0 0
4	Bán	8 srs.	0 1 0 per seer	0 8 0
5	Cost of labour	„	...	4 14 0
			Total ...	35 6 0

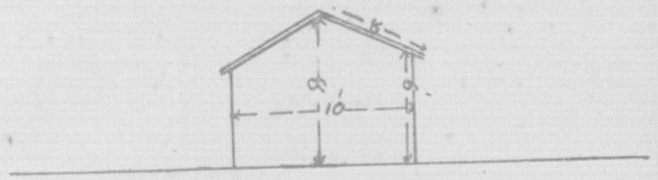
Dispensary hut

9





Elevation

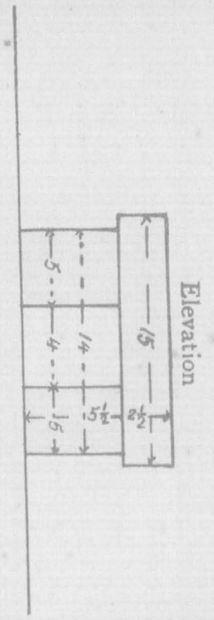


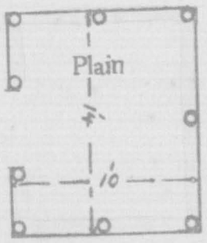
Scale 1 foot to 100 feet

Estimate of cost of Dispensary hut.

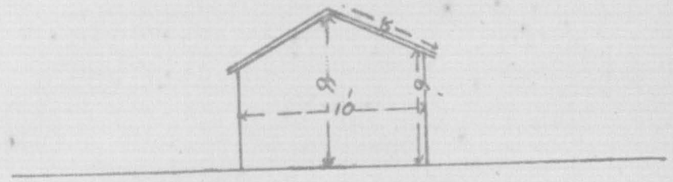
No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	60	7 8 0 per cent.	4 8 0
2	Sirkís	40	37 8 0 „	15 0 0
3	Bán	10 srs.	0 1 0 per seer	0 10 0
4	Poles	5	3 0 0 per pole	15 0 0
5	Cost of labour	...	...	5 4 0
			Total ...	40 6 0

Dispensary hut





Elevation



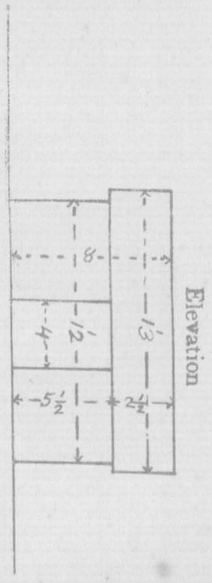
Scale 1 foot to 100 feet

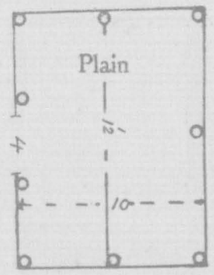
Estimate of cost of Dispensary hut.

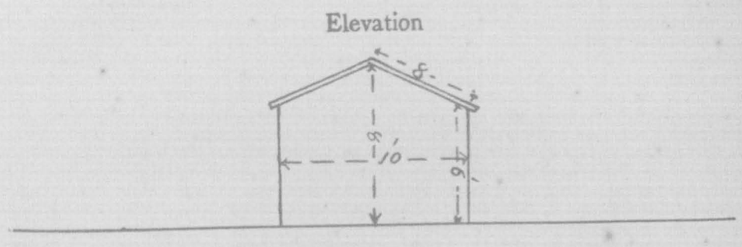
No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	60	7 8 0 per cent.	4 8 0
2	Sirkís	40	37 8 0 ,,	15 0 0
3	Bán	10 srs.	0 1 0 per seer	0 10 0
4	Poles	5	3 0 0 per pole	15 0 0
5	Cost of labour	...	...	5 4 0
			Total ...	40 6 0

Kitchen hut

10





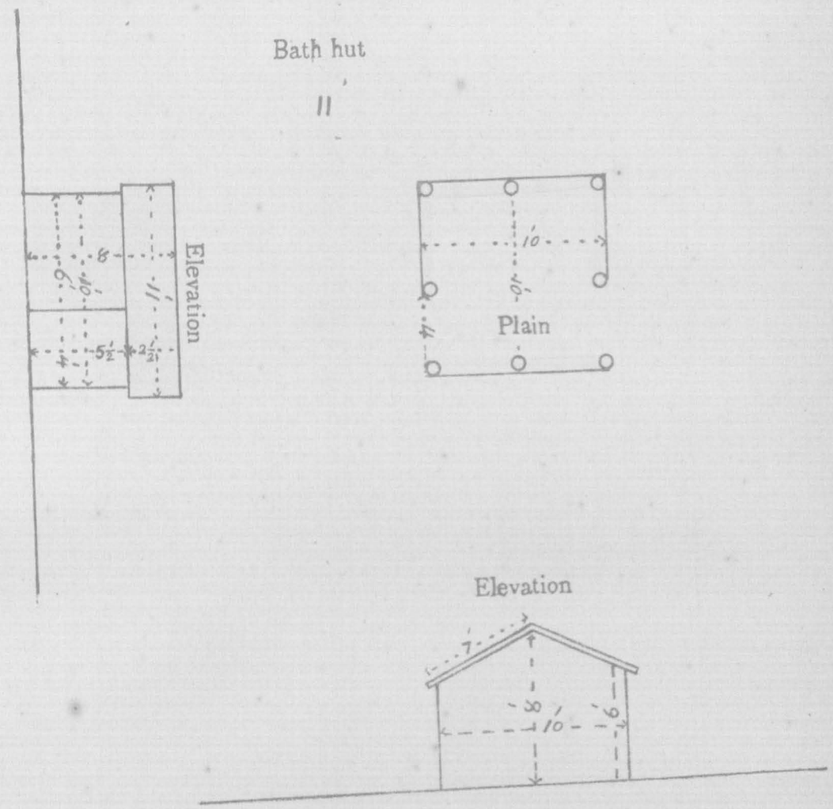


Scale 1 foot to 100 feet

Estimate of cost of one hut for kitchen.

No	Name of article.	No.	Rate.	Cost.	
			Rs. A. P.	Rs. A. P.	Rs. A. P.
1	Bamboos	50	3 12 0	3 12 0	3 12 0 for fifty bamboos
2	Sirkís	35	37 8 0	13 2 0	37 8 0 per cent.
3	Bán	8 srs.	0 1 0	0 8 0	0 1 0 per seer.
4	Poles	5	3 0 0	15 0 0	3 0 0 per pole.
5	Cost of labour	...	...	5 4 0	
			Total ...	37 10 0	

Bath hut

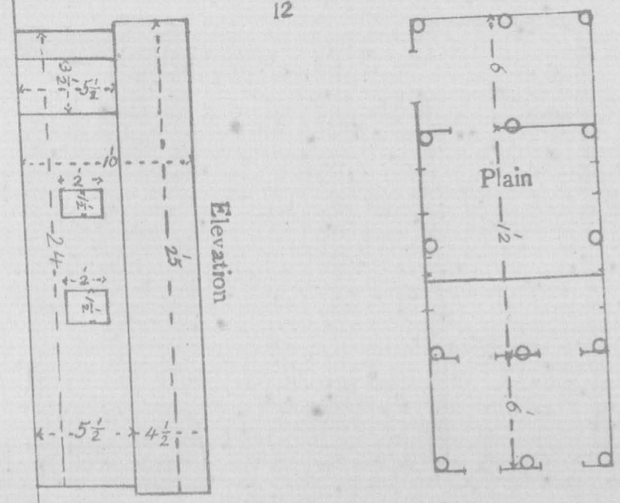


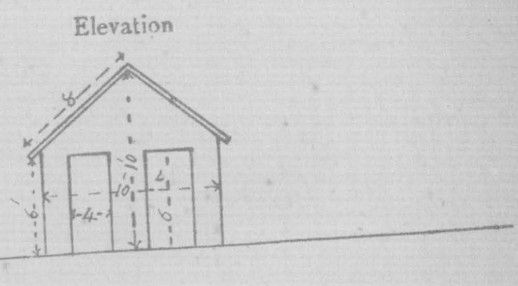
Scale 1 foot to 100 feet

Estimate of cost for bath hut.

Name of article.	No.	Rate.	Cost.
		Rs. A. P.	Rs. A. P.
Bamboos	40	7 8 0 per cent.	3 0 0
Sirkís	15	37 8 0 ,,	5 10 0
Bán	4 srs.	0 1 0 per seer	0 4 0
Poles	5	3 0 0 per pole	15 0 0
Cost of labour	...	...	4 2 0
		Total ...	28 0 0

Tahsíldár's hut





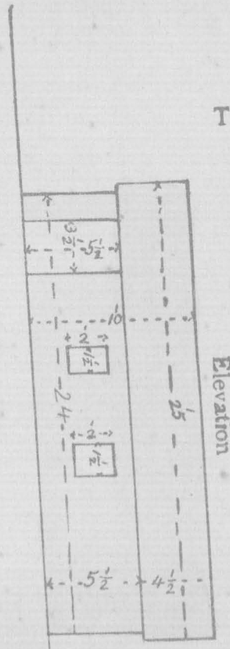
Scale 1 foot to 100 feet

Estimate for the cost of Tahsíldár's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	100	7 8 0 per cent. ...	7 8 0
2	Sirkís	60	37 8 0 " ...	22 8 0
3	Bán	16 srs.	0 1 0 per seer ...	1 0 0
4	Poles	10	3 0 0 per pole ...	30 0 0
5	Cost of labour	...	...	7 4 0
			Total ...	68 4 0

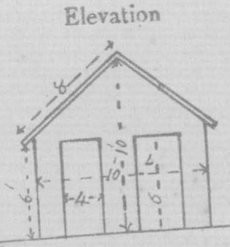
Tahsíldár's hut

12





Elevation



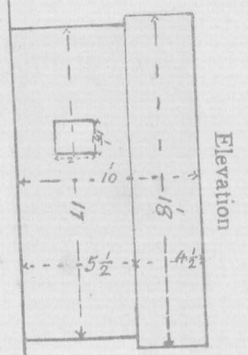
Scale 1 foot to 100 feet

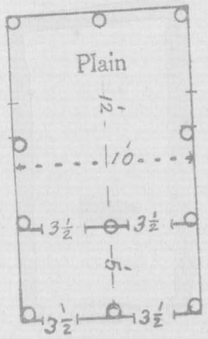
Estimate for the cost of Tahsíldár's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	100	7 8 0 per cent. ...	7 8 0
2	Sirkís	60	37 8 0 " ...	22 8 0
3	Bán	16 srs.	0 1 0 per seer ...	1 0 0
4	Poles	10	3 0 0 per pole ...	30 0 0
5	Cost of labour	...	...	7 4 0
			Total ...	68 4 0

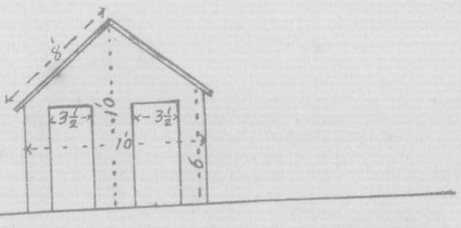
Náib Tahsíldár's hut

13





Elevation



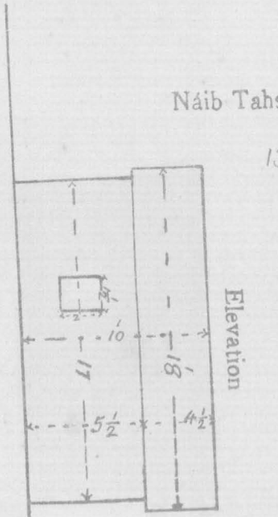
Scale 1 foot to 100 feet

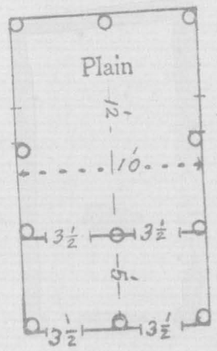
Estimate of cost for Náib Tahsíldár's hut.

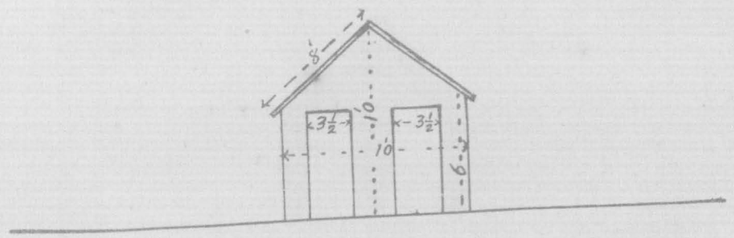
No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	70	7 8 0 per cent.	5 8 0
2	Sirkís	40	37 8 0 „	15 0 0
3	Bán	12 srs.	0 1 0 per seer	0 12 0
4	Poles	7	3 0 0 per pole	21 0 0
5	Cost of labour	...	...	6 0 0
			Total ...	48 4 0

Náib Tahsíldár's hut

13







Scale 1 foot to 100 feet

Estimate of cost for Náib Tahsíldár's hut.

No.	Name of article.	No.	Rate.	Cost.
			Rs. A. P.	Rs. A. P.
1	Bamboos	70	7 8 0 per cent.	5 8 0
2	Sirkís	40	37 8 0 „	15 0 0
3	Bán	12 srs.	0 1 0 per seer	0 12 0
4	Poles	7	3 0 0 per pole	21 0 0
5	Cost of labour	...	...	6 0 0
			Total ...	48 4 0

APPENDIX B.

Report on Plague Operations in the Garhshankar Circle by Mr. Langley, Assistant Commissioner.

IN reply to your letter No. 1116 (June 11th, 1898), I have the honor to forward the following report.

I was not put in charge of the executive plague work at Garhshankar until May 7th. Consequently, of the 16 villages which have been visited with plague in the Hoshiárpur District, I have only had to do with 7, and of these 5 had been evacuated before I took over charge. Only Bhagwain and Ibráhímpur became infected during my term of office.

With regard to the other villages, I have consulted the diary of Mr. Stow, Assistant Commissioner, continued for a few days by Mr. Leslie Jones, Assisiant Commissioner. In this diary, however, the dates when the villages were evacuated or declared free are seldom given; in but few cases too does it appear that an attempt was made to discover the source of infection.

Consequently the information that I am able to give on point (1) of your enquiries is very incomplete.

(1). (1). *Bahrámpur* was the first village to become infected with plague, the appearance of which is, I understand, traced to Jullundur (village Khatgarh I believe). This occurred in December 1897, and I have no record by me with regard to the treatment of Bahrámpur.

(2). *Parkhowál.*—The first case was found on February 1st, 1898, and the village was evacuated by the 4th. The spread of plague to this village is attributed either to thieves (Gujars) from Bahrámpur or to arrivals from Mandi State, in a part of which plague is known to have existed.

Cleaning of the village began on February 16th, and the last case was on March 10th; but it is not recorded when the village was reoccupied. Plague does not seem to have been confined to any one class.

(3). *Rámpur Bilron.*—This village has been attacked twice. The first case was on February 4th, among the Chamárs. Only this class was segregated and their houses cleaned, they being allowed back in the village when plague seemed to have died out among them.

The cause of the appearance of the disease is not traced.

This partial evacuation and cleaning was not successful, a recrudescence appearing on April 15th; from where is not noted; but there is no reason to suppose that plague was stamped out in the village. At this time a policy of *laissez-faire* prevailed, and little attempt was made to get the people out of the village until after the Gharshankar riot (April 28th), when the village was wholly evacuated, being empty on May 3rd.

The village is now almost ready for reoccupation, delay having been caused by repeated fresh single cases after intervals. The village has been thoroughly recleaned.

Infection is confined to Bilron and to the half of the village towards the Chamárs' quarters where plague first appeared.

(4). *Simal Mazra.*—First case on February 8th. Disease seems to have been brought from Shikohpur in Jullundur by fakírs visiting fakírs in Simal Mazára. At first only fakírs and adjoining low caste inhabitants were turned out into *chappars*, but as this did not stop the spread of the disease, on February 26th adjoining Ját houses (some 150 men) were turned out. This further evacuation was successful. It does not appear whether or how the whole village was cleaned, nor is any date of reoccupation given.

(5). *Deron.*—First case on February 15th, a probable cause of the disease being, as in Simal Mazra, the visists of fakír from Jullundur. The village (small) was evacuated by February 20th and reoccupied some time towards end of March.

(6). *Bhajjal.*—First case on February 21st, infection having possibly been brought by Kasáis who were living guarding fruit trees in the neighbourhood of Bahrámpur and who probably also visited Parkhowál.

Owing to lack of huts only those actually suffering from plague and their immediate connections were segregated. This was done at once. Afterwards the Chamárs and some Játs were turned out. The disease in Bhajjal took a virulent form, due doubtless to the delay in evacuation and the partial nature of the evacuation.

Cleaning of the village was not commenced till March 13th, and it is not recorded when re-occupation was allowed.

Sadhowál was found to be badly infected on March 6th. The whole village was promptly evacuated by the evening. Source of infection not traced.

Hájipur was found to be infected on March 9th. At first only the Chamárs were put into camp; but the disease spreading and taking a virulent form, the whole village was evacuated on April 2nd. It was reoccupied on March 2nd. Source of infection not recorded.

Párowál—Found to be attacked on March 24th. Village wholly evacuated and cleaning finished on April 24th.

Garhshankar.—First case found on March 29th; almost certainly other cases before this. A number of people, mostly Katrís, went into camp voluntarily, and people found to be suffering from plague were removed into segregation from time to time.

The town was not wholly evacuated until May 2nd or 3rd, Colonel Massy's order being that no force should be used to induce the people to turn out.

Infection may possibly have come through the school. There is a large boarding school established in the town, of which several of the boys belong to previously-infected villages. The first discovered case, too, was a school boy. However, Gharshankar is a market town, and plague may have been brought from any infected village.

The whole town has been well cleaned and disinfection of persons and property is proceeding. Considering the size of the town, there has been no undue delay after evacuation.

Saunli.—First case on April 4th, source of infection being almost certainly Hájipur The whole village was quickly evacuated. Disease here not severe, though not confined to any one class. Village reoccupied May 2nd.

Kallewál.—First case April 13th. Kallewál is close to Simal Mazra, and disease probably spread from there. The whole village was not turned out till after the Garhshankar riot (April 28th). Nearly all cases occurred during this time. Village reoccupied June 12th.

Garhi.—First case April 19th. Infection from Sadhowál through a Lohár woman of Garhi, who went there to work before Sadhowál was declared free. Infection in Garhi widespread and mortality heavy owing to village not being evacuated till May 2nd. Reason for delay same as in case of Garhshankar. Village reoccupied June 15th.

Chinkoha.—First case April 23rd. At first only Chamárs, among whom plague was discovered, turned out. Whole village evacuated after Garhshankar riot, but delay not long enough to allow disease to get a hold. Only sporadic cases since. Village re-occupied June 15th.

Bhagwain.—First case May 19th. Infection probably from Garhshankar through a shop-keeper in neighbouring police camp. Village evacuated at once, attacked quarter being successfully segregated. No cases except in latter (segregation) camp. Village about to be re-occupied.

Palewál.—First case June 3rd. Infection from Garhi through village hakím. Infected quarter turned out. Delay of one week in complete evacuation, permission being given until further cases occurred. Two other cases occurring in segregation camp. Village evacuated.

Village now being cleaned.

2. A supply of sirkís and bamboos for huts could always be commanded at short notice from Ludhiána, Phagwára or Hoshiárpur. The supply could consequently always be kept up to the demand, except occasionally when a number of villages became attacked almost at the same time.

To start with, phús grass was used, but the supply of this failed, and then only sirkís were employed.

The sirki chappar is not so good a protection against sun (nor I think against rain) as the ordinary phús chappar. Against the sun, however, the people themselves put sheets and coverings of their own over the sirkís, the usual form of which is the ordinary ^ shape and is composed of four pairs sirkís, 16 bamboos with 2 seers of bán for tying them together.

A sirki chappar can be made in less than half the time required for a phús chappar, the usual recognised rate of work being four sirki chappars per man a day.

I advocate, in times of rain, a sirki framework with a phús covering, the material being two pairs sirkís, 20 bamboos, four bundles of phús and two seers bán. This makes a much thicker and stronger chappar, and would also afford a greater protection against the sun. In this respect I think the ordinary sirki hut is scarcely adequate. It leaks in time of rain and is a very thin covering against the sun.

The disadvantage of the latter chappar is that one man can only make two of them as against four ordinary chappars.

For large chappars, such as are supplied for hospitals or native officials, we have always used phús, sirki not being strong enough or giving sufficient protection. The usual form has been Mistrís can make any form of hut required, and for special purposes such as the latter will build any shape to suit circumstances.

3. Different castes usually require different camps, or, at least, a small interval between the groups of chappars allotted to each caste. Hindús, Muhammadans and Chamárs usually require distinct wells.

There is no objection to having a number of small camps scattered about, wherever trees can be found; in fact, the object being to give the people air and light, it is desirable not to have large crowded camps. In some of the Garhshankar villages trouble has been caused by the small number of wells available, *e. g.*, in Bilron one of the wells which had to be used is inside the village. This of course partially defeats the purpose of turning the people out of the village. On the other hand, latterly in some villages, *e. g.*, Garhshankar and Garhi, we allowed the people to use wells on the verge of the village site, to water tobacco without bad results. The first point to go for in fixing camps is of course the number and position of the wells.

The first camp to be chosen is the hospital camp, and the best place as regards shade has usually been given to this camp. This consists of sick persons with one attendant each.

The segregation camp, consisting of the houses in which there is a case of plague and those houses which by their proximity to infected houses may be reasonably deemed likely to be infected, has been kept separate from the hospital camp, though it is usually impossible to prevent people going from one to the other. It is not possible as fresh cases occur in a segregation camp to further segregate the family in which the case occurs, though for the safety of the rest of the segregation camp this is what should be done. The question of water and food supplies prevents this being done. The segregation camp has been regarded as a more or less doomed quarter which must take its chance.

The important point is, on the discovery of plague in a village, to make a judicious segregation and then to cut off the segregation camp by guards from the health camps. Through paucity of police force we have usually been unable to do this at all.

It is almost equally important to guard the village site, but for the same reason we have been unable to do this at all adequately.

When the cleaning of the village begins it is further necessary to segregate the cleaning gang, among whom one or more cases of plague usually appear. Practically, this gang should be put in the segregation camp, or at a short distance from it and included in the same guard. There is a difficulty with regard to the feeding of this gang. Our arrangement has been to let their relatives bring them their food to within a short distance and there deposit it. Without very careful looking after, it is impossible to say that intercourse does not take place. We could only impress on the men the danger they were causing to their families by having anything to do with them.

We have thus had the following camps: 1 hospital, 2 segregation, 3 health, 4 isolated chappars for the working gang to sleep in. Within these camps there have been sub-divisions to suit the requirements of castes or the nature of the place.

4. Villages have been equally divided among Assistant Commissioners (or officers doing the same work), and each Assistant Commissioner has had practically independent charge, the Assistant Commissioner in charge of the district having a general authority in order to maintain as far as possible a consistent policy throughout. Assistant Commissioners have when possible visited their villages once a day, listened to arzís throughout the camps and received reports from such officials as Náib Tahsildárs, Hospital Assistants and Lambardárs.

The cleaning work has been wholly in the hands of the Medical Officers. If an Assistant Commissioner interferes with this, contradictory orders and friction arise. The Assistant Commissioner has seen to the payment of the cleaning gang and to the supply of materials.

Turning people from their houses and keeping them within narrow limits naturally changes the course of life of the people in many respects, and collectively and in individual instances arrangements have to be made, especially when a village is evacuated at time of harvest. A Náib Tahsíldár is a useful official to put in charge of a village at this stage, and one Náib Tahsíldár I have used in this way.

A second Náib Tahsíldár has been kept almost exclusively for Garhshankar, and to arrange for the distribution of certain articles, such as lime.

Some days after the evacuation of a village most necessary arrangements have been made, and any further arrangements can be made by the Assistant Commissioner on his daily visits. In a large village (such as Garhshankar) a Kánúngo is useful to keep the *ginti* of the cleaning gangs and prepare bills and distribute pay; the latter has generally been done in the presence of an Assistant Commissioner, who sees that false names are not entered in the bills.

For supplies, three shop-keepers are ordinarily required for a village,—one for the police camp, one for the health camp and one for the segregation and hospital camps. In a small village one is sufficient for the first two camps. It is important not to have the segregation camp dealing with the same shop-keeper as the health camp. If there are not shop-keepers available in the village they have to be brought from outside and receive additional pay (Rs. 10—20 a month); when a shop-keeper's stock runs short he can get more by letter from his usual source, the supplies being unloaded at the cordon.

It is necessary to keep an eye on these outside shop-keepers, especially those of a hospital or segregation camp, as they naturally prefer to arrange personally for their stores and also to visit their relatives at times or do a little business in neighbouring villages. The Lambardárs of their village should be especially warned.

The usual business transactions between villages can usually be arranged by post. In special cases, such as bringing in the harvest from outside the cordon, special arrangements can be made under the management of a Náib Tahsíldár or the police. In all such cases a written application has been put in and orders passed on it. Generally speaking, it was almost always possible to make some satisfactory arrangement. On the whole, I think the usual course of business and work has not been much diverted.

5. As a rule, it takes two full days to get the people of an ordinary-sized village into camp and independent of the village. They get out most of their property on the first day but they generally find, on the second, that there is a number of things they have forgotten and arrangements to be made, especially with regard to grain and the feeding of their cattle, for which they have to bring out bhúsa.

Perhaps the greatest difficulty in connection with the cleaning of a village is the question what to do with the grain stored in the houses. Since grain, like everything else, should be disinfected, the simplest thing to do is to have it all taken out into the camps; and this has always been done in the case of infected houses. When, however, there are large stores of grain, this is difficult, and there is not proper accommodation for it in camp. Latterly, therefore, when there has been a daily fear of rain, we have allowed the occupants of non-infected houses at the time of vacating the village to take out from the kothís all their grain and spread it in their courtyards or on the roofs where it will be exposed to the sun, permitting one man of each house to enter the village once a day at a certain time and turn the grain over. In the event of rain the grain can be temporarily put under cover. When the cleaning of the uninfected houses begins, the first things cleaned in every house are the kothís. The grain is then put back in the cleaned kothís, and the cleaning of the houses is then commenced. Anxiety with regard to grain (a very important point) is thus minimised.

Before this is done, however, the infected houses are cleaned ten days after evacuation of the village. Ten days seems an unnecessarily long time to wait. We have always done the cleaning of infected houses by a small gang of Chamárs, and latterly all these have been inoculated previously. Without inoculation we have refused to allow them to work, and the Chamárs are naturally anxious for work which means pay (3 annas a day). While the clearing of infected houses is going on, more menials (if any) and a a number of householders are inoculated so as to be ready to form a larger gang to clean the uninfected houses.

When the cleaning of infected houses is over, the now increased body of cleaners start first on the grain kothís and when these are done on the uninfected houses. If the village is large, separate gangs can be formed for each patti. Hospital Assistants are much the best men to look after cleaning.

It is necessary to allow the owner of each house to be present when work is started in his house, to open it and see that his property is all right. This, though theoretically there may be no danger, is in practice a dangerous rule, as it involves a continual connection between the health camp and the village, a connection which ought to stop as soon as possible, and not later than the final disposal of the grain in the kothís. We can never be sure that infection is not being brought from the village to the health camps. Later cases which occur in health camps must generally, I think, be attributed to this rule.

If the present system is continued, all property except grain should be taken into camp, and after the grain has been put back in the kothís, houses should be left open and no one allowed from the health camp into the village. The disinfection of actually infected houses should be begun almost at once and should not take long. This must be done by a small gang to prevent the chance of infection to a large number of cleaners (besides, a large number is not necessary). Then should follow the cleaning of kothís and the putting back of grain by house-holders. This would bring us to about a week after evacuation.

Connection between the village and the health camps is then at an end, and after, say, ten days it should be reasonably certain (if there is no case in the health camps) that there is no infection there.

Persons and property in the health camps should be disinfected on evacuation of the villages, thus removing all chance of the existence of infection in the health camp. After these ten days, or ten days after the last case in the health camps, the cordon could then be removed from outside.

We have not carried out disinfection of the health camps at time of evacuation, partly because of lack of proper overseers for this work, which has to be well looked after, and partly because under the present rules it is not necessary, the cordon being kept on six days after the village is re-occupied and property in the camps having been disinfected previous to re-occupation.

But I consider the retention of the cordon all this time an unnecessary waste of police and restriction of the mass of the villagers.

The village site, the segregation, hospital and camp of cleaning gang should be cordoned as much from the health camps as from the rest of the world.

There is a daily roll-call in all the camps carried out by the Hospital Assistant. It would of course be better to have this done by some one not connected with the hospital. If the cordon were removed the necessity for a roll-call would cease.

In cleaning the infected houses the whole roof is removed. Compensation on an average of Re. 1 per roof is given to poorer people. In the case of richer zamíndárs to whom in the cleaning of their houses labour and lime is supplied without charge there is no need to give compensation. Similarly in the case of uninfected houses, where only a hole is made in the roof, the damage is not sufficient to necessitate compensation being given.

The lime has throughout been supplied free. I have no figures showing the amount of lime used previously, but since I took over charge the consumption of lime amounts to from 1—2 maunds (pakka) per house, which I believe is a great increase on previous consumption, but there is no question that the cleaning work has been very much more thoroughly done of late, though it must be admitted that the previous style of cleaning seems to have been sufficient, no wholly cleaned village having become re-infected.

At the time of destruction of property of small value in infected houses it has been estimated almost always in the presence of an Assistant Commissioner, and compensation will be given. Property of value has been carefully disinfected.

It is necessary to give a certain amount of subsistence to indigent people thrown out of work by being turned out of the village or prevented from going outside. The amount varies according to the size and nature of the village, but I have carefully gone through the lists, in the presence of the people, of those to whom subsistence has been given in my time. There can be no question that some subsistence is required, and not to give it simply means that extreme want of which perhaps nothing may be heard is caused. It can, however, be minimised by making large cleaning gangs, by which, too, the village is more quickly cleaned. Zamíndárs are usually anxious to help in the cleaning (when the menials are few) and so hurry up the work. They should not, as a rule, be paid, and the gang should in the first instance be made up from inoculated menials and poor people (adult males or well-grown boys). Where richer house-holders are required to work and refuse to, they should be charged for a certain amount of labour, though this has rarely been done.

6. The strength of the cordons has, as far as possible, been kept up to ten sentries to the mile; in places this has been increased. As I have said before, I think this cordon could be removed after a time. On the other hand, we have usually been unable to guard, certainly not able to guard adequately, the villages and the segregation and hospital camps. Certainly people have got through the cordons, but to say that they are therefore of no use is to confound uselessness with imperfection. Cordons have prevented numbers, and certainly the sick of an infected village, being removed and carrying infection elsewhere.

If cordons are maintained some system of passes is necessary. The reason for passes being clear, officers in charge will naturally only grant them when necessary and where there is no danger. Strict rules cannot be laid down; the discretion of officers might be relied upon in this case. Each Assistant Commissioner, Police and Medical Officer should be allowed to give passes to those who come within his sphere of action, spheres which are generally recognised.

If the present system is maintained a quarantine camp is a necessity. Not only should healthy people be allowed to leave under precautions, but it is occasionally necessary to allow them to leave. As stated above, precautions and measures might be taken to render the whole health camp free from infection, in which case a quarantine camp is not necessary. In time the sickness in a segregation camp ceases, and after a time the whole segregation camp may be considered healthy. The risk of allowing any person from a segregation into a quarantine camp and of consequently causing general infection and delay seems too great. A segregation camp should be kept intact until healthy as a whole.

7. I found that one English-writing clerk was a necessity, and an English-writing Muharrir was also of great use. The work of course varied at times, but at least one Muharrir has always been necessary.

Names of persons who have done good work in connection with plague.

I have the following names from Mr. Stow, Assistant Commissioner, of men who did good work in his time:—

Tahsíldár.—Sardár Hamdam. (This Tahsíldár has not worked hard while I have been in charge.)

Naib Tahsíldárs.—Lala Ganpat Rai.

Munshi Amír Bakhsh.

S. Fazl Karím.

Amír Bakhsh has done very good work wherever *intizám* has been required. He is a capable man and can get people to do what he wants. He has also worked hard.

Fazl Karím was originally on observation duty, but was put on the other work when Garhi and next Bilron were turned out. He has remained at the latter village, and though he has not the gift of commanding obedience, he has worked hard, as he also did on observation work.

Clerks—B. Ajudhia Pershád.

Everybody who has had anything to do with this man commends him. He is one of the most intelligent clerks I have met. He is very hardworking and is always ready to be of service. He would make an excellent Serishtadár.

I strongly recommend him for either promotion or a substantial reward.

Zaildárs.—Khem Singh of Badiána.

Imám Bakhsh of Garhshankar.

Ghulám Jailáni of Garhshankar (officiating).

Naamat Khán of Chinkoha (if he has done well since).

I know nothing good about these men. The last named has not done well since; in fact he has kept out of the way, except once, when he made trouble.

Ghulám Jailáni has also been of no assistance when Garhshankar was out.

Imám Bakhsh, I understand, did some good work in Birámpur. He has been of no particular use in connection with Garhshankar.

I know of no instance in which *Khem Singh* has helped us in respect of Bilron.

Personally I think none of the Zaildárs should be rewarded.

Safed posh.—Lál Chand of Rámpur Bilron. This man has certainly done very good work in my time, too and will probably be mentioned by the Medical Officer in connection with cleaning work.

I recommend him for a reward and should like to see him made a Zaildár.

Mr. Stow refers to two *safed poshes*—one of Rurki Mughlán and one of Simal Mazra—of whose names he is not certain. I shall send them in later.

Lambardárs.—Sone Khan (1), Sone Khán (2), Tare Khán } of Birámpur.

Sáhibdád Khán of Rurki Mughlán.

Nabi Bakhsh (Rájpút) of Hájipur.

The Birámpur men have made a good thing out of lime, and I think have reaped a reward in that way.

I know nothing about the other Lambardárs mentioned, and have no others to recommend.

Hospital Assistants and Compounders.—These will also be written about by the Medical Officer, but since the present Medical Officer has only had charge a short time, Mr. Stow's commendations will be of value:—

(1) Karm Chand,
(2) Mangal Sain,
(3) Gyás-ud-din, } Hospital Assistants.

(1) Jai Dyál,
(2) Sundar Dás,
(3) Barkat Rám, } Compounders.

I also especially recommend Karm Chand (1), Hospital Assistant, for a reward. He is a most capable man, quiet and to be depended on. He strikes me as being too good for a Hospital Assistant.

Hakím Shah Naváz Khan of Garhshankar will doubtless be also commended by Medical Officer. The one hakím who has really tried to work with us.

Chaprássis.—(1) Banne Khan, Jamadár.

(2) Mirán Bakhsh.

(3) Khazán Singh, Jamadár, at Bilron.

(1) is a useful hardworking and capable man. He should be promoted, but is also deserving of a reward. He has been especially connected with the Chahlan business, but has been otherwise useful.

(2) has looked after lime and probably made a good thing out of it. He might receive some reward other than a money reward, as he has kept the lime supply up to time.

(3) has not been prominent in my time.

Private persons.—(1) Bedi Sikhs of Bilron.

(2) Sapúran Singh of Hájipur.

(3) Wazíra of Hájipur.

(4) The Kázi of Sadowál.

I have had more to do with (1) than Mr. Stow, and consider that they should not get a reward. They have only played for their own hand.

Know nothing of (2), (3), (4).

I also recommend *Jiwán Singh* of Bhagwain, a zamíndar, who has been of assistance and energetic in cleaning work.

Some small rewards have already been paid to villagers who have given assistance in their own villages as well as to some who have given information of the presence of plague.

It may be necessary to send in one or two more names.

A. LANGLEY,

Assistant Commissioner.

APPENDIX C.

Report of Plague Operations in the Nawashahr Circle by Mr. Butler, Assistant Commissioner.

CHAPTER I.—GENERAL REMARKS.

1\. Description of the Circle.

1\. THE Nawashahr Circle comprises roughly the villages lying to the east of a line running from Kama on the metalled road on the north past Gunachour on the east and down to Aropur on the Phillour-Ráhon road on the south, and though its borders have never been officially determined, it was understood to include potentially the whole of the Ráhon Thána. It was fed by the divisional agencies of Nawashahr and Aur, though as events turned out nearly all the new villages were discovered through the latter medium. As finally constituted, the circle, exclusive of village lands of Aur, had a circumference of some 32 miles and a total population of 20,924 persons. The bulk of the villages, which amounted in all to 20 in number, were inhabited by Sikh Játs, but there was also a seasoning of Rájpúts in Kumam, Kariha and in one patti of Katheron, whilst the Mehton element was only too conspicious in Sahlon and to a lesser extent, though with equally disadvantageous results, in Karnána. Nawashahr itself lies well outside the circle of which it was the head-quarters, and at a distance of 10 or 11 miles from its furthest village, and the bulk of the work was separated by an interval of at least 8 miles. The eastern and northern parts of the infected tract have a firm loam soil, but from Kamám to the south down to the Ráhon-Phillour road there is an expanse of loose sand which makes camping out uncomfortable for the people and renders them unduly sensitive, especially about their cattle. The circle is enclosed within the metalled road from Nawashahr to Banga on the north and the unmetalled main road from Ráhon to Phillour on the south. It is commanded of its north-east and south-east extremities by the large municipal towns of Nawashahr and Ráhon, and its chief danger lay in the possible, and in fact only too probable, infection of these two important places. It had also another vulnerable point in the large town of Aur. The measures adopted to protect these centres will be detailed later.

Constitution of the circle.

2\. The circle was first constituted on February 2nd on the discovery of the disease at an advanced stage in Shikohpur, and Surgeon-Lieutenant Walton, I. M. S., with Mr. Goldney, Assistant District Superintendent of Police, to control the police, was detached from the Banga Circle to take over subordinate civil and medical charge of this village. On February 28th, after the discovery of Sahlon and Kumam had rendered the combination of civil and medical duties too onerous, Mr. M. S. D. Butler, Assistant Commissioner, was sent to relieve Surgeon-Lieutenant Walton of the former cares, and he was instructed to take his orders from the Assistant Commissioner in charge of the Banga Circle as before. This arrangement remained in vogue for the whole time that the officers' camp remained at Shikohpur and also after it had, with the commencement of the hot weather, been removed to Nawashahr, and it was not till May 16th that the circle was made formally independent and the responsible officer allowed to communicate direct with the Deputy Commissioner on special duty. As, however, no general orders as to its management were ever issued, it formed for all practical administrative purposes an independent charge and can be reviewed as a whole without a loss of perspective.

Superior staff employed. European Officers.

3\. The staff of officers remained practically the same throughout, though it was strengthened for a while during the month of May. Mr. J. P. Thompson, Assistant Commissioner, after recovering from the effects of inoculations, took over subordinate civil charge of 9 out of the then 18 villages on May 10th, but fell ill on May 18th, and was finally invalided off on May 27th. On May 30th Mr. Burton, Assistant Commissioner came in his place to be re-transferred to the Banga Circle on June 2nd, when he was relieved by Mr. Henriques, Assistant Commissioner, who remained on till towards the conclusion of the operations.

On the medical side Surgeon-Captain Smith, I. M. S., took over superior charge from Surgeon-Lieutenant Walton in May, and these two officers carried on the medical arrangements until June 1st, when the latter left the circle. Mr. Goldney remained in sole charge of the Police throughout.

The superior native staff.

4\. The supervising native staff consisted of Assistant Surgeon Jowáhir Singh, who held charge under Surgeon-Lieutenant Walton, and la[illegible] on under Surgeon-Captain Smith, of the hospital and [illegible] fection work in Lodipur, Kumam, Chahlan, Rasúlpur, Mahmúdpur, Karnána, Pa[illegible] Laroya and Jingran and who encamped in Kumam or there abouts throughou[illegible] Tahsíldárs Abdul Sattar and Amar Singh, and Police Inspector Safdar Jang. The [illegible] strength of the inferior medical and police forces will be shown in its proper place[illegible]

5\. The course of the disease in each village and the history of its progress will be examined in the following pages.

General scheme of operations. Protection of Nawashahr.

The general scheme of the operations was, as far as it is possible to control this disease at all, to confine it to the villages and keep it out of Nawashahr and Ráhon. As the only means of doing this, the first steps which were taken at the beginning of March were to concentrate attention on the village of Kiriam, which commands practically all the cart roads leading to Nawashahr from the villages south of Musapur between the road from Banga to Nawashahr and Nawashahr to Ráhon. It has, too, a special advantage for the purposes of a buffer state in that it is an isolated Rájpút village with but little intercourse with its neighbours. By dint of daily visits the Lambardárs began to take a real interest in their self-preservation, and finally put out watchmen of their own to command all the main lines of traffic and prevent any one suspicious from passing through their village. If any one did come who could not be "persuaded" to leave it he was at once handed up to the Plague Officers for appropriate measures to be taken. They were also zealous in showing up cases of sickness or death and were in every way a pattern of what a village should be in times of plague. In this way though surrounded on almost all sides by infected villages, they escaped, and in escaping have deserved the chief credit for the immunity enjoyed by Nawashahr; so vigilant was their watch that they became daily more and more unpopular with their uninfected as well as their infected neighbours, and there were constant reports made in consequence that this village was concealing cases. These complaints were especially noticeable from the infected villages of Katheron and Lodipur, which are directly cut off from Nawashahr by Kiriam, and this would seem to show that the people in these villages found that there were other obstacles to egress than the official cordon.

Ráhon.

6\. Ráhon admitted of no such protection and escaped chiefly by virtue of its distance from any village on its western boundary and from the fact that the set of trade from this circle is towards Nawashahr and Aur rather than to Ráhon.

Aur.

7\. The town of Aur seemed to bear a charmed existence, and this it owed largely to its own efforts. In the early days of the plague this place was much resorted to by infected persons from Shikohpur and Sahlon for medical treatment at the hands of a woman who lived there. When, however, Shikohpur had been discovered this practice was stopped, and the Aur people began to look after themselves. The first proof of this was afforded by the immediate capture by the chaukídárs of Aur of a man who had broken the Sahlon cordon, had gone to that town, and later on when a case of plague was reported from it there was in consequence little hesitation in believing it to be the only one and in evacuating only a portion of the town, a remedy which proved completely successful. From its situation Aur could not be the object of much supervision by the executive staff in the early days, and when it became the head-quarters of a searching agency it of course passed entirely out of the knowledge of the Executive Department. It will not though it is to be hoped, be forgotten in the distribution of rewards.

General protective measures.

8\. The first therefore and the chief steps taken to control the spread were, it will thus be seen, to get the people to protect themselves, and this experience has shown to be the only effective means of dealing with plague. Minor measures were resorted to, such as common sense dictated. Villages for instance which stretched across the main roads were when infected like Malpur, Mohrampur and Kariha, confined to the near side and not allowed to go to their outlying fields across the road, except under a special system of passes and then under escort. It is obvious that it is easier to keep a cordon along a natural line than when it is spread about amongst crops, where neither the police man himself nor yet the inspecting officer is quite sure what is exactly the village boundary. It has too the further advantage of keeping the lines of communication open, and it is no small satisfaction to have had Malpur, Mohrámpur, Aur and Urapar either infected or under suspicion and never to have been obliged to block the main Phillour Road.

9\. Such other precautions as making Hansron the head-quarters camp for an additional Inspector so as to keep the cordon between it and Ráhon an efficient one are too obvious for mention.

[illegible]ble direction in which the [illegible]ad.

10\. However this may be, and more by good fortune than anything else, the disease took exactly the course which it ought to have done and which it was wanted to do. Beginning at a point between Aur, Ráhon and Nawashahr, it turned its [illegible]twards and rolled back on to itself, that is, on to the originally or early infected

villages, Khatkar Kalán and Gunachaur, where under the combined influences of the sun and the watchfulness of people, who had learnt only too well to know what plague was, it ceased to spread and burnt itself out. One determined on-slaught was made on Nawashahr when sweeping round the borders of Kariha from Katheron it fastened upon Bhangal, a move which with the local knowledge now possessed might have been at least foreseen and possibly prevented.

11. A general summary of certain leading facts in the history of the individual villages attacked will be found in the following table:—

Tabular summary of the history of individual villages.

Table showing the Villages attacked by Plague in the Nawashahr Circle, with the principal dates and their Mortality Statements.

1	2	3	4	5	6	7	8	9	10	11	12	13		14
Serial No.	Villages in order of attack as discovered.	Population at (census of 1891).	Prevailing caste.	Date of first case as reported.	Mortality Returns.		Percentage of column 7 on column 6.	Date of evacuation.	Disinfection.		Date of re-occupation.	Length of time in Camp.		Remarks.
					Cases.	Deaths.			Date of commencement.	Date of completion.		Month.	Days.	
1	Shikohpur ...	592	Játs ...	2nd Feby. 1898	75	41	54·7	3rd Feby. 1898	6th Feby. 1898	29th March 1898	1st April 1898	1	28	
2	Sahlon ...	983	Mehtons ...	22nd Feby. 1898	107	74	69·15	4th March 1898	8th March 1898	26th April 1898	28th April 1898	1	26	
3	Kumam ...	1,969	Rájpúts ...	27th Feby. 1898	61	45	73·7	6th March 1898	19th March 1898	30th April 1898	3rd May 1898	1	27	
4	Katheron ...	1,020	Játs, Rájpúts ...	2nd March 1898	38	22	57·9	9th March 1898	31st March 1898	12th May 1898	18th May 1898	2	9	
5	Karnána ...	1,328	Mehtons ...	6th April 1898	42	24	57·1	6th April 1898	12th May 1898	10th June 1898	11th June 1898	2	5	Karnána had an imported case from Kumam on March, 2nd, which was taken out, and the village was subsequently declared free. It was reinfected on April 6th.
6	Lodipur ...	1,165	Jats, Ráins ...	6th March 1898	49	33	67·4	9th March 1898	31st March 1898	9th May 1898	13th May 1898	2	4	
7	Mohrámpur ...	831	Játs ...	9th March 1898	56	33	58·9	14th March 1898	19th April 1898	19th May 1898	20th May 1898	2	6	
8	Mahmúdpur ...	411	Do. ...	22nd March 1898	24	16	66·7	24th March 1898	21st April 1898	29th May 1898	30th May 1898	2	6	
9	Musapur ...	1,721	Do. ...	23rd March 1898	32	23	71·9	25th March 1898	19th April 1898	27th May 1898	28th May 1898	2	3	
10	Sodhián ...	291	Do. ...	28th March 1898	21	13	61·9	29th March 1898	20th April 1898	31st May 1898	1st June 1898	2	3	
11	Chahlan ...	583	Do. ...	6th April 1898	29	18	62·07	6th April 1898	5th May 1898	1st June 1898	2nd June 1898	1	29	
12	Aur ...	2,850	Do. ...	Ditto ...	1	...	...	...	...	...	...	...	...	
13	Malpur ...	509	Do. ...	9th April 1898	9	7	77·8	9th April 1898	29th April 1898	21st May 1898	22nd May 1898	1	13	
14	Hansron ...	694	Do. ...	12th April 1898	40	23	57·5	13th April 1898	4th May 1898	24th May 1898	25th May 1898	1	12	
15	Karíha ...	1,848	Rájpúts ...	19th April 1898	194	142	73·2	4th May 1898	28th May 1898	16th June 1898	19th June 1898	1	15	
16	Rasúlpur ...	636	Játs ...	21st April 1898	42	25	59·52	29th April 1898	17th May 1898	7th June 1898	8th June 1898	1	10	
17	Parágpur ...	484	Rájpúts ...	Ditto ...	83	61	73·5	1st May 1898	18th May 1898	12th June 1898	14th June 1898	1	11	
18	Bhangal ...	1,014	Játs ...	23rd April 1898	45	32	71·1	27th April 1898	16th May 1898	11th June 1898	12th June 1898	1	15	
19	Bajon ...	230	Do. ...	27th April 1898	16	10	62·5	29th April 1898	17th May 1898	5th June 1898	6th June 1898	1	7	
20	Laroya ...	462	Do. ...	16th May 1898	13	10	76·92	17th May 1898	5th June 1898	19th June 1898	23rd June 1898	1	6	
21	Jhingrán ...	1,103	Do. ...	24th May 1898	13	7	53·8	26th May 1898	Ditto.	21st June 1898	...	...	...	

CHAPTER II.—THE HISTORY OF THE SOURCE AND SPREAD OF THE DISEASE IN INDIVIDUAL VILLAGES.

(*i*) *Shikohpur*, (*ii*) *Sahlon.*

Shikohpur.

12. The village of Shikohpur was first discovered on February 2nd, when the hospital registers show that 13 cases were at once taken out. As far as can be ascertained, no records or notes regarding the infection of this village are in existence, and as the disease had worked itself out before I was sent to the circle, it was never possible to establish those relations with the villagers which alone make it possible to arrive at the truth. When it is remembered, too, that the Shikohpur Lambardárs underwent a criminal prosecution, it is hardly to be wondered that there should be no enthusiasm on the part of the people to unbosom themselves. The only thing which ever really transpired was that quite 30 deaths occurred before the village was evacuated. The general talk of the neighbourhood points to Khatkar Kalán as the infecting agency, which, however, is improbable on a point of dates. All that can be certainly said is that the disease existed in Shikohpur from the beginning of January, and probably from the end of December, and that it must have been carried by human agency, as it is hardly credible that rats should have travelled some seven or eight miles before pitching on this village as their new home. Shikohpur was finally cordoned on February 2nd.

Sahlon.

13. The infection of Sahlon followed as a matter of course. The two village sites are 200 yards apart and lie on the same main line of traffic. The Sahlon men cultivate freely as tenants in Shikohpur and the people enjoy a daily and frequent intercourse. Sahlon, it is true, was only officially discovered on February 22nd, but when it was found to be rotten throughout. There can be no question that Sahlon had been infected since the end of January, though it is as hopeless to expect to get any truth out of this village at any rate until next cold weather as it is out of Shikohpur, and to attempt to trace the first case or to establish the connection between what is said to be the first case is to indulge fancies and to play with facts. Shikohpur and Sahlon existed side by side, or rather, if the expression may be used, inside each other for a month while plague was active and before anything was known about it, and there is therefore not a shadow of ground for supposing that the infection of the latter was caused by anything but human agency.

(*iii*) *Kumam.*

Kumam.

14. The first case of plague in Kumam was discovered by Dr. Davidson on February 27th, and the addition of this village to those of Shikohpur and Sahlon was the occasion of the transfer of a Civil Officer to take over subordinate charge of what subsequently developed into the independent Nawashahr Circle. There can be no doubt about the origin of plague in Kumam, especially as the people of that village have learnt to know and trust the officers in whose care they have been and have no scruples about telling what, as far as anything in India is worthy of credence, may be believed to be the truth.

Origin of the disease.

15. The man discovered by Dr. Davidson and who was freely showed up by the Lambardárs was a Brahmin shop-keeper by name Amín, with his brother Jeora in Karnána. Amín, it is said, had been spending some two or three weeks in Shikohpur and later on in the adjoining village of Sahlon in trafficing in sugar-cane juice, the produce of the Sahlon press, which in January and February was hard at work. On leaving Sahlon apparently about February 17th, and as it may be supposed on discovering that there was plague in the village, which was not officially known till the 22nd, Amín went off to Kumam, stayed there a day or two, and then went on to his shop in Karnána. There he stayed a few more days with his brother Jeora and then came to Kumam to his home, saying he felt ill. This seems to have been on the 24th, though the dates are necessarily approximate. On the 27th Dr. Davidson came round and the Lambardárs showed him Amín, who was found to have plague, and the village was accordingly cordoned.

Subsequent development in Karnána.

16. The subsequent history of Amín's family is instructive. On March 2nd Dr. Davidson was in Karnána and there found that Amín's brother and partner in the shop, Jeora by name, was also ill, and this man was sent over to Kumam. With the experience then possessed of plague it was only thought necessary to disinfect with phenyle and lock up Amín's shop in Karnána and to keep the village under observation, and when after some weeks no fresh cases were discovered, Karnána was declared free, to be reinfected on 6th of April.

Course of disease in Kumam.

17. In Kumam itself the disease ran its usual course. The second person to be attacked was Amín's aunt, Nihálí, who lived in the same compound. There Híra, a Ját in a neighbouring house became ill, and then Nihálu, a Lohár working in the same mohalla. On March Kumam was finally evacuated, by which time of course the disease had obtained a hold.

Substantiatory evidence.

18. Another cause of the disease is also put forward, but it is rather complementary and substantiatory of the story as told above than contradictory. Amín, it is stated, and Híra, Ját, the third person to fall ill in Kumam, were confirmed charas-smokers, and Sultáni Ját, and Mohabbat Shah, fakír of Shikohpur, were constantly associated with them in this practice. Jíwa Khán, Lambardár of Kumam, stated that the four men used to meet constantly at their respective homes to smoke, and even was prepared to say that the two latter had broken the Shikohpur cordon to come to Amín and Híra in Kumam to do so. It is also asserted that when the Shikohpur people gave the customary "Jag" to avert the disease after going into camp, that Amín slipped through the cordon to join in the celebrations. These statements are vague, but there is not a shadow of doubt that Amín was constantly in Shikohpur, in which the disease existed from December onwards, went to Sahlon when Shikohpur was cordoned and while the disease existed, although it was hidden there, and then, when it became too dangerous there, went off to Kumam, having previously, to show there was no ill-feeling, infected Karnána.

(*iv*) *Katheron.*

Katheron.

19. The village of Katheron is owned by Ját and Rájpúts, of whom the former preponderate. It was the fourth in order to be attacked and all classes were equally affected. The village came out four or five days after it was added to the list, but this delay was not due to any obstinacy. In those days immediate evacuation had not been found to be the right policy, and it was customary to wait and see how the disease developed. The village remained in camp from March 9th to May 18th, a preposterous length of time due to excessive caution, a series of dropping cases and bad lime arrangements. It was in fact one of the three or four original villages from which the staff had to extract its experience, and was experimented on accordingly. The people stood it very well, and Ját behaved excellently.

Origin of disease. First case.

20. The origin of the disease is certain. The first case owned to by the Lambardárs is that of Bora, son of Wazíra, Teli, who recovered about February 24th or 25th. The chaukídár's book, however, shows that Mussammát Asa, wife of Wazíra, Teli, died on February 2nd, or, as it was not entered at the time, it will be safer to say about February 2nd, and it is hardly credible that plague should have existed in this house and that this woman should have died from some other cause. It may be assumed therefore that the first genuine case of plague existed in Katheron on or about February 2nd. This is borne out by the following coincidence:—One Uttam Singh, son of Sahab Singh, Ját of Shikohpur, had gone from Shikohpur to Jullundur on business before the former place had been cordoned (*i.e.*, before February 2nd). He came back on February 2nd to find it guarded by the police, and as he could not get in, went to stay in Katheron and slept in the house of this very Wazíra, Teli. Next day he went again to Shikohpur and got permission to go in. He went in, developed plague at once, and, as is borne out by the register, was admitted to hospital in Shikohpur on February 4th. The conclusion is irresistible, that there was plague in Wazíra's house on February 2nd, and that Wazíra's wife, Mussammát Asu, died of plague.

Source of infection.

21. As to how this Wazíra's house became infected the explanation is obvious. It is customary in these parts for Telís to clean cotton for zamíndárs, and this Wazíra is a noted cotton-cleaner about here, and did a large business with Shikohpur. All this January plague was raging unknown in Shikohpur, and all that time the Ját women from that village were taking cotton to be cleaned to Katheron to Wazíra's house. What conclusion is more obvious than that Massummát Asu, Wazíra's wife, caught the disease while gossiping with her Shikohpur customers over the wool.

Spread of disease in village.

22. The second case in Katheron was that of Wazíra's son, and the next two occurred in the houses of two Rájpúts adjoining and touching that of Wazíra. From this focus the disease spread over the village, and information was lodged on March 2nd. The Lambardárs say that Wazíra's son Bora was shown to the "Doctor Sáhib," presumably Dr. Davidson, on February 20th, on his way through the village, but that he did not think he had plague. There was, I think, no intentional concealment in this village. At that time it must be remembered even the officers employed on plague duty with few exceptions were not by any means certain of their ground when they saw an alleged plague case, and the villagers until a marked mortality set in may well be pardoned for taking the benefit of the doubt.

(*v*) *Karnana.*

Karnána.

23. Karnána is a large Mehton village. It was infected first on March 2nd, and then after an isolated case declared free. On April 6th it was found to be infected again and was promptly turned o camp, returning to its village site on June 11th. Their long period outside was heir own fault, as they were always passively obstructive and were disobedient t. The disease ran its course impartially in the village, and it is interesting to t was here that the lowest mortality of any village, *viz.* 57 per cent. on the vered, occurred.

24. No satisfactory reason for the RE-infection of this village can be put forward

Origin of re-infection obscure.

The first man to fall, it is said, was Nihál, a Brahmin trader, who, it is known, had recently been on tour down to Phagwára to sell grain, and he may possibly have come into contact with some centre of the disease. It is actually stated by the villagers that he went into Mallupota, where he had connections, but this is not to be trusted, and even if it were true, Mallupota was not active at that time. Nor is it certain—for a Mehton seldom tells the truth—that Nihál was the first man attacked, and the disease must have acquired a firm hold by the 6th, as between that date and the 19th 16 cases were discovered, most of which were from the houses bordering on that of Nihál. Nihál's house, however, is quite close to that of the man Jeora, who (see the Kumam narrative, page 100) was taken out ill on March 2nd, and the conclusion, though it is naturally a reluctant one, is that the phenyling of the then infected house was an inadequate precaution, and that the poison was conveyed from it, presumably by rats, into the surrounding dwellings in which Nihál and the people to be first attacked in the main outbreak were then living. Experience is a hard lesson, but the Karnána mistake led later on to the strikingly successful *coups* in Aur and Urapar.

24 *a*. Since writing the above, and as this report was being made ready for despatch, the Karnána people in their joy at seeing the cordon removed from their village have let out the real facts. They are as follows:—Shortly after the man Jora was removed and his house disinfected and locked up, a girl in the next house, one Mussammát Nanju, daughter of Mewa Singh, Mehton, became ill, but recovered. Her case was followed by those of Mussammát Umti, wife of Labha, Mehton, and Mussammát Premi, wife of Ralla, Lohár, whose houses touched the others. They died, but were pronounced by the Hospital Assistant—so the villagers say—who came to examine them, to have been the victims of a simple fever only. The next people to fall ill were their neighbours, Mussammáts Gujri and Isri and Sadda Singh, and then with the subsequent fall of Nihál it was impossible to keep things dark any longer, and plague was rediscovered.

Later note showing that no RE-infection took place.

24 *b*. This is not a very comforting thought for the officer who was responsible for the *fiasco* here, but time has repaired the mistake and the experience has been a valuable one, and the facts disclosed throw light on a good many debated points. It is very satisfactory, however, to find that the conclusions drawn from the facts connected with this village as at first known have been correct. Karnána has been almost the only village in which the facts did not fit in with the canons which have in this enquiry been laid down as the tests of truth and the failure to fulfil which led to the unwilling adoption of a conclusion against a *re*-infection theory. That this conclusion has been shown to be right is a strong argument for the efficiency of the canons and should give additional weight to the positive conclusions arrived at for other villages.

(*vi*) *Lodipur.*

25. Lodipur is inhabited by Játs and Ráins and is a typical congested village.

Lodipur.

Its village site is a small one, and the people estimated their own numbers on the first outbreak at 600 or thereabouts. On the completion of attendance roll, however, they were found to be double that number. The list of absentees too showed a long line of names of men and families who were in Australia or Africa, or who had been drafted on to the Chenab Canal. The village lands are not extensive, and the people cultivate largely in Katheron, Kumam, Músapur and Kiriam.

26. Plague was reported by the Lambardárs on March 6th, when three cases and

The first case.

one death were found to have occurred. The original offender was said to be a little Chamár girl, Mussammát Jassi, daughter of Bhani, and to this statement the Lambardárs for months adhered. This was unsatisfactory as a small child is never the first to fall ill. The only other death which could be found was that of Mussammát Nandi, wife of Rulia Chamár, who was entered as having died in childbirth. There was reason though to suspect that the birth had been premature, and suspicion centred on this woman's family, especially as her house touched on that of Mussammát Jassi. It was finally discovered that about the middle of February this woman's husband's brother Achhru, son of Tába, Chamár, had been taken ill with plague, but had recovered. There for some days the clue failed. In Lodipur, however, two parties exist, and it was evident that with a little breathing space the Lambardárs who had been very loyal throughout would speak up, and an opportunity was found of getting them in alone to Nawashahr. They then stated as follows:—About the beginning of February Achhru, son of Tába, went to the Hoshiárpur District to Karnál to visit his maternal grandmother Mussammát Resán. On his way back from Karnál he stayed in the village of Simal Mazra at the house of one Saon, Chamár, the brother of the father-in-law of Achhru's uncle, Hira, and in whose house plague is stated to have existed. After staying the night Achhru went back to Lodipur. About two days after his arrival there it is said that Simal Mazra was discovered and cordoned. This fixes Achhru's

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the overcrowded state of the village would have lent itself to a great mortality.

(*vii*) *Mohrampur.*

28. Mohrámpur is a Ját village of the usual type. Its Lambardárs though are

Mohrámpur.

young and inefficient, and it has been a source of a good deal of worry. Plague was reported here by the Zaildár on March 9th, and it is almost certain that the first case had only just occurred. The evacuation of the village was promptly commenced, though it took a few days to accomplish, and the people remained in camp till May 20th. The disease spread itself over all classes.

29. The first man to get ill was Ran Singh, son of Diál Singh, Tarkhán, and it is

The first case.
Its origin.

generally stated that he was in the habit of going into Sahlon, the neighbouring village, in which at that time plague was rife. He is said to have brought clothes too out of Sahlon belonging to one Káhan Dás, Sádhu. The following facts in attestation of this story have been discovered:—In Mohrámpur two Sádhús, Kishan Dás and Káhan Dás, have a home in common. When plague broke out in Shikohpur and on its fastening on Sahlon, the latter like all villages on the approach of this disease determined on a solemn reading of the Granth (Akandh Páth) as a means of averting the evil. Káhan Dás was accordingly invited to act as reader, went to Sahlon, and after concluding his labours stayed on to reap the benefits which the high death-rate was conferring on all religious persons. He was also not averse to receiving the subsistence allowance which the innocence of the officer in charge of the village thought fit to grant to such a tattered mendicant. Amongst his fees for performing "Páths," Káhan Dás obtained, as is prescribed by custom, from the relatives of the deceased persons in whose memory the "Páth" was performed, many presents of clothes which he naturally wished to consign to his home in Mohrámpur. The fitting medium presented itself in Ran Singh, the Mohrámpur Tarkhán, whose relative Hira Singh lived in Sahlon, and to see whom he is supposed to have broken the cordon. This Ran Singh was also a pupil of Káhan Dás' partner, Kishan Dás, who had stayed behind in Mohrámpur, and was a devoted student of the "Granth," and it has been definitely ascertained that at this very time Kishan Dás was occupying an outhouse belonging to Ran Singh and attached to his house for the purpose of performing a "Páth" in memory of a nephew of Ran Singh's next door neighbour Tiddu, Ját, who had no spare room in his house for Kishan Dás to occupy. It is only reasonable to suppose that Kishan Dás took the opportunity to persuade Ran Singh to go over to Sahlon and to see how his partner Kahan Dás was fairing and to bring back the spoils, and that once in Sahlon, Ran Singh mixed with his relatives and the other people in the Sahlon camps which at that time were giving up six or seven cases a day From Ran Singh's house the disease spread over the rest of Mohrámpur in a diffused manner, which may be accounted for by the fact that the village was promptly turned out before it had had time to spread in the village from house to house.

N. B.—In Appendix A to this report have been collected certain facts connected with the performance of "Páths," a ceremony which has been strikingly familiar throughout this epidemic and which has no doubt in certain cases been the cause of the spread of the disease. The information has been obtained from Naib Tahsíldár Amar Singh, himself a Sikh and a resident of this neighbourhood. It may possibly be of interest.

(*viii*) *Mahmúdpur.*

30. This village of Mahmúdpur is owned by Játs and has been a source of considerable

Mahmúdpur.

trouble. It was suspected from the middle of March, and on the 16th of that month was overhauled by the Executive staff, but nothing was found beyond some funeral meats outside the house of one Ganga Rám. In spite of this search rumours continued to come in, and on the 19th the Assistant Commissioner with Mr. Goldney and the Inspector paid a surprise visit in the early morning, turned the village out, and while the Inspector rode round and round outside to catch lurkers in the crops, every house in the village was searched by the European officers. Again there was no result, though the uneasy demeanour of the owner of the house next to Ganga Rám's deepened suspicion. On the 22nd it was determined to cordon the village plague or no plague, and in the small hours of the morning the Assistant District Superintendent of Police threw a cordon round the boundary and gradually drew it in up to the village site so as to enclose every one within the four walls of their village—a very smart piece of work.

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Origin of re-infection obscure.

The first man to fall, it is said, was Nihál, a Brahmin trader, who, it is known, had recently been on tour down to Phagwára to sell grain, and he may possibly have come into contact with some centre of the disease. It is actually stated by the villagers that he went into Mallupota, where he had connections, but this is not to be trusted, and even if it were true, Mallupota was not active at that time. Nor is it certain—for a Mehton seldom tells the truth—that Nihál was the first man attacked, and the disease must have acquired a firm hold by the 6th, as between that date and the 19th 16 cases were discovered, most of which were from the houses bordering on that of Nihál. Nihál's house, however, is quite close to that of the man Jeora, who (see the Kumam narrative, page 100) was taken out ill on March 2nd, and the conclusion, though it is naturally a reluctant one, is that the phenyling of the then infected house was an inadequate precaution, and that the poison was conveyed from it, presumably by rats, into the surrounding dwellings in which Nihál and the people to be first attacked in the main outbreak were then living. Experience is a hard lesson, but the Karnána mistake led later on to the strikingly successful *coups* in Aur and Urapar.

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The first case.
Its origin.

generally stated that he was in the habit of going into Sahlon, the neighbouring village, in which at that time plague was rife. He is said to have brought clothes too out of Sahlon belonging to one Káhan Dás, Sádhu. The following facts in attestation of this story have been discovered :—In Mohrámpur two Sádhús, Kishan Dás and Káhan Dás, have a home in common. When plague broke out in Shikohpur and on its fastening on Sahlon, the latter like all villages on the approach of this disease determined on a solemn reading of the Granth (Akandh Páth) as a means of averting the evil. Káhan Dás was accordingly invited to act as reader, went to Sahlon, and after concluding his labours stayed on to reap the benefits which the high death-rate was conferring on all religious persons. He was also not averse to receiving the subsistence allowance which the innocence of the officer in charge of the village thought fit to grant to such a tattered mendicant. Amongst his fees for performing "Páths," Káhan Dás obtained, as is prescribed by custom, from the relatives of the deceased persons in whose memory the "Páth" was performed, many presents of clothes which he naturally wished to consign to his home in Mohrámpur. The fitting medium presented itself in Ran Singh, the Mohrámpur Tarkhán, whose relative Híra Singh lived in Sahlon, and to see whom he is supposed to have broken the cordon. This Ran Singh was also a pupil of Káhan Dás' partner, Kishan Dás, who had stayed behind in Mohrámpur, and was a devoted student of the "Granth," and it has been definitely ascertained that at this very time Kishan Dás was occupying an outhouse belonging to Ran Singh and attached to his house for the purpose of performing a "Páth" in memory of a nephew of Ran Singh's next door neighbour Tiddu, Ját, who had no spare room in his house for Kishan Dás to occupy. It is only reasonable to suppose that Kishan Dás took the opportunity to persuade Ran Singh to go over to Sahlon and to see how his partner Kahan Dás was fairing and to bring back the spoils, and that once in Sahlon, Ran Singh mixed with his relatives and the other people in the Sahlon camps which at that time were giving up six or seven cases a day From Ran Singh's house the disease spread over the rest of Mohrámpur in a diffused manner, which may be accounted for by the fact that the village was promptly turned out before it had had time to spread in the village from house to house.

N. B.—In Appendix A to this report have been collected certain facts connected with the performance of "Páths," a ceremony which has been strikingly familiar throughout this epidemic and which has no doubt in certain cases been the cause of the spread of the disease. The information has been obtained from Naib Tahsíldár Amar Singh, himself a Sikh and a resident of this neighbourhood. It may possibly be of interest.

(*viii*) *Mahmúdpur.*

30. This village of Mahmúdpur is owned by Játs and has been a source of considerable

Mahmúdpur.

trouble. It was suspected from the middle of March, and on the 16th of that month was overhauled by the Executive staff, but nothing was found beyond some funeral meats outside the house of one Ganga Rám. In spite of this search rumours continued to come in, and on the 19th the Assistant Commissioner with Mr. Goldney and the Inspector paid a surprise visit in the early morning, turned the village out, and while the Inspector rode round and round outside to catch lurkers in the crops, every house in the village was searched by the European officers. Again there was no result, though the uneasy demeanour of the owner of the house next to Ganga Rám's deepened suspicion. On the 22nd it was determined to cordon the village plague or no plague, and in the small hours of the morning the Assistant District Superintendent of Police threw a cordon round the boundary and gradually drew it in up to the village site so as to enclose every one within the four walls of their village—a very smart piece of work.

The Lambardárs then gave in and showed up several cases. It subsequently transpired that when the inspection was made on the 19th the villagers had had men out to look out for any Sáhibs, and had hidden the sick away in the crops on seeing them approach. The disease ran an ordinary course. The village was promptly evacuated, and after remaining in camp from March to May was finally re-occupied.

First case.

31. It has been extremely difficult to get any clue out of this village. After the discovery of the disease instructions were issued for the prosecution of the Lambardárs, though this idea was subsequently abandoned. As a result, however, the villagers are absolutely dumb, and every officer has tried his hand in vain. The only facts which were known were Ganga Rám's death, and that about the 20th his wife was found ill in her father's home in Mazra Nawabad in the Banga Circle. All official efforts failing, the Lambardár of Karnána was sent to take the matter over, and he reported that Ganga Rám did have plague and was the first to succumb, and that he had contracted the disease from Sahlon, where he had been to see his friend Bela Singh on hearing that his family was suffering. This story would be of little value were it not humanly speaking certain that Ganga Rám was the first case. This is proved by the following facts: On the 16th of March funeral meats (dhandíla) were seen outside his door. These meats normally remain out for from four to seven days, though they may be left for 13. It is improbable though that a village engaged in concealing cases would run this unnecessary risk. Ganga Rám must then have died between the 11th and 16th. On the 19th one of the cases hidden in the fields was a member of Ganga Rám's household, Mussammát Rajji. About the 20th Ganga Rám's wife died of plague in Mazra. On the 22nd nearly all the cases were in houses adjoining that of Ganga Rám. So much for the first case.

Origin of the infection.

32. As to the statement about Ganga Rám's visit to Sahlon, there is no evidence beyond the statement reported by the Lambardár, but its veracity is borne out by dates. It would be impossible, it must be remembered, for the villagers of Mahmúdpur to be aware of, and much less to remember, the exact dates at which deaths occurred in Sahlon, where the disease remained active for fully a month. Consequently when the story is that Ganga Rám went to condole with Bela Singh, when his family began to be attacked, and when the hospital registers show that Bela Singh's wife and daughter Mussammáts Gujri and Puru died on March 9th, and that the same man's brother died on the 5th, and that Bela Singh himself died on the 16th, and when it is remembered that Ganga Rám must have become ill between the 11th and 16th, the case becomes almost convincing. The fact too that Bela Singh and his household have been swept off almost to a man discountenances the possibility of the story being the outcome of private animosity. Man does not war in this way with the dead.

(*ix*) *Músapur.*

Músapur.

33. Músapur is a large Ját village with a sprinkling of Brahmins and Tarkháns. Until towards the end of its period in camp the disease was confined entirely to the Chamárs, and the two dropping cases amongst the Hindús at the end have been traced to personal contact with infected people in Rasúlpur, between which and Músapur there are no cordons. The village came out at once and remained in camp from March 25th to May 28th, the delay being due to the occurrence of the two dropping cases referred to above.

The well episode.

34. This village was a constant source of trouble. Amongst its inhabitants was a retired Hospital Assistant rich in the ripe experience of a three years' inattention to his duties. On the outbreak of the disease this worthy, who still dabbled in drugs, thought it an excellent opportunity to pour large quantities of Condy's fluid down the village well by night, and next morning the village was in a commotion. Everything that could be done, by drinking the water and unearthing the Condy's fluid, was done to allay the unrest, but such a palpable proof of the fact that the Sarkár was poisoning the wells was too strong to be gainsaid, and the people never put any trust in the measures which were being taken for their safety. The incident was an unfortunate one and spread through all the neighbourhood, and it was very noticeable in many villages as one rode through—in Karíha for example—that the people had put guards on their wells. The episode is worth mentioning as showing the excited condition in which the people have been almost throughout.

The origin of the outbreak.

35. The origin of the disease in Músapur must be sought in Lodipur, where the Chamárs too were the principal sufferers. Plague was first discovered on March 21st, but the report was delayed by being sent first to the Assistant Commissioner in superior charge at Banga, and it only reached its destination on the 23rd, by which time five deaths had occurred. The first case was that of Rora, son of Massa, Chamár, who must have got ill on or about March 18th. It has been established that Rora had business transactions and also friendly relations with Jandu, son of Manga, a wealthy trading Chamár of Lodipur, and it is not disguised in Músapur that Rora used to slip into Lodipur to see this man, whilst the Lodipur villagers, the most cautious and reticent of any, admit that they met "on the boundary."

Jandu got ill in Lodipur on March 8th, and his wife Rám Devi and his son Dheru followed suit on the 12th. The inference is obvious, that Rora went over to see them partly no doubt out of friendship and partly to settle business, and contracted the disease and fell ill on the 18th. It may be urged that what was going on in Lodipur could not have been known in Músapur. Those, however, who have mixed with the people know that news does travel in spite of cordons, and again and again it has been found that things have been fully known which one would have supposed to be necessarily hid. The details of the Garhshankar affair were, for instance, known in Parágpur, 20 miles away, three days before any Government officer at Nawashahr knew that any firing even had taken place, and so it has been throughout.

The dropping cases at Músapur.

36. The re-infection of Músapur, if the two dropping cases may be so called, were due to the facts—

(1) that a Brahmin by name Birbal went from Rasúlpur to see his relatives Gopi and Ráma in Músapur, and so carried the infection into their house; and

(2) that Mussammát Jiuni, daughter of Biru, Bhisti, the girl attacked, had admittedly been into Rasúlpur to look for a cow belonging to her father which had strayed over the boundary, and had stayed to take her dinner in the Rasúlpur camps.

(*x*) *Sodhián.*

Sodhián.

37. The small Ját village of Sodhián was discovered March 28th, and after the disease had run an uneventful course was re-occupied on June 1st. The people went into camp at once, and there was certainly no concealment.

The first case.

38. The first case admits of no doubt. The man's name was Jodh Singh, son of Kishan Singh, Ját. A few days before he got ill he had been with his cart to carry the belongings of a police guard from Kumam to Mahal Gohla, an infected village. The police guard in question was from Ludhiána, and Jodh Singh himself had served for a few years in the Ludhiána police, and naturally did not get a very close watch from his old comrades. Arrived at Mahal Gohla, he is said to have got in this way into the village to see friends and get food for his bullocks. From Mahal Gohla he was told to go and get his hire money from Banga, and after waiting there was referred back to Shikohpur. This took about three days, after which he returned to his home, was taken ill next day, the 26th, and when it became clear he had plague a report was made and the village at once turned out.

Substantiatory evidence.

39. This story has a ring of probability and it is a known fact that Jodh Singh's cart was often employed on these errands, and that a Ludhiána guard did go from Kumam to Mahal Gohla, and Sodhián was the nearest uninfected village to the police camp in Kumam. There is though only proof that Jodh Singh was in contact with a plague-infected spot, and not with a definite person who had plague, and in this much the evidence here is defective. There can though be no question that Jodh Singh was the first case and was attacked immediately on his return to his village.

(*xi*) *Chahlan.*

Chahlan.

40. Chahlan is a small Ját village lying not a quarter of a mile apart from the village site of Kumam. Its inhabitants have considerable intercourse with their larger neighbour, and cultivate to certain extent within its area. Plague was officially declared in Chahlan on April 6th, but by that time it had obtained a firm hold, as is shown by the returns of April 6th and 7th, on each of which days six new cases were discovered. The village had been under suspicion for a few days, and the villagers had even shown up a corpse on April 5th; but the Medical Officer was unable definitely to pronounce that it had died of this disease. On the next day, however, a well developed case was discovered, and the village was cordoned, and went out at once.

The first case.

41. The first person to fall ill, or rather to die, was according to the villagers a Gujri woman, Churi by name. She died in her own home. At about the same time, it was allowed, her son Nabia fell sick, and his attack was followed by the fall of two other Gujri women, Mussamát Gagon and Jindon, living in the neighbouring house. The fifth case was Sultáni, a Chamár, whose house had one wall with that of Mussammát Gagon and Jindon, and finally Nabia's next door neighbour, Mussammát Atri, a Ját woman, succumbed to the disease. In all of these houses the rats began to die before the people went out. This was the villagers' story, and they would commit themselves to nothing further before a European officer. Munshi Abdul Sattár, Náib Tahsíldár, has, however, worked out the clue, which, as would be expected from the above account and from the fact that the Chahlan people suggested that Nabia's fields were on the Kumam boundary, is to be found in the wanderings of that person.

42. Nabia, it appears, was definitely the first to succumb, and the date given is April 1st or 2nd, and his mother Churi was only a close second.

The origin of infection.

Nabia used to graze goats on a piece of land lying between Kumam and Chahlan. Towards the end of March and before the disease was extinct in Kumam the Kumam people celebrated a "niáz," which corresponds to the Sikh "jag," and Nabia, a fellow Mussalmán, slipped over the boundary to share in the feast and brought back some of the food for the members of his household who had not had the courage to venture over the forbidden line.

43. Once started, the disease ran its course impartially amongst all classes; but the people were very loyal and were rewarded by a rapid cessation of their troubles, and on June 2nd, after being in camp since April 6th, were allowed to re-occupy their village. A curious circumstance is related by the villagers. Some time before the disease broke out the Divisional Officer rode through the village and found fault with its dirty condition. Happening to pass by Nabia's house, from which the droppings of his goats had not been cleaned out, he stopped and said: "Such is the house into which plague will first come." When his words were fulfilled the people recognised that it was no use concealing their cases in the face of such supernatural prescience.

Incidental remarks.

(*xii*) *Aur.*

44. Aur is a town with a population of 2,850 persons, and is the centre of all the petty trade of this circle. In spite of its efforts to protect itself, a Chamár fell ill on April 6th, but was at once detected and shown up. As there was naturally some hesitation in turning out so large a place for one Chamár, it was determined, with the approval of Surgeon-Lieutenant Walton, to remove the patient and his family and the inmates of the neighbouring house to Mohrámpur. This was done, and the two buildings which stood detached from the neighbouring houses were promptly disinfected and unroofed, and the village was left undisturbed. The experiment proved a complete success, and after being roll-called several times Aur was declared free and was never re-infected.

Aur.

45. As to the origin of the disease, the fact that Aur is separated by a few miles from any infected village and has a barrier of uninfected villages between itself and the infected area, almost necessitates the belief that the disease was imported by human agency.

Origin of the disease.

(*xiii*) *Malpur.*

46. Malpur is a small Ját village lying a stone's throw away from Mohrámpur, and its infection followed as a matter of course. It was though promptly discovered and turned out, and only the Chamárs, and but 9 of them, became ill. It remained in camp from April 9th to May 22nd, and behaved excellently, though its inhabitants are quite colourless, and it contains no one of mark.

Malpur.

47. The origin of its infection must be sought in Mohrámpur, with which in ordinary times it enjoys constant intercourse. The Malpur villagers, a very reticent body when interrogated, allowed after a good deal of beating about the bush that several visits had been made to Mohrámpur from their village. Amongst the instances cited was that of Nathu, Chamár, who is said to have gone into Mohrámpur to see one Mangtu, son of Jiwa, Chamár, whose wife and his wife were related, on getting news that he had fallen ill. Now, as far as can be made out, the first person to be attacked in Malpur was the wife of this man Nathu, Mussammát Dhooli, who succumbed on April 5th; whilst in Mohrámpur on March 28th, as the hospital register shows, the Mangtu in question was taken ill, but for some reason was not admitted to hospital till two days latter. Asked if Mussammát Dhooli went with her husband, the villagers said no, but as the man Mangtu was her and not her husband's relation, it is only reasonable to suppose she did, especially as she became ill on the 5th, and intercourse between the two husbands is allowed to have taken place on the night of the 28th or 29th, when, as is proved by the hospital registers, the man Mangtu was ill, but had not gone into hospital. The evidence, however, is not absolutely conclusive.

Origin of the disease.

48. From Malpur comes the only story about rats which is worth repeating. A native of this country has not, as the every-day experience of the Law Courts shows, the faculty of observation developed in the way it is in a European. He does not therefore—he has never heard of the rat theory of infection—notice at the time when rats began to die, and the almost invariable answer to a question on this point is the familiar "how am I to know." When made to give an answer though, he will of course state whatever he imagines will be most acceptable and least incriminatory. No credence therefore is to be attached either way to an expression of opinion by a villager on this point, though it is practically always stated that of course the people became ill first. At Malpur, however, a peculiar

Rats of Malpur.

and striking circumstance arose. The Chamárs' camp had been placed on a convenient spot just outside the village and close to their own well, which lay under the walls of their own quarter. A few days after going into camp they came up in great excitement and asked to have their well changed, as they had that morning found some rats running round and round their well in a frenzied manner until after a few minutes they plunged in and were drowned. This seems to show that in Malpur the infected rats did not migrate, but stayed in their runs until under the stress of the delirium, which the disease brings on in man too, they dropped from the wall on to the well in search of water, which it is the natural instinct of every animal to do in the circumstances. No rats which came out like this escaped, it was said, a watery grave.

(*xiv*) *Hansron.*

49. Hansron, a village of Hindu Ját on the borders of Ráhon, was discovered on April 12th after lying under suspicion for several days. The site was evacuated at once, and 9 cases were taken out on the first day and 33 in the first six days. It was obvious of course that concealment had been practised. Once out, however, things went very smoothly. The people were very loyal, and in the Hospital Assistant Mushtáq Hussain they were fortunate in obtaining a reliable and sensible officer. They asked to be allowed to have their own treatment, and appointed the village Nái for the purpose. He proved a very nice old man. As soon as he found that Government medicines could be had for nothing, whereas he had to pay for his own and take the risk of recovering the amount from his patients, he at once decided that as long as he administered the "dawai," there could be no chance of its being poison. The Hospital Assistant backed him up very tactfully, and the people thus secured the advantages of the medicine, while they escaped the terror which their distrust of the hospitals always inspired. Whether it be due to this or not, the mortality at Hansron, even though the disease had a firm hold there before discovery, was less than in any other place except Jhingran and Karnána.

Hansron.

50. For a long time enquiries in this village proved abortive. The villagers could only re-echo the fact that one Maia, son of Labha, all of whose family nearly had died, had been to the house of Atra Singh in Katheron. This was tolerably safe and presumably false, as neither Maia nor Atra Singh had become ill. The hospital books though showed that three deaths had been entered by the villagers as having occurred in the village. They, however, were all little children, amongst whom plague never claims—experience shows and common sense dictates—its first victims. All these three, however, lived quite close to the scapegoat Maia or were related to him, and it was clear that the real first case was to be sought in or near that compound. One day after Hansron had been declared free the old Nái came in to discuss things in general, and after an hour's conversation on the forms of native medicines most suited to the plague, and on being challenged to mention people he had cured by early cupping, he instanced one Gonda, son of Mahtába, who had been the first to get ill. This Gonda lives next door to Maia, and the hospital registers show that he was taken out the first day from the camp and that he recovered.

The first case.

51. Enquiries about this man elicited the general admission that he had been into Katheron, the neighboring village, to watch his crops which were situated in its area—a proved fact—and that he used to mix there, especially with one Bubi Khán, Rájpút, whose lands adjoined his, who became ill of plague, as is shown by the Katheron hospital register, on April 7th, Now, Gonda must have become ill between the 7th and 10th himself, and the exact correspondence of the dates and the difficulty of obtaining the information carries absolute conviction.

Origin of the infection.

(*xv*) *Rasúlpur.*

52. Rasúlpur is a Ját village lying about half a mile off Chahlan and a mile from Músapur. The disease was first discovered on April 21st, and, following the lead of Kariha, the people refused to come out. As orders regarding the use of or abstention from force in the case of Kariha had not by then arrived, Rasúlpur had necessarily to be left tightly cordoned, and on the 27th Rasúlpur was, though without violence, turned out. The knowledge naturally that 400 men were under arms at Nawashahr, and the sensation which the *coup* at Bhangal on the 25th had caused throughout the neighbourhood, had had everywhere but in Parágpur and Kariha a sobering effect. The village remained in camp till June the 8th, and was declared free of plague on the 18th.

Rasúlpur.

53. The genesis of the disease admits of no question. The first case occurred on April 10th, when Ishar, son of Búta, Ját, became ill, having contracted the disease from Chahlan in the following manner. When Chahlan was cordoned, *viz.* on April 6th, Munshi and Sunda, sons of Káka, Ját, came over to Rasúlpur and slept the night in Ishar's house. At that time a

Origin of the infection.

member of their household, one Achru, Ját, was ill. The whole of Ishar's household became infected, and from there the disease spread over the village. In Rasúlpur curiously enough it was noticed that the infection did not appear to radiate from one focus, but to claim its victims all over the village. The reason seems to be that Ishar's house opened out on to the village grinding mill, which was the place of general meeting. Here members of Ishar's household must have rubbed up against people from all quarters, and in this way the seeds of the poison were disseminated. A striking confirmation of this is the practical immunity enjoyed by the Chamárs, only one of whom, and this the woman who was treating cases, succumbed out of a total of 42 persons attacked. In Rasúlpur the Chamárs are debarred by caste rules from using the village mill, and do not gather there like the Játs.

Alleged previous existence of plague.

54. Another very peculiar point about this village is that the people say that when Khán Khanán had plague, *i.e.* in December, 40 cases occurred in Rasúlpur which were treated by a Chamár woman with such success that only 3 died. They wished to continue this treatment. Arrangements were made for a separate hospital for such people as wished to be treated in this way, but as nothing came of it, it was abandoned. The reason of this has now become clear. Between April 10th and April 27th, when the village went out, 12 cases of something had, it appears, been successfully treated by this Chamár woman, and in the next two days 3 more were operated upon secretly in camp with equally good results. On the 29th, however, the Chamári herself became ill and no one would take up her mission; the people came into the Government Hospital. It is hard to know how much of this to believe. It is hardly conceivable that plague existed in Rasúlpur in December without spreading to the neighbouring villages, and yet many men there must certainly have been treated for something. Even after dividing 40 by 2½, which would seem in this country to be roughly the ratio between truth and falsehood in the matter of figures, the fact would have to be faced that 16 persons were treated for swellings in the armpits and groin, and this would be in itself peculiar. It is of course only too possible that the story of the 40 recoveries was a pure fabrication, designed to form an argument for the non-evacuation of the village, but it is not to be denied that between the 10th and 29th of April 15 men were treated in the manner referred to; their wounds are to be seen, and it would seem probable that some at least of these latter cases were real plague; else why should the woman who treated them have been the only member of her caste to be attacked. She herself only claims to be able to effect anything if she is able to cup the patient directly he falls ill, and otherwise will not venture on any treatment. In any case whether true or false, this woman's treatment is implicitly believed in by the villagers. It is also believed about here that several villages have had slight outbreaks of plague and have escaped detection. Ferozepore, for example, near Khán Khanán, and Ratinda too, where Inder Singh, servant of Nagina Singh, is said to have died, are mentioned. Inter-village jealousies, however, are responsible for a great many of the reports as to the existence of plague elsewhere, as many weary and fruitless rides have impressed upon plague officers.

(*xvi*) *Parágpur.*

This is a Rájpút village, though a small one, and was reported on April 21st. The people did not wish to come out, and there is reason to believe they were in league with Garhshankar and Kariha on this point. They remained in therefore till the 27th, when sanction was given for the use of force, if necessary, to expel them. This fortunately was not required, as after arresting two men who were insolent and who were appealing to the rowdy element in the village the opposition collapsed and the people went out. Up to the time of evacuation 41 deaths had taken place, which were entered in the returns, though no account was taken of recoveries. The people remained in camp till June 15th. The disease was spread generally. In all 61 deaths occurred out of a population of 484 persons. It may be felt that their punishment has been severe enough without the intervention of man's vengeance.

The origin of the disease in this village has not been discovered. There is such a dread of a prosecution that no one will speak, and the village is too distant in this weather for visits there to be of the nature that is required to elicit the truth. It will be better therefore to leave the question untouched. As far as investigations have gone everything seems to point to Mahmúdpur as the source of the disease. One thing is certain, and that is that plague existed long before the 21st. It has been traced back to one Sohna, son of Budda, Rájpút, who died on April 11th with, it is stated, a swelling on the right side of the neck, and other inmates of whose family followed suit, and on the 13th it is known that the searching Tahsíldár reported that he had very strong suspicions about this village.

(*xvii*) *Kariha.*

Plague was discovered in Kariha, a large Rájpút village, on April 19th, but the people have all along admitted that the first person died five days previously, and the disease has now been definitely traced back to the 5th. For reasons into which it is not necessary to enter, the people absolutely refused to go out and were prepared to use force to stay in.

In accordance therefore with the then existing orders they were cordoned closely and allowed to remain in. Attendance rolls were called daily, a report made of the daily number of deaths, until the Medical Officer refused to return such figures as unreliable. On April 30th the people came out, but as they were still very bitter against any Medical Officer, it was thought best not to establish a hospital at once, especially as May 2nd was the 'Id and the villagers were Muhammadans. The people were all out by May 3rd. The infected persons were then weeded out and got into a segregation camp by the Civil authorities, and on the 6th the medical staff came into play. From that date returns were made.

On May 6th the returns were as follows: 10 new cases, 1 death, 136 total cases and 127 total deaths. That is to say, the list of 126 deaths as ascertained from the roll-calls was accepted as the total of *cases* up to date; no account was taken of recoveries, which must have been fairly numerous. To this number 10 cases and 1 death which were at once taken out of the segregation camp were added.

On May 7th the first inspection of the healthy camps was made. It was a tentative affair, as it was desired not to frighten the people, and the Assistant Commissioner in charge went round with the Hospital Assistant himself: 7 cases were taken out and 2 corpses were discovered. On May 8th a strict search was made, and 34 cases and 1 corpse were found. On May 9th, 10th and 11th, 9 cases in all were found. After this plague may be said to have ceased. The 4 subsequent cases on May 13th and 23rd and on June 4th were contracted as follows:—

N. B.—May 10th return should be 4 not 5.

(*i*) By attending on their sick friends in hospital	... 2
(*ii*) By entering the village site by night against orders	... 1
(*iii*) From disinfection of village site	... 1

In all 67 cases occurred after the villagers left their homes, of which 64 were treated in hospital, the other 3 dying in camp. Of the 64 treated only 13 died! The mortality at Kariha, that is amongst the patients, was only 20·3 per cent. Whether this is to be ascribed to purely professional skill or to the fact that most of the patients were convalescent when they left their homes is a question which suggests itself.

It may be premised that the same medical treatment was employed at Kariha as elsewhere, and that the village surroundings in no wise differ from those of other villages attacked. A comparison of the Kariha mortality per cent. of cases treated will therefore be instructive.

Table showing mortality per cent. of cases of plague in the Nawashahr Circle.

1	2	3	4	5
Serial No.	Name of village.	Number of cases total treated.	Number of deaths total.	Per cent. of column 4 on column 3.
1	Shikohpur ...	75	41	54·7
2	Sahlon ...	107	74	69·15
3	Kumam ...	61	45	73·7
4	Katheron ...	38	22	57·9
5	Lodipur ...	49	33	67·4
6	Mohrámpur	56	33	58·9
7	Sodhián ...	21	13	61·9
8	Mahmúdpur...	24	16	66·67
9	Malpur ...	9	7	77·8
10	Músapur ...	32	23	71·9
11	Chahlan ...	29	18	62·07
12	Karnana ...	42	24	57·1
13	Hansron ...	40	23	57·5
14	Bajon ...	16	10	62·5
15	Rasúlpur ...	Not filled in, as these villages delayed going out, and all did not come properly under treatment.		
16	Parágpur ...	13	10	76·92
17	Bhangal ...	13	7	53·8
18	Laroya ...	64	13	20·3
19	Jhingrán ...			
20	Kariha ...			

55. The striking difference between the mortality per cent. of cases treated at Kariha and those of other villages can only mean that the bulk of the patients were convalescent at the time. This conclusion is still further borne out by the fact that out of the 62 persons admitted to hospital no less than 33 were found to have a normal temperature when a record was opened on this point on the 8th. It is also worthy of notice that the mortality per cent. on the whole number of cases returned in this village is not markedly higher than that in any other village, and this in spite of the fact that 126 deaths which took place before the site was evacuated were included in the returns, while no account was taken of the recoveries in the village, which must at the least have reached a total of 40 That several such recoveries did take place has been clearly proved during the investigations which were subsequently made into the origin of the disease. The question naturally arises whether it was worth turning the village out if, as the figures would seem to show, the disease had practically exhausted itself. Apart from the fact that the people must have gone out for from two to three weeks to enable the disinfection work to be done, there can be very little doubt that by allowing the village to be evacuated when the people petitioned to that effect many lives were saved. A ground plan map of the village site has been prepared and is submitted with this report. This map represents only the infected portion of the village or one-third of the whole, the pattís of Amír Khán and Sher Jang and Jhandu Khán being only sufficiently drawn to show the isolated cases in their pattís. The disease broke out in the patti of Suba Khán and spread from there to that of Aladád Khán, in both of which quarters it raged with indescribable vehemence : in the other two-thirds of the village only 15 houses in all were attacked. The reason for this is that there is an old standing feud between the pattís of Jhandu, Amír Khán and Sher Jang on the one side and of Suba Khán and Aladád Khán on the other, though perhaps it would be more accurate to say that each patti was at enmity with every other, and that those of Aladád Khán and Suba Khán were of necessity thrown more together. Thanks, however, to this ill-feeling three pattís escaped, but it can hardly be believed that this immunity could have long continued, and it is noticeable, as the map will show, that the 15 houses in these three pattís which were infected were amongst the latest to be attacked. It was this fact doubtless which moved the people in this quarter of the town to beg to be allowed out.

It has been a matter of great difficulty to obtain reliable information about the origin of the disease in this village until the day before they went in; the earliest ascertainable case was that of Mussammát Jeevi Ráin, who died on April the 14th, and of her the villagers said that she had been to the infected village Mallupota to see her daughter who had been sick. Apart from the fact that there was no illness in Mallupota in April, this story was entirely discredited by the mention of Mallupota at all. It has been noticed as a curious fact that whenever a villager wishes to conceal the true source of infection he establishes a fictitious connection with Mallupota. This has been the case until the truth was wormed out at Sodhián and Kumam and one or two other villages, and the reason is of course obvious. Mallupota is the only village in which the Lambardárs have been prosecuted to conviction for disobedience to plague rules, and it is naturally supposed first that anything will be believed against such desperate characters, and secondly, that having been once punished they are not likely to be put on their trial again, and that therefore there is no harm in attributing such villanies to their village.

It has now been discovered that Mussammát Jimán Ráin, became ill on or about April 5th, and this is admitted by the woman herself, who recovered. The villagers say that at the time the bubo which appeared was supposed to be of a syphilitic origin, and hence was not mentioned before, and the curious fact has been elicited, which throws the necessary light on the extraordinary way in which when one woman falls sick several others always seem to follow in quick succession, namely, that as a charm (totka) to get rid of the pain caused by the swelling it is the custom amongst women, and women only, for several of the female friends or relatives of the patient to gather round the sick bed, and after the bubo has been opened to touch the wound with some portion of the clothing in the belief that in this way the pain will be distributed amongst the participators in this rite, and thus become too dissipated to be of any inconvenience to any single person. This was done in the case of Mussammát Jimán, and, as far as it is known, all the women who came to give their aid in this way were attacked. The Mussammát Jeevi who for a long time figured as the first case was one of them.

It is not quite certain how Mussammát Jimán became ill. The village story is that her brother-in-law Karam Bakhsh Ráin brought the disease from Kumam. Karam Bakhsh himself states that about four days before Mussammát Jimán became ill, that is about April the 1st, he went to the boundary between Chahlan and Kumam in order to make over certain stores to his relation Shádi Ráin in Kumam; that he was stopped by the sentry on the boundary and made over his stores to one Kálu, Ráin of Kumam, who was appointed on the hospital staff ; that he waited there some three hours until Kálu returned with the news that the stores had been given to Shádi, and then went home to Kariha. The theory was that the infection had been communicated from Kálu to Karam Bakhsh and from Karam Bakhsh to his sister-in-law Mussammát Jimán, but as Kálu did not certainly become ill, and as the last dropping case in Kumam occurred amongst the Chamárs on March 31st, this theory will hardly hold water.

The true history, however, at once suggests itself to any one who is acquainted with the locality. The village site of Chahlan is but one hundred yards or so from the Kumam boundary, the other side of which and some three hundred yards away the Ráin camp of Kumam had of necessity been pitched. In the village of Chahlan there is but one Muhammadan family, that of Nabia, Gujar, and it is known that plague first broke out in Chahlan in the house of Nabia, and that he himself became ill on or about the 1st of April, though the village was not cordoned till the 6th. It would have been inconceivable had Karam Bakhsh remained three hours on the boundary of Kumam in the sun, when there was a hukka available about a hundred yards away. From the fact that Nabia's house was the only Muhammadan one in the village, Karam Bakhsh must have gone to smoke there. When asked if this was not the case, Karam Bakhsh said that of course he had done so. Whether Karam Bakhsh became ill or not himself there is no definite proof, but from the demeanour of the villagers it is to be suspected that he did. No one when put on their oath by the Tahsíldár, himself a Muhammadan, would state definitely that he had not: his neighbours would only shrug their shoulders and say that God alone knew. In any case the infection may have been carried by Karam Bakhsh in his clothes and so communicated to Mussammát Jimán.

A word of explanation with regard to the map is here necessary. The original house is marked A, and in this Mussammát Jimán fell ill; from her the disease spread to that marked 1, in which the Ráin woman Mussammát Jeevi, who took part in the charm, lived, and in Nos. 2 and 3 other Ráin women fell ill from the same cause. No. 4 is the house to which Mussammát Jeevi was transferred during her illness, and which belongs to her brother. Nos. 5, 6 and 7 follow by contiguity, and in No. 8 lived a particular friend of No. 4. Up to now the disease had remained amongst the Ráins. The 9th house to be attacked was that of a Chamár, who was the servant of No. 4, and from there the infection spread like wildfire amongst the closely-packed Chámárs, part of whom live in the block marked with a blue cross in Suba Khán's Patti and part in the long lane in Aladád Khán and Suba Khán's Patti, in the numbers ranging from 15 to 45, to which a similar mark has been assigned in the order of the occupant's death as ascertained from the daily roll-calls and the hospital registers.

(*xviii*) *Bhangal.*

Bhangal.

The village of Bhangal fell under suspicion about the middle of April, but it was not till April 23rd that Umed Ali, Zaildár of Kariam, gave definite information against it. Mr. Clarke's Tahsíldár attempted to make a search, but was turned back. The next day in attempting to arrest the Lambardárs Mr. Clarke was attacked and the police driven off. On April 25th Colonel Rennick, Deputy Commissioner of Jullundur, arrived and extensive arrests were made. Plague was definitely discovered and the village taken over. The villagers were turned out into camp on 26th.

First case.
Origin of the infection.

According to the statement of the villagers and by the admission of the man himself, Harbhaj, Lambardár, was the first person to fall ill in this village. Two men employed on the disinfection work when separately interrogated said that there had been constant intercourse between Bhangal and Katheron, and that villagers from the former used to execute commissions for the latter in Nawashahr. They also stated, what has since been fully established by enquiries and the preparation of lists, that the two villages were united by marriage ties, and they specially mentioned one Kanon, wife of Khazána, a Bhangal woman, who used to go regularly to Katheron to see her married daughter there. Harbhaj, the Lambardár, they also stated, had been several times to Katheron, and they said he had had intercourse with Naráin Singh, the Katheron Lambardár. Their statement was borne out by one Dittu, a Ját, to whose house after Harbhaj's the plague spread. This man had lost from the disease several members of his family and was evidently deeply distressed and had no friendly feelings towards Harbhaj. This latter, he said, had brought all their troubles on them by persisting in going to Katheron. Harbhaj himself, when asked about the origin of the disease, said that he had been the first to get ill, but as to how he got ill "God alone knew." On being pressed and being too conscious of being under some obligations not to lie too freely as he had received no little kindness during his illness, he said he had been once to Katheron to see the Patwári there about a question of the revenue. The Patwári, it may be stated, is a joint one and had been let into Katheron to do its girdáwari, when he was allowed to live quite apart from the Katheron villagers, and this admission of Harbhaj may be taken to be a compromise between his better instincts to tell the truth and his natural desire not to incriminate himself. That this is the case is still further to be believed from statements which have been made before the Tahsíldár by other Bhangal villagers that Harbhaj used to go to Katheron to meet one Jaimal of that village, and that their meeting place was the well by which the Patwári lived, and that on one occasion he took a load of sugarcane seed from Jaimal in Katheron to Bhangal.

Once in the village the disease spread from the house of Harbhaj to that of his neighbour and caste-follow Dittu, and the first person in Dittu's house to fall was his wife Mussammát Kanon, who had been frequently to Harbhaj's house to consult with her friend Harbhaj's wife about him. Dittu's daughter Mussammát Sadan was the next victim. From his house the plague fastened on Mussammát Ralli, the wife of Dittu's brother Ganesha, who lived in a room in the same compound, and from there it spread to the houses of Nathu, another Lambardár, and of Sundar, his brother, some little way off. In all these houses dead rats were found in the roofs. In this village it is recorded as an extraordinary thing that a few house rats ventured away from their homes and appeared amongst the villagers' huts in camp.

Spread of the disease in the village.

It now becomes necessary to test this story. Bhangal was reported by the Zaildár on April 23rd, and Harbhaj at that time must have been ill some four or five days, as he was himself past the crisis, and there were 17 reported cases when the village first went out. The desease, then, we may say, assuming it proved that Harbhaj was definitely the first to fall ill, which there seems no reason to distrust, broke out on April 18th. Plague remained active in Katheron down to April 8th, and there were dropping cases on 10th, 15th and 16th. From the 16th to 18th, supposing Harbhaj to have gone into Katheron before he got ill, is but a short time, and admits of the belief that he contracted the disease by personal contact, and that this was the case is rendered almost certain by the fact that the case on the 16th was that of Wariáma, Ját, who was Naráin Singh the Lambardár's sister's son, and whose hut in camp was next to that of Jaimal. Now, it has all along been stated that it was to meet Naráin Singh and Jaimal that Harbhaj went to Katheron. It is also worthy of notice that after Katheron was declared free and while Harbhaj was ill in Bhangal this man Jaimal tried to break the Bhangal cordon, presumably to see his friend, but was caught and stopped by the police. If, however, this is not convincing, and it is allowed that Harbhaj may have got plague from contact with infected clothes or anything else which he took away with him, the period from the 8th, when the disease was active in Katheron, to the 18th is by no means too long to upset the theory that Bhangal owed its infection to that village. There seems, however, to be no question that Harbhaj got ill through contact with the man Wariáma. If he did not, the coincidence is extraordinary.

The story substantiated.

N. B.—It is only right to state that since writing the above, information has been solemnly sworn to before me by the Rájpút Lambardár of Katheron that Jaimal and 13 other men, whose names are given and who include both Játs and Rájpúts, became ill, but were concealed and not taken to hospital. This may very likely be true, and it has always been suspected that concealment was practised in this village owing to the way sickness kept cropping up after periods of freedom, and also because two concealed cases were actually discovered by the police. This Lambardár though does not command my belief, and I could not consent to base any theory on his evidence. There are factions in Katheron, and the case is strong enough without this additional proof.

Supplementary.

(*xix*) *Bajon.*

Bajon is a small Ját village whose infection followed on that of Parágpur. It was at once turned out, and after remaining in camp from April to June 6th was allowed to return to its site. The disease ran an uneventful course, and the people behaved excellently, their Lambardár being particularly conspicuous. The source of the infection admits of scarcely any doubt. The first man to fall ill was Amín, son of Khazána, Khatri, a hawker by profession, who up to April 19th, when Parágpur was cordoned, was daily in that village selling sweetmeats (reoris) to the people there, and mixing freely with them. On the 19th he came back finally to Bajon, where his home was, and the next day became ill and died on 25th. His body was examined, and as a result plague was declared in the village. Plague, it must be remembered, existed in a marked form in Parágpur from the 10th of April onwards at least, as has been shown in the report dealing with that village. Laroya, Parágpur and Bajon too form a natural trio. None of these is self-supporting, and each depends on the other for supplies, sweepers, &c, &c. As soon therefore as Parágpur fell the other two were bound to follow.

(*xx*) *Laroya.*

Laroya, a small Ját village, lies some 300 yards off Parágpur and depends on it for its shop and sweepers. There is constant intercourse between the two villages. Plague was discovered on May 16th; the people were turned out into camp next day and remained there till June 24th, when the re-occupation of village was sanctioned. The disease ran a perfectly ordinary

Laroya.

course. The people though refused all treatment, and objected too to using the hospital huts for shelter. The sick accordingly remained exposed to the sun with little or no protection, and the mortality was very heavy.

The first person to fall ill was Gonda, son of Sahab Singh, who was attacked on or about April 21st. It has been established that this man was in Parágpur, where the disease was actively raging, though it was only discovered on 19th, shortly before to buy medicine for his cattle which were ailing. It is also stated that he had been to the house of Sonda, son of Pír Bakhsh, Rájpút, in Parágpur to purchase mustard seed. Now, it is an ascertained fact that Sonda's daughter-in-law died of plague on 19th April, while Sonda himself succumbed on 21st, and his son Munshi on 24th. Another of his sons, too, Kira by name, is said to have died on the 19th. There can be no reasonable doubt that plague was in this way brought into Laroya. The facts though have only been obtained with great difficulty and under an assurance that there is no fear that criminal proceedings will be instituted, as Gonda's illness was not reported. The Lambardárs, however, are not to blame for the concealment of the disease up to May 16th, as when Gonda's wife, Mussammát Rao, got fever towards the end of April and developed a bubo in the left groin, which she cauterized on May 2nd, and for the treatment of which she was subsequently taken into hospital, a report was made, but the case was pronounced one of ordinary fever. On May 3rd yet another case occurred and was examined, but was again pronounced to be ordinary fever, and it was not till May 15th that the death of Mussammát Hukam Dai, Ját, brought this village on to the infected list. Besides this Mussammát Rao, two other relatives of Gonda got plague, namely, his sister-in-law Mussammát Jessi, wife of Isher Singh, and Mussammát Rájo, wife of Indar. It is a curious fact that once a woman gets ill it would seem the usual thing for all her female relatives to be attacked. This is presumably because they gather round the sick bed to help nurse in a way men would not do for one another. This was specially noticeable in Bhangal too, and has in fact been conspicuous everywhere.

First case.

Origin and spread of disease.

(*xxi*) *Jhingrán.*

Jhingrán is a large Ját village and was the last to become infected in this circle. It was reported on May 24th, went into camp next day, and was ready for re-occupation by June 21st, though it was kept out some time longer, as there were a few patients still undischarged from hospital. In all 14 cases occurred amongst the Játs, of which 9 were from one family, 2 from another, 3 from a third, and all lived near each other.

The infection appears to have come from Aujla, as the first person to fall ill was certainly Mussammát Ishri, daughter of Nathu Ját. She had been, it is said, on a visit to her maternal uncles Nathu and Gaya at Aujla, but when plague broke out there, April 28th or thereabouts, before the cordon was put on, her mother went from Jhingrán and fetched her back. She developed a bubo, but as she got well her case was not reported. It was in her family that 8 other persons were attacked. This story has the making of a clue, but the investigation which alone can make it admissible in evidence have been cut short by the necessity of concluding this report by a fixed date. Aujla is in the Banga Circle, and the hospital register, &c., are consequently not in this office. Hence the inevitable delay. The villagers say that Mussammát Ishri's relations in Aujla did get ill, but such a statement is entirely inadmissible till proved. This village history must hence be left incomplete.

(*xxii*) *Arapar.*

This large village was reported on the 12th May, when it was said that one man had died and two others were sickening. A guard was accordingly at once despatched and the village cordoned. As, however, on the arrival of Surgeon-Captain Smith next day it was found that the corpse had been burnt and the two other persons showed no signs of ill health, it was decided not to accept the Hospital Assistant's diagnosis, but as a precautionary measure to turn out 12 houses, cordon the village site, and have the place regularly called over. The 12 houses chosen were such as abutted on the supposed infected house in all sides and were designed to form a buffer state as it were. Their unroofing was commenced at once and concluded in one day, and a coating of lime was washed over their walls. There was thus left a large open space exposed all round the suspicious to atmospheric conditions. On the 10th day when no further sickness had taken place the cordon was taken off and a guard put on the 12 houses in segregation, and they were kept out 4 or 5 days longer. The village was then declared free.

Chapter III.

In this chapter a summary of the history sheets of the individual villages as given above will be made and the necessary deductions drawn from them. With the exceptions of Aur and Arapar, which never really came under the supervision of the executive staff, and which have therefore been excluded from consideration, the whole of the villages proper of this circle, amounting to 20 in all, have been placed under a minute examination extending in many cases over two or three months.

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Of these in the twelve marginally-noted villages there can be no doubt that not only has the real first case been elicited, but also that the exact source of infection has been discovered.

Kumam, Katheron, Karnána, Lodipur, Mohrámpur, Músapur, Chahlan, Hansron, Rasúlpur, Bhangal, Bajon, Laroya.

In four villages the first case has been definitely discovered and the source of infection denoted with a probability which amounts almost to certainty.

Mahmúdpur, Sodhián, Kariha, Jhingrán.

In one village the probable source of infection has been ascertained, though absolutely convincing proof is wanting.

Malpur.

In two villages the length of time that the disease was concealed before the village was cordoned made enquiries as to who fell ill first necessarily futile, but it is inconceivable that the disease was not imported by human agency.

Shikohpur, Sahlon.

In one village alone has no definite information been obtained, and this because of the concealment and recusancy there indulged in and the fear that a prosecution was impending, and also because the village lay at so great a distance from head-quarters as to make it impossible in the month of June to spend such a length of time there as is required to worm out the necessary information in these cases.

It thus follows that in 18 and probably 19 out of 20 villages the source of infection has been shown to be the contact between man and man.

This conclusion has been elaborated at great detail, because it surely must be allowed that the one point above all others which it is of importance to elucidate is simply this: is plague spread by the agency of man, or is it by rats that it may be passed from village to village? If it is by man, then it may be controlled by man, but if it is by rats, all human efforts are vain, and we should do better to refrain from harrassing a loyal and contented people and say with folded hands we can do nothing: it is God's will.

Chapter IV.—Hutting arrangements.

The Nawashahr Circle has throughout been dependent for its supply of huts on the Banga workshops. It will therefore be unnecessary to go into the details of cost and construction which will be obtained first hand from the figures given in the Banga Circle Report. The only remarks which suggest themselves therefore are connected with the supply. This was necessarily, owing to the rush of villages, wholly fitful and inadequate throughout and it was never possible to do more than furnish the police and the hospitals with proper accommodation, and after a village had gone out and made its own arrangements to provide for those who were too poor or feeble, like Chamárs or widows, to do anything for themselves.

The supply.

Should plague ever break out here again, it would certainly be advisable that a separate hutting establishment should be entertained at the head-quarters of each circle. In this way alone can the Circle Officer maintain an intelligent hold on this important branch of his duties. The circumstances of plague change rapidly, and the supply of huts which one day may be urgently wanted to turn the scale between a peaceable and a forcible evacuation of a village will only too probably, if they arrive a fortnight later, be a luxury with which it would be possible to dispense; for, once settled down, be their own shelter ever so slight, the villagers are naturally to move into new abode. It should be remembered, too, that at a time of plague communications are difficult, and that once huts are started off on a certain road it is extremely hard to divert them at a moment's notice without playing havoc with the cordon. To conduct hutting arrangements properly too the Circle Officer's head-quarters should undoubtedly be outside the cordon, and if for any reason only one central workshop can be formed, he should have a permanent reserve of huts to be maintained and kept up without fail at his head-quarters, so as to allow him to be master of his own movements. This point may be considered essential.

Suggestions.

Chapter V.—Camping arrangements.

In the early stages of the disease camps were laid out with an artistic nicety which left nothing to be desired. To make perfect camps though it is first necessary to have a plentiful supply of huts, and secondly an adequate police force. The ideal arrangement is to turn the village out by pattís, each patti on the side of its fields, and to have huts put up on neat lines and with suitable spaces between each before any one moves out of his home. It is then a simple matter to evacuate a village, as the people race out to get the best huts.

The ideal camp.

In this circle, however, this was only done in the case of Shikohpur, and every other village made its own huts, supplemented later on by a few Government chappers. As regards the actual disposition of camps, it was at first tried to move out pattis separately, but this was found to require an extra number of police for night duty and had to be discontinued. Sahlon, Kumam and Katheron were accordingly the only three so treated, though in Músapur and Malpur, where the Chamárs were alone attacked, a separate camp was formed for this caste. In Bhangal and Kariha too the camps, though not separated into definite blocks, straggled over a large area. This was due to the press of work going on at the time, which made effective supervision difficult.

The real camp.

The practice was first to choose two wells for the hospital and segregation camps respectively, the wells being the first thing to see to in laying out a camp. This done, a large open space with as many wells as possible was set apart for the healthy camp. One corner of this would be allotted to the Chamárs, and a special well would be made over to them, and its selection left to the Lambardárs and the land-owners of the village. The rest of the people went out together, sorting themselves into caste groups according to their fancy. Muhammadans will as a rule take one corner and Khatrís and Brahmans another, while the Játs kept together in the main part of the camp. In Parágpur and Kariha, where parda rules were observed or affected, a special block on the further side of some trees or a sand bank or some such natural screen would be selected, and the men would complete their arrangements and bring out their women under cover of night. In the hospitals in these villages too the huts for parda ladies were set apart, and only the dhái visited them unless the husband asked for the doctor, which after a few days he almost invariably did. It was found in fact that the people preferred to sort themselves, and did it much better than any official could have done. The great drawback to this encouragement to self-help was that it was extremely hard to prevent the crowding together of huts with the consequent danger of fire, and in fact there were three outbreaks in Músapur, Karnána and Kumam respectively. All that could be done by precept and warning was done, but it was impossible for a single officer with 15 to 20 villages on his hands to be present all day, and it was not often feasible to have the Tahsíldár there. Another drawback, too, is that the huts as made by the well-to-do were so magnificent as to be quite proof to sun and air. However, little harm was done, and where a free expenditure is being incurred within a small area it is very advisable from many points of view to make the people do something for themselves, so as to escape the ever-ready danger of pauperisation.

Wells. Caste distribution.

Chapter VI.—Duties of Executive Staff.

The duties of an Assistant Commissioner are essentially those of supervision, and this officer should keep himself informed of everything that is going on in each village. He has to make arrangements for supplying huts to the Medical and Police Departments and to the villagers themselves, choose sites for camps, be invariably present to order a village to turn out, and to see that his order is obeyed. Once in camp he has to watch that the Lambardárs give a loyal support to the Medical Officers in the way of showing up the sick and having them and their relatives removed from the healthy camp, and though in this he must necessarily be guided by the wishes of his Medical colleague, he should endeavour to inspire confidence in the hospitals by visiting the sick there, and letting the Lambardárs see him do so from outside the hospital compound. The terror inspired by the hospital is very real, and there is nothing more unfortunate from a political point of view than to make it a fortress into which no man's foot may enter save that of the doctor, and the only exit from which as seen by the people is the mournful egress of the dead. It is even a wise thing where, as in this circle, the Medical staff has raised no objection for a European officer to take the Lambardárs into the hospital compound with him, and let them see with their own eyes the way in which the sick are being cared for. As a rule, of course the Lambardár much

Assistant Commissioners.

prefers to remain outside. The Assistant Commissioner has too to keep an eye on the progress of the disinfection work, to draw attention to the fact if there is delay in commencing it, to provide and pay the coolís employed on it, and to collect and furnish a proper and timely supply of lime, brushes, &c., &c. He must also be constantly ready to listen to complaints and endeavour to repress as far as possible the extortion which he knows must be going on, and to keep his superior officers informed of the temper of the people. He will also do well to keep payments as far as possible in his own hands and not make over any definite branch of them to native subordinates. When this gets beyond his powers he can always depute his Tahsíldárs to disburse specific sums of money. On no account should payments be made by Medical or Police subordinates, and the arrangements for them are, under the supervision of the Circle Officer, the proper sphere of the Naib Tahsíldárs, 2 of whom were allotted to this circle.

Special requirements and procedure followed in arranging for the same.

Amongst the special requirements of the people there may be noted—

(*a*) *Postal arrangements.*

(*a*) Postal.

The plan adopted was to have ordinary letters delivered and posted in the police camp on the boundary, from which they were distributed to the villagers. Money Orders or registered articles were made over to the Assistant Commissioner, who distributed them through his Tahsíldárs.

(*b*) *Provisioning.*

(*b*) Provisioning.

The village bania was always employed to supply the villagers, and as his stores ran out fresh consignments were sent to him to the cordon on his own order from Ráhon or Nawashahr and were paid for by him in advance. The police camps which were placed just outside the cordons had each a bania of their own. This arrangement presented great difficulties at first, and it was only by paying Rs. 15 a month that shop-keepers would come at all, and even then they at first tried either to run away or be dismissed. At the end of the first month, however, the Assistant Commissioner paid every man with his own hand, and the police were made to clear up their debts. This gave confidence, and there was never afterwards the slightest hitch anywhere, and there were always volunteers ready to go from Nawashahr.

The hospitals were provisioned as follows:—Books of vouchers were prepared in triplicate and issued to Hospital Assistants. When anything was wanted for the patients a signed order on one of the three foils was sent to the bania in the police camp for so much flour, so much ghi, &c., &c. The goods were sent and the order kept by the bania. A duplicate of the order was then sent in with the daily report to the Medical Officer, who, if he considered that the quantities were not excessive with reference to the number of patients under treatment, signed the voucher and sent it to the Assistant Commissioner. At the end of every fortnight the vouchers were totalled and the Tahsíldár given the money to pay the bania, from whom the original vouchers were taken after being checked against the duplicates. The triplicates remained with the Hospital Assistant. The system prevented wholesale overcharging on the part of the Hospital Assistant and kept the payments out of his hands.

(*c*) *Purchases.*

(*c*) Purchases.

All the villages required to purchase things like wine, opium, post-cards, cord baskets, &c., &c.—the rule was invariable for these things. Provided the money was paid in advance, anything was supplied; otherwise no requests of this sort were as much as listened to. This worked very well. Small articles like opium or hemp were bought in Nawashahr and carried out by the Tahsíldárs, while large consignments were sent to the Police Camp on the boundary to await the arrival next day of the Tahsíldár, who then summoned the purchaser to the camp and made over to him the goods.

(*d*) *Litigation.*

(*d*) Litigation.

Litigation was not very freely indulged in, and the only suits which were brought were such as had to be filed to be within the period of limitation. These were admitted in the Assistant Commissioner's Court, and the hearing was postponed indefinitely and the files were sent to Sadr. Where necessary, litigants were given the services of a petition-writer who was despatched to the police camp on the cordon where an interview was arranged for with his client under the supervision of the Tahsíldár. Similar arrangements were made in cases where mortgagors desired to pay off their mortgages, &c.

(*e*) *Cultivation.*

Cultivation.

Cultivation required constant care throughout, especially at the time of harvest, when it was necessary to arrange for the cutting of crops in other villages. To manage this lists were made out where necessary, maps prepared beforehand of all out cultivation, a distinction being drawn between lands just over the village boundary and lands at a distance from it. In the case of the former dates were fixed within which the healthy village across the boundary on one side would be allowed to cut its crops within a certain radius of the boundary, if necessary over the boundary itself, and during which the cordon was drawn in on that side, while the infected villagers were made to do their harvesting in the fields away from the healthy village. This period over, the healthy villagers having cut their crops near the infected area were moved off, and having no inducement to stay went as they were told. The cordon was then thrown out for two or three days to include the fields of the infected villagers in the healthy area. Where, however, the fields of the infected or healthy villages were right away from the boundary and could not be cut by shifting the cordon backwards or forwards, it was arranged either to get the crops cut and stacked on the boundary by some relative of the owner of his own choice, or to set in motion the local custom, by which a man may call upon his caste fellows or the menials of the village, at the cost of a big dinner to the former and a few sheaves to the latter, to cut his fields for him. ('Abt bulána). Once cut the corn was made over to the owner in the Tahsíldár's presence. This worked excellently. During the fortnight during which harvesting operations were in full swing the two Tahsíldárs were kept almost entirely on this work, and they were expected to see that the arrangements as sanctioned were properly carried out. It was due to their energy and good sense that in no single case was it found necessary to pay compensation for losses caused to cultivators, and as far as it is known the harvest operations were not responsible for the spread of plague. At other times it was found necessary to allow the people to store their fodder or grain in their barns. This was done in the presence of the Assistant Commissioner or one of the Tahsíldárs, and was accompanied by liberal libations of phenyle and the usual precautions for avoiding infection, and the practise was always dicouraged. If wells too came outside the cordon, as was often the case after the harvest when the cordons were drawn in, and any landowner desired to water his sugarcane crops, one or two constables would be given for as many days' day duty on the well as was necessary.

(*f*) *Sugar refining.*

Sugar refining.

One very constant source of trouble was the necessity for allowing sugar refiners to draw off the liquid matter (sira nikálna) from the sugarcane juice (ras) which was being converted into sugar (khand). If this was not done every 10 days or so, fermentation set in and great loss was caused. This necessitated some one going into the village, but it was considered more important to run the risk than to face the loss and the consequent discontent. The operations were carried out in the presence of the Tahsíldár, and the same precautions were observed as are in vogue when a disinfection gang is at work. In only one case did an operator get ill, that in Kariha, and it was stated that apart from the occasions on which he went with leave he used to be sent in by night by his master, the owner of the sugar, to act as watchman over the considerable property which remained inside. This he admitted himself.

Chapter VII.—Disinfection Routine.

General procedure.

The process of freeing a village from sickness was almost invariably the same. Every day the Hospital Assistant went round the camps and saw each person, marking their names off on an attendance list. Such as were sick were removed to the hospital camp, and their relations, after a full disinfection of their property had been made, were sent into segregation. In some villages too, in which during the cold weather the disease was very obstinate, it was found advisable to disinfect the whole of the healthy camps with a phenyle solution—a most laborious task. As soon as the disease began to abate and there was any one available to supervise the work, the actual disinfection of the village site was begun. All the infected houses were marked, and after being well phenyled the property inside was removed and the rooms were completely unroofed. In the uninfected houses large holes, 8 feet by 6 feet, or in small rooms 6 feet by 4 feet, alone were made. The houses were then washed with quicklime obtained from Birámpur and supplied at the rate of one maund pakka per house. These operations completed, the segregation camp was thoroughly disinfected with a phenyle solution, and the people after a lapse of one month in the cold and three weeks in the hot weather from the date of the last case were allowed back. The Hospital Assistant continued all the same to make his daily inspection in the village, but on the sixth day a formal roll-call was made by a Náib Tahsíldár, sometimes in the presence of the Assistant Commissioner, and if all were found present and well, the cordon was taken off. A second roll-call was then made on the tenth day, after which the

village was declared free. The disinfection gang was drawn from the village menial and were paid annas 3 per head per day, the pay being distributed usually by the Assistant Commissioner, or if not, by a Náib Tahsíldár.

Length of time in camp.

The period during which each village remained in camp differed, but through lack of staff the early villages were kept out too long. This is always a most regrettable thing, as it not only chokes the Executive staff with old villages, but it also renders new villages discontented and unwilling to go out. The whole aspect of the people about here changed towards the end of May as villages began rapidly to go in, and when in consequence all complaints ceased. In future it would probably be a very good plan to extend the practice of employing good conduct constables on the supervising work. They are readily obtainable, anxious to come, and if carefully selected the very men for the work in the prospect of promotion. Were such men more freely used—and on the whole they would probably be much more satisfactory agents than European Non-Commissioned Officers—disinfection could be commenced directly the disease showed signs of abating, and this all-important branch of plague operation could be kept up to date. If Hospital Assistants are to be used, everything may be stopped by an outbreak in a new village.

The lime supply.

The lime supply was at first capricious and often adulterated, and this had to be met by fines or short payments. It would probably be better in future if a supply were imported by rail from Jhelum, for example, after being duly passed by a Public Works official. A nice discrimination between various qualities of lime can only be acquired by a Civil Officer after some experience, and the experience as well as the lime has to be paid for.

Police guards on hospitals and village sites.

The question of a police guard on hospital and village sites has been raised, and much may be said on either side. They are, it may be said, perhaps a luxury. Anything like systematic invasion of these forbidden places can at once be stopped by the arrest and punishment of a few of the offenders, and the casual lurker by night will probably get in in any case. The village of Karnána proved troublesome in this way, but a sudden raid and the seclusion of six of the offenders for a week put things right at once. The maintenance of police, too, on this duty is a serious danger to the constables themselves, as they are but human, and in the hot sun nothing is more tempting between the Sergeants rounds than to retire in the shade of a house to rest. It is undesirable as well to thrust the police too freely into the gaze of the villagers. They look upon them as the engines of the oppression which at the best they consider plague operations to be, and the more they are kept on the outer cordon the better. The saving of men, too, is no inconsiderable advantage. It was very seldom, as a matter of fact, that village sites were cordoned, and no harm was done. It is true that some burglaries took place, but as a rule the people prevented this by appointing their own watchmen. Of the burglaries, too, which were reported some were clearly spurious to excite compassion and to put in a claim for the everpossible compensation.

Compensation.

With regard to compensation, the less of it there is probably the better. The only compensation given here was for the destruction of roofs, for which as two annas per "khan," or space between each rafter, were given to buy the grass (phus) which is placed on the beams to hold up the upper coating of mud, and which was always burnt. Perhaps this was not absolutely necessary, but it was a great hardship for the people to see their homes dismantled, and the compensation offered was a crumb of comfort. It should always though, even if possibly unnecessary for the zamíndárs, be given to Chamárs and village menials.

Subsistence allowance.

Subsistence allowances were purposely restricted as far as possible. Private relief came forward; it was necessary, and it was obviously better that this should be the case. Prompt and regular payment of their dues is really more appreciated by the people than an indiscriminate liberality.

Evacuation of the village site.

The only other question which remains, *viz.*, when a village should be turned out, is a difficult question, and must always depend on circumstances and times and seasons. Where the people are known to be co-operating loyally it is only fair to them to try milder measures at first, and the experience of Aur and Urapar has shown what can be done in this way; where though any suspicion of concealment attaches, or where the rats are found to be dying and the village is a small one, immediate evacuation would probably be unanimously advised. Where though a large and especially a Muhammadan or Khatri village is infected, political considerations will frequently recommend a deliberate as opposed to an immediate evacuation. It will

be better often, that is, to face some half dozen more deaths and to give a village four or five days to go out, during which time friends can be made with the people, than to issue an ultimatum on first acquaintance, when perhaps only one or two Chamárs have become ill.

The use of force.

These questions though are not ones for serious disagreement. Where opinions would seem to be divided is on the question of an appeal to force. One party will be prepared to treat any obstruction to plague rules as a deliberate defiance of authority, while the other will see in it the workings of ignorance or fear, and will ask for time if not to dispel ignorance—for this is almost impossible—but to establish confidence and banish fear. The one party will, to come to concrete facts, be quite ready to shoot if by so doing lives can be saved from the plague, while the other, by tightly cordoning the foolish village round its site to protect the neighbouring villages and until it asks to come out, will not wince at five or six times the number of deaths from plague to save the few from the bullets. From the point of view of the Plague Officer there will probably be no dissentient voice, as the feeling that he has but to call upon the police and have done with all opposition is an enviable one, and relieves him of the constant tension which the other policy requires where a false move or an angry word may banish the confidence which has been built up by several days of intercourse, but from the point of view of the people there are other considerations. The heavy mortality at Kariha made a vast impression throughout this circle, and it caused places like Amargarh, Lál Mozara, &c., to take precautions for their own safety, which no amount of shooting will ever do, and in this readiness to protect themselves lies the only hope of stopping the spread of plague. Experience is a good master, and more is taught to a circle by seeing what plague really means in one of its villages and in learning its lessons than by being village by village infected and escaping its worst ravages. It was a common remark, until Kariha threw the necessary light on the subject, that this sickness does not cause nearly so many deaths as the cholera; Why then all this fuss? That the people themselves feel the use of force as an outrage to their already harassed feelings receives an illustration in the shrewd remark of an old man who had been talking of the Garhshankar affair, and to whom as in duty bound I had explained that it was kinder to shoot 14 men than to let 120 die of plague as in Kariha. It was simply this, but there it was God's will that they died. It is not necessary for me to say that I would gladly feel that force was only to be used to meet force, though I am only too conscious that my experience is too limited to give much weight to my judgment. The above remarks are only offered in the belief and in the absolute conviction, founded upon now nearly five months daily intercourse with a friendly and attractive people, that their faults are neither of the head nor of the heart, but of that unreasoning panic which our swift and direct occidental methods, however necessary, are always found to create. Plague measures can never, if they are to be efficacious, be popular, and the fear of the measures will always be more terrible than that of a disease which, as experienced, claims but a death roll of some 20 or 30 persons. It is incomprehensible, but I believe it to be a solemn fact; and in this state of feeling the intrusion of force does but gall the opened wound. It must always be remembered too that there is probably no happier or milder a people than is to be found in the Jullundur District, and that what can be done there is no criterion of what will be possible in places where the villagers are less prosperous and more ready to stand up in assertion of their beliefs, because they are either more fanatical or more accustomed to a struggle with nature for their existence.

* It will be noted that it is a tight cordon round the *site* which is contemplated. A cordon round the village lands can never be protection against the spread of the disease, thus allowed its own course, to neighbouring villages. Again, if kept inside the village site the necessity of going out to see to their crops will very soon make the land-owning classes implore to be allowed out, in which case the evacuation becomes an act of grace on the part of the Government and not an oppressive necessity imposed by force on the villagers.

Chapter VIII.—Police Cordons and Passes.

Cordons.

The main effect of police cordons is a moral one. However many sentries there are to a mile, probably any one who deliberately meant to break the cordon would be able to do so. Still the rule by which 8 sentries to the mile were made essential was a wise one, and there should never be less than this number. The essential point, however, about police is the maintenance of a reserve. No reserve ever existed in this circle, and it was often two days before a village could be cordoned at all, and then not properly. From the account regarding the spread of the disease submitted in this report it will be seen how frequently the infection was communicated to another centre in the critical time between the discovery and the cordoning of the new village. It is probably essential that on the outbreak of

plague in any new district that enough men to cordon ten villages should be sent off at once and arrangements be made for keeping the reserve up to strength. This has perhaps been the great lesson of this year's operations.

Passes. General remarks.

With reference to passes there can be no doubt that the rules introduced in May did not work well, even after they were modified to do away with a deadlock which had been produced; but there was nothing wrong in the rules. The whole secret of an efficient pass system lies in the situation of the head-quarters camp, and it is absolutely essential that this should be outside the cordon, and it should be made so at all costs. When this circle head-quarters were at Shikohpur inside the cordon there were constant difficulties in the way of people being stopped who should have had free access to the officer in charge.

Lambardárs reporting new villages, carts bringing huts and lime, dâk runners from some unusual place, &c., &c., would frequently be held up with a loss of valuable time and the production of much unnecessary irritation. On the other hand, if the matter was left to the discretion of the police it was not to be expected that a constable would nicely distinguish between a Lambardár bringing news of a fresh outbreak and some other man who professed a desire to have an interview with one of the officials. It is always to be remembered that, with one or two exceptions, not a single native subordinate employed on plague duty has had any more belief in the measures which were being taken than the villagers have had themselves, and consequently once the hard-and-fast rule of no pass, no road, admitted of exceptions, the whole cordon tended to become loose and unsatisfactory. Once at Nawashahr these troubles ceased. All stores, &c., were gathered there and despatched with passes as occasion required, and every one had free access there to the officers on duty. It was not till the camp moved to Nawashahr that an intelligent conduct of the operations could be attempted.

Permanent passes.

With regard to details it would be most desirable to issue permanent passes to every official employed on plague duty at once. These men are under daily supervision, and could not become ill without its being discovered at once, and they are not the people whom it is desired to stop, nor are they the agents who are likely to carry plague.

Hospital Assistant passes.

Again, the power of granting passes should not be given in any circumstances to Hospital Assistants. It is in the first place unnecessary, and besides this it is open to the most obvious abuses. All European officers on the other hand should be able to issue these documents.

Quarantine camps.

No need in this circle was found for a quarantine camp, and such a place would always probably be a luxury. In the very few cases in which it proved a convenience here satisfactory arrangements could have been made in the main police camp or the havalát police camp for segregation. This of course presupposes that the head-quarters camp is outside the cordon; where it is not, presumably a quarantine camp would become necessary. The situtation of the head-quarters camp is a point on which too much stress cannot be laid.

Chapter IX.—Establishment of Clerks.

Establishment required.

An English-writing clerk is essential at the head-quarters of each circle, and he should be familiar with accounts. A Muharrir is also necessary for about every 15 villages to read reports and conduct vernacular correspondence. This man would also be entrusted with the pass register. This is the smallest staff with which the work can be done and where a mass of statements had to be prepared for submission to Government more would certainly be wanted. All returns from this circle were, even after it became independent, sent to the Banga office for incorporation in a single tahsíl statement.

An Assistant Commissioner in subordinate charge of 10 or 12 villages could manage with one vernacular clerk, provided there was some common copying agency to deal with reports in English.

Chapter X.—Measures for checking the spread of the disease.

Self-protection alone effective.

To check the spread of plague from village to village it would appear that there is only one way possible. This consists in making the healthy villages protect themselves.

The rat theory of infection has already been discussed, and it has been shown that in this circle, so far from any evidence existing to substantiate it, the facts all point definitely the other way. Personally I am not prepared to believe plague to be the bogey it is made out to be. It is a terrible disease and claims a melancholy due, and there are few who have lived amongst it on whom it has not often had a saddening influence, but it is not the incomprehensible enemy with whom it is impossible to grapple or fight. The secret of success is to work with the people. With their help much can be done; without it the most heroic struggles are of no avail. This is an old saying, but it is none the less a wise one, and the only difficulty, and it is the great obstacle, lies in obtaining the people's help. To do this it is first essential that they should learn what plague means, and the only way to ensure this is to harden the heart and welcome the first sign of obstinacy as a signal to put an impassible cordon under the very walls of the village and to let the disease run its course. The lesson once learnt, and the daily death roll will be the common talk of the countryside. Attention should be turned not so much on to the infected as on to the neighbouring uninfected villages. In a few days the heart of any village may be won, and with a little persuasion the healthy village, if it will not turn out into camp, will at least take measures for its own safety, and one village watchman appointed by the villagers is worth hundreds of policemen. It is at this time that a plentiful supply of huts and a timely khillat to the man who will set the example—and a lead is everything—may mark the distinction between success and failure. Until, however, it has been seen what plague really means nothing can be done. It is an instructive fact that when this circle's head-quarters were shifted to Nawashahr even the leading men of the town came at once to gossip with the native officials on plague duty, and the first thing they asked was whether the disease which existed was a got up thing or not, so insignificant did it seem. The four villages too which, though encompassed by plague, escaped infection, *viz.* Kiriam, Amargarh, Lál Mazára and Ráipur, were the very four which took precautions to protect themselves. From the 5th too, namely Herián, the precaution had been taken to formally call upon the Lambardárs in writing to stop all ingress and egress to or from their village lands, and this order was, as far as it could be ascertained, obeyed. This village also escaped. Plague will doubtless, in spite of all efforts, sometimes slip through and fasten on some fresh spot, but until the neighbouring uninfected as well as the infected area becomes the object of immediate care there can be little doubt that plague will inevitably spread. During the time that the eyes of all who took an interest in plague this January were fixed upon the then infected villages the disease was in this circle spreading unknown in Shikohpur and Sahlon, in Katheron and Lodipur with the fatal harvest of new villages at the end of February and at the beginning of March. The searching party organisation experience has shown should be coeval with the executive, and its value would be increased fourfold if it became at once a preventive and a detective agency.

Chapter XI.—Mentions of Officials and Non-Officials.

Of the officials who have served directly under my orders I should wish to bring to notice the services of Munshi Abdul Sattár and Bhái Amr Singh, Náib Tahsíldárs. Between these officers the infected villages were divided so as to form two sub-circles, and on them fell the brunt of the work, which was uncomplainingly borne. Of the abilities of Munshi Abdul Sattár I formed a very high opinion. His work was always turned out in first-rate style, and he is one of the very few natives I have met who really seemed to understand and appreciate the meaning of the operations for the suppression of the disease. He also did very good work in investigating the causes which led to the spread of the disease and showed an unusual grasp of the principles of evidence. Bhái Amr Singh is a very loyal and painstaking officer, and his knowledge of the locality—his home was on the borders of the infected circle—was of the greatest use to me. He has a competent knowledge of English and should make a good officer. Both Náib-Tahsíldárs were popular with the people and deserve some recognition.

Of the medical staff I should wish to record my appreciation of the loyal way in which Assistant Surgeon Jowáhir Singh and Hospital Assistants Mushtáq Hussein, Kartár Singh and Harnám Dás co-operated in the general scheme of operations. Assistant Surgeon Jowáhir Singh underwent very real hardships, and the good example which he set up was of the greatest value, and I trust his services may be specially recognised. A Sikh Ját himself, he was exactly the right man in the right place, and he worked infe[illegible] and cheerfully throughout. The three Hospital Assistants mentioned above were conspicuous

for their honesty at a time when every facility for dishonesty was only too ready to hand, and that their probity was appreciated by the people was proved again and again by the petitions which came in from newly infected villages that one of them might be sent to take charge.

Amongst the Police Inspectors Safdar Jang has impressed me with his thoroughness, tact and powers of organisation, and credit is due to him that the civil and police subordinates have worked together harmoniously throughout. Deputy Inspector Hans Ráj, of Hazára, has shown considerable force of character and powers of control in difficult circumstances. The 1st Grade Sergeant in charge of the Muzaffargarh guard, 2nd Grade Sergeant Naráin Singh, and 3rd Grade Sergeant Lalji Rám, both of the Jullundur District, have attracted my notice, and a word of praise is due to Constable No. 396 Ganga Parshád, Rohtak, who was lent for disinfection work and has done admirably throughout. He is a Phillour man and has passed his examination for promotion, which from his work on plague duty he certainly deserves.

Of the non-officials the following have been specially noticeable :—

Kumam.—Pír Bakhsh, son of Fauju Khán, Rájpút, Lambardár.

Katheron.—Naráin Singh, Ját, Lambardár.

Partáb Singh, „ „

Lodipur.—Devi Ditta, Ját, Lambardár.

Bullu Rám, Ráin, „

Bajon.—Gopála, son of Jemayat Singh, Ját, Lambardár.

Kiriam.—Umed Ali, Rájpút, Zaildár.

Ghulám Muhammad, Rájpút, Lambardár.

Of the above I have received the greatest assistance from Pír Bakhsh, Lambardár of Kumam, for whose character I have a very high regard. Naráin Singh of Katheron was perhaps the finest specimen of a Ját in the circle, and he was responsible for the excellence of the disinfection in his village, which he held in perfect control throughout. Umed Ali, Zaildár of Kiriam, has been in constant attendance on some officer or other since February, and has done excellent work. He reported the outbreak of plague in Katheron and Bhangal, and he has not received as yet the reward of Rs. 50 which was offered pending orders as to whether it might not be given in the form of a khillat. While anxious not to lose such a large sum, his undoubted due, he expressed a very proper desire that if possible the payment might take the form I have referred to above, a feeling which I cordially endorse. Ghulám Muhammad, also of Kiriam, besides being largely responsible for the model behaviour of his village, intervened in the Bhangal riot to protect Surgeon-Lieutenant Walton from the violence of the mob.

Good work has also been done by the following :—

Kumam.—Jiwa Khán, son of Komonda Khán, Rájpút, Lambardár.

Bábu Khán, son of Pura Khán, Rájpút, Lambardár.

Hákim Khán, son of Mámon Khán, Rájpút, Lambardár.

Bane Khán, son of Fateh Khán, Rájpút, Biswedár.

Sonda Shah, son of Natha Shah, Syad.

Lálu Mal, son of Kaneia Mal, Sahúkár.

Chahlan.—Chanda Singh, Ját, Lambardár.

Dhalel Singh, Ját, Biswedár.

Kiriam.—Ghulám Ghaus, Rájpút, Lambardár.

Ashraf Ali, Rájput, Lambardár.

Amr Bakhsh, Rájput, Lambardár.

M. S. D. BUTLER,
Assistant Commissioner.

Note by Surgeon Captain C. H. James, on Mr. Butler's Statements in Chapter II.

Letter dated Banga, 6th July 1898.

From—Surgeon-Captain C. H. JAMES, I. M. S., Deputy Sanitary Commissioner, Punjab,

To—Major E. INGLIS, Deputy Commissioner, on Special Duty, Simla.

THE following are some of the points in Butler's report which I think require a little modification :—

1. *Shikohpur* was discovered to be affected with plague early on February 1st, and not February 2nd.

The disease was probably imported from Khatkar Kalán by either Mahtáb Singh or one of his household. Mahtáb Singh's daughter was married to a man named Shera in Khatkar, and he often went to that village when the cordon was on in November last. In fact, he was several times seen by the Khatkar people. His nephew's mother, Bagar, who lived in the same house as himself, is stated to have been the first person attacked in Shikohpur. If this is the case, the disease existed in this village early in December. The last case attacked at Khatkar Kalán was on December 3rd, 1897.

2. *Sahlon and Katheron.*—When I visited Shikohpur on January 29th and again on February 1st, the Lambardars of that village stated definitely that cases of plague had occurred both in Sahlon and Katheron, the adjoining villages. So persistent were they that I sent a Hospital Assistant to make enquiries. We heard that several deaths had taken place at Sahlon and also at Khateron, but in the latter place the disease had died out.

This would put the introduction of the disease in these places to dates earlier than that stated by Butler. In fact, it existed in both villages in January.

In Katheron, Bora, son of Wazíra, Teli, was probably not the first case, nor can the honor be claimed by Asa. Jones and Goldney both knew that I was sending Hospital Assistants over to the village on account of rumours early in February and that the Lambardárs of Shikohpur had reported plague there on February 1st.

I remember Uttam Singh as he was brought to me on the cordon by the police on February 2nd. He was very ill with plague, and as his glands were suppurating, I concluded he had been some days ill. Can it be possible that he infected Wazíra's house from Shikohpur? In any case, Katheron had already fallen under suspicion.

Kumam.—I find from my note-book that I was at Kumam on February 26th, and saw Amar Chand, Brahmin, who stated that he had been attacked the previous day. I also saw (2) *Nihála*, son of Narain Singh, Lohár, who was suffering from plague and who had been ill five days, and (3) *Nihálo*, wife of Wazír Singh, Lohár, who was also stated to have been five days ill. Besides these there were—(4) *Niháli*, wife of Basamba, Brahmin, who had died that morning. I saw the body and found enlarged glands and other signs of plague. She was also reported as having been ill for five days.

The Zaildár Bishen Singh also reported that a Chamár named Rámu had died on February 22nd. It was impossible on February 26th, when I visited the village, to say definitely that he died of plague, but there was something suspicious in the case from the fact that the relatives made an attempt to hide information, and his name had not been entered in the Chaukídárs' Register.

From these facts it will be seen that Amar Chand, who, I take it, is the same man called Amír by Butler, and certainly the man seen by Davidson, was not the first case of plague at Kumam, and even if he were, it would be difficult to account for so many seizures in so short a time as two days*. The other cases I saw could not possibly have been infected in less than two days, but were probably older.

*The longest possible time for him to have been in the village.

Lodipur.—It seems difficult to believe that this village, which was nearly surrounded by the infected villages of Katheron, Shikohpur, Sahlon and Kumam, should get its infection not from the neighbouring villages, but from one ten miles away, namely, Simal Mazra, in the Hoshiárpur District. The very fact that the information was obtained with the utmost difficulty and only after a long period makes me doubt its accuracy. However, I may be wrong.

Mahmúdpur.—Ganga Rám died on March 3rd. Thirteen days later, *i.e.*, March 16th, according to the usual Hindu custom, the relatives assembled for the karya karm, and the deceased's father-in-law attended from Mazári Nawábad and brought away Ralli, his daughter, who was also Ganga's wife. This independent evidence was given us by Ralli on March 20th. It agrees with Butler's statement in so far that the funeral meats are only put out on the 4th, 7th and 18th day after a death in the house. The fact that Butler saw these meats on the 16th confirms Ralli's statement that her husband died 13 days earlier, but makes the date earlier than that fixed by Butler.

I know nothing about the other villages. But I may be excused for making the following remarks:—

Sodhián.—There is no proof to show where Jodh Singh contracted the disease. Mahl Gohla, the village he is supposed to have visited, was entirely out in camp, so that if he went "into the village" he would not have found any of his "friends" there.

Karíha.—It is difficult to make out what Butler is trying to prove in this case.

In the table on page 107 he compares the percentage of deaths with the total cases in all his other villages. But in the case of Karíha he deducts the 126 deaths occurring in the village, but includes 41 cases found on May 7th and 8th, many of which are admittedly cases which were convalescent before they left the village.

If he wants to prove the efficacy or otherwise of the medical treatment as compared with the other villages, he ought also to have deducted all cases which died beforee the village was evacuated in each of these villages. This he has not done, and consequently the table is useless for purposes of deduction.

If he wishes to prove that the disease was naturally dying out in the village, how does he get over the facts which he himself mentions, *viz.*, that two people were infected by entering the village, one 24 days after evacuation and the other 36 days? Surely if the infection remained in the village so long after evacuation, it must have existed when the people left? I think his statements only show how quickly the disease can be got under after evacuation and not any tendency for the disease *naturally* to diminish.

Reports by Officers on Observation Duty.

APPENDIX D.

Letter dated Sahiba, 17th June 1898.

From—Assistant Surgeon J. T. Weston, Divisional Officer, Sahíba,

To—Major E. Inglis, Deputy Commissioner on Special Duty, Phagwára.

I HAVE the honor to acknowledge the receipt of your letter No. 1101, dated the 11th of June, and in reply beg to submit the following brief notes.

The staff commenced its work in the latter end of March last, and since then has worked on prescribed lines in accordance with instructions received.

The accompanying lists will show how the members of the staff were distributed for the various duties they were required to perform, which distribution was chiefly based on the peculiar physical features of the division, the situation of its villages, their size and population, the controlling influence of the three Zaildárs, the nature of the several duties of the staff, and the working capacity of the three Tahsíldárs. Up to date only two villages have been infected in the division. They are Simal Mazra and Chaukoha.

In Simal Mazra the disease broke out before the establishment of the observation staff; consequently its particulars are not known, but in Chaukoha from information obtained the disease first appeared in a man named Saudágar, who lived next door to a villager who had previously visited Kullewál, a neighbouring infected village, and had brought home from there some articles of infected clothing belonging to an infected person. This villager died afterwards from pneumonia, but the suspicion now is that the disease from which he died was that of plague. Saudágar, who lived next door to him, manifested distinct symptoms of plague a few days after his death, and the village was accordingly cordoned. The outbreak of the disease was first discovered by Assistant Surgeon Míra Bux who at the time was residing in the village and was working under orders of the "Plague Executive Staff." Why Assistant Surgeon Míra Bux, who at the time was treating plague cases in Simal Mazra, a neighbouring infected village, was permitted to reside in Chaukoha remains a mystery. All this happened before I had taken over charge of the division.

Regarding the increase of the members of the staff, I would suggest that for a division such as Sahiba six Kánúngos are not sufficient. Nine Kánúngos ought to be employed, so that the work of the Patwárís may daily be checked by a daily visit to their respective villages. It appears to me that for the effective working of the present system continuous supervision is necessary to render it complete. And if it be found impossible to augment the number of Kánúngos, then the Patwárís should be entirely replaced by men specially employed for the work. Plague work in combination with their own duties is considered by the Patwárís a hardship, and their duties are consequently scamped whenever opportunity presents itself. The work is hard, especially in inclement weather, and a man, though he may physically be fit for the duties of a Patwári, is not necessarily fit to perform additional duties, and if he be wanting in endurance, he naturally acts in accordance with the nature of the burden. A liberal grant of horse allowance is then necessary to the Kánúngos, who are obliged to maintain means of carriage, without which they cannot perform their duties properly.

Regarding the selection of Tahsíldárs, I think none but the best ought to be deputed for such work; for upon them the entire success of the scheme depends. If the Tahsíldár is slack, his entire subordinate staff will follow suit.

The system of employing the village dhái is not a satisfactory one, for the reason that she is always the confidante of the village women, and all the inducements on earth will not improve her behaviour. External female agency ought then to be employed. A female Hospital Assistant or certificated dhái from one of the medical schools is necessary as an addition to the medical staff of the division, whose duty should be to inspect and count the *pardah nashíns* in their homes, and to report the results to the Divisional Officer. This is all the more important in Rájpút villages, where it is extremely difficult to obtain information as to the condition of the *pardah nashíns*, of whom there are a large number in this division.

The question of village quarantine needs further attention, in that every village should be provided with two sheds—one for males and the other for females—for the accommodation of suspected cases, and that a small sum of money should always be placed in the hands of the Divisional Officer for urgent use, such as the feeding and care of paupers undergoing quarantine, especially when they are afflicted with ill-health and are unable to provide for themselves.

Further, the Divisional Officer ought to be endowed with power to punish in a summary way for disobedience of orders or neglect of duty the following members of his staff with small fine, namely,—

Kánúngo,
Patwári, and
Lambardár.

The employment of compounders on the observation staff is, I think, unnecessary, and the money spent now on them could in the future be utilized in the employment of certificated dháis.

The system is an excellent one, and in my humble opinion if the few improvements herein advocated are added to it there is no reason why it should not in the future work most successfully.

List of the names of persons employed on the Observation Staff in the Sahíba Division.

SAHIBA SECTION.

Náib Tahsíldár (1)—
Lála Mittha Mal.

Kánúngos (2)—
Muhammad Nizám-ud-dín.
Tulsee Dás.
The section was divided equally among these two Kánúngos.

Zaildár (1)—
Wazír Khán.
Originally resided in Chaukoha. Has had entire charge of the Sahíba zail.

Safed Posh (3)—
Míra Bux, in charge of the sub-zail of Chinkoi.
Goláb Khán, in charge of the Rurki Moglan sub-zail.
Bhullah, in charge of the Rakran sub-zail.

Patwárís (6)—
Daya Rám, in charge of the Patwári section of Sahíba.
Rangu Rám, in charge of the Patwári section of Mahmudpur.
Permesari Dás, in charge of the Patwári section of Karaur.
Amír Khán, in charge of the Patwári section of Rurki Moglan.
Rája Rám, in charge of the Patwári section of Chaukoha.
Fatteh Dín, in charge of the Patwári section of Chinkoi.

Lambardárs, 52 in number—
In Sahíba (3)—Emamdín, Attra and Muttaba.
In Bharapur (2)—Attrah and Subah.
In Sujawalpur (3)—Híra, Gyah and Jai Diál.
In Maedhpur (5)—Moti, Khema, Attra, Fakíra and Moolah.
In Mazari (3)—Samun, Hamíra and Naráin.
In Rakran (3)—Moti, Naginah and Bhullah.
In Karaur (4)—Khairu Khán, son of Mannu Kán; Khairu Khán, son of Pír Bux; Nabi Bux and Bullundah.
In Gulpur (2)—Issur and Jeewa.
In Rurki Moglan (4)—Sahib Dád; Hakim Beg; Goláb Khán and Golám Ghause.
In Jadli (2)—Shadee and Nabbiah.
In Gurle (3)—Nutha, Kharietee and Bunnah.
In Simal Mazra (4)—Harnám Singh, Boota Singh, Dittu and Jodh Singh.
In Chaukoha (1)—Nimat Khán.
In Kolgar (2)—Rulla and Uttam.
In Rurki Khurd (1)—Sonah.
In Rurki Kalán (2)—Kalu and Jewa Khán.
In Chinkoi (2)—Ghulám Gouse and Míra Bux.
In Buchauri (3)—Rullah, Rám Ditta and Bhullah.
In Kharaur (2)—Chujju Khán and Nabi Bux.
In Tapperian Ranewál—Rallah Rám.

Chaukídárs in the Sahíba Section 23.

Dháis in the Sahíba section as follows:—
In Sahíba, (2)—Thabbu and Zabu.
In Karaur, (2)—Beeney and Kadan.
In Rurki Moglan (1)—Mamu.
In Chaukoha (1)—Chirago.
In Rurki Khurd (1)—Jewni.
In Chinkoi (1)—Ralli.
In Kharaur (1)—Gomah.

Hospital Assistant (1)—Hawan Dás, for general work anywhere in the division. His head-quarters Sahíba.

Compounder (1)—Beli Rám for general work in the Sahíba, Maujawál and Soroa sections. Transferred for duty on the 19th May to Garhshankar.

The total population of the above section is 15,829, and from its situation, the size of its villages, and the number of *purdah nashín* women in it, it is the most important section in the division, and consequently requires very careful and frequent supervision. Náib Tahsíldár Lála Mittha Mal has been in charge of it.

STAFF IN THE SOROA SECTION.

Tahsíldár—Mirza Muhammad Naqui. Has been in charge since the transfer of Tahsíldár Chaudhri Allah Bux to Ferozepore.

Kánúngos (2)—Ganda Mal and Shah Mír.
This section was divided equally among these two Kánúngos, but since Shah Mír's transfer to Nawashahr his share of work has been performed by two safed poshes.

Zaildár (1)—Madeh Khán. In charge of his zail, namely, that of Shimli and Soroa.

Safed Poshes (4)—
Lallu, in charge of the sub-section of Hyátpur Rurki.
Har Bhaj, in charge of the sub-section of Dyal.
Ghulám Mustafa, in charge of the sub-section of Soroa.
Labba, in charge of the sub-section of Chandpur Rurki.

Patwárís (7)—
Chirag Ali, in charge of the Patwári Circle of Shimli.
Ganpat Rái, in charge of the Patwári Circle of Jainpur.
Hákim Singh, in charge of the Patwári Circle of Chuddauri.
Ummi Chand, in charge of the Patwári Circle of Sahungra.
Salamut Rah, in charge of the Patwári Circle of Begampur.
Bassant Rah, in charge of the Patwári section of Chandpur Rurki.
Gokal Chand, in charge of the Patwári section of Malewal.

Lambardárs, 56 in number—
In Shimli (6)—Madi Khán, Gámu Khán, Amír Khán, Imám-ud-dín, Samund Khán and Mudday Khán.
In Wazírpur (1)—Karím Bux.
In Jainpur (4)—Díwan, Mutsuddi, Mutha and Munshi.
In Buccapur (1)—Kowdah.
In Hyátpur Rurki (2)—Lallu and Khazána.
In Chiddauri (2)—Kirpa and Bír Bul.
In Dyál (3)—Har Budj, Chujju and Roddah.
In Amia (1)—Wazíra.
In Alowál (3)—Jhanday Khán, Nabbee Bux and Shummay Khán.
In Sahungra (3)—Gungoo, Lallu and Lukha.
In Soroa (4)—Ghulám Mustafa, Sundey Khán, Sonay Khán and Munnay Khán.
In Begampur (2)—Dosondee Khán and Jhundu Khán.
In Hyátpur (2)—Hira and Gobind.
In Harimpur Dhiani (1)—Labbah.
In Karímpur Chahuwállah (1)—Maidhu.

In Kulpur (2)—Soobah and Wazíra.
In Chandpur Rurki (2)—Labbah and Budh Singh.
In Bholewál (1)—Kharieti.
In Chuchaywál (1)—Gohur.
In Torowál (3)—Samund, Tekku and Moti.
In Pajaywál—Kheira.
In Katwára—Niggaiah.
In Singpur—Soobah.
In Malewál (3)—Dhanput, Agru and Labbah.
In Chandiani Kalán (2)—Jhandu Khán and Kharieti.
In Mungupur (2)—Jeeyah and Ramma.
In Kukar Sooba (1)—Labbah.

Chaukídárs—(29) in number.

Daffadár (1)—Bhagwán Singh. Works in Soroa.

Dháis (2)—

In Shimli (1)—Jhundee.
In Soroa (1)—Baggu.

Compounder (1)—Sikandar Khán. Belongs to the Garhshankar Division, but resides in Soroa. The Tahsíldár of Soroa states that he has employed on occasions the services of this man.

This is the next important section of this division, and contains some very large villages. Its situation is contiguous with the division of Garhshankar, and has the Grand Trunk Road from Garhshankar passing through it. The villages of Malewál, Chandiáni Kalán, Mangupur and Kukar Sooba were added to it on the arrival of Tahsíldár Mirza Muhammad Naqui, as the section of Manjowál in charge of Bábu Gurdás Mal was found to be too large for him. The total population is 17,855, and the villages of Shimli and Soroa contain a large number of *pardah nashín* women.

THE STAFF OF THE SECTION OF MAUJOWAL.

Náib-Tahsíldár—Bábu Gurdás Mall.

Kánúngos (2)—Nassur-ullah Beg and Fatteh Singh. The section was divided equally among these two Kánúngos. Since the transfer of Fatteh Singh to Nawashahr, namely on the 29th May last, Kánúngo Muhammad Nizám-ud-dín has been working in this section excepting during the last four days, his work having been made over to Zaildár Soobah of Rattawál as a temporary measure.

Zaildár (1)—Soobah, in charge of the entire zails of Rattawál and Maujowál.

Sufed Posh—None.

Patwárís (7)—

Prab Diál,	in charge of the	Patwári Circle	of Bhaun.
Surjan Dás,	ditto	ditto	Chandiáni Khurd.
Fakír Chand,	ditto	ditto	Bhuddee.
Dasondi Rám,	ditto	ditto	Maujowál.
Tulsi Rám,	ditto	ditto	Thopia.
Guri Shankar,	ditto	ditto	Takarla.
Nihál Chand,	ditto	ditto	Rattawál.

Lambardárs, 57 in number—

In Bhaun (3)—Fatteh Khán, Khairu Khán and Puran Chand.
In Sahdra (4)—Sáhib Diál, Hako, Myah and Fakíra.
In Khurdán (1)—Bhunnah Khán.
In Tapperián Khurdán—Bhunnah Khán.
In Mukhupor—Híra.
In Chandiáni Khurd (2)—Niggaiyah and Golába.
In Nanowál (1)—Wazíra.

In Chuharpur (1)—Ramma.
In Jítpur (1)—Nuthuah.
In Paeli (1)—Kaissar.
In Dharmpur (1)—Golába.
In Ootal Muzara (1)—Rallah.
In Bhuddee (2)—Bhumboo Khán and Karím Bakhsh.
In Bhungri (1)—Ramma.
In Manowál (1)—Peru.
In Jítpur (1)—Babah.
In Sahbazpur (1)—Sookah.
In Rajju Majra (1)—Sookah.
In Bhanewál (1)—Kooráh.
In Adonána or Akalgarh (1)—Ramma.
In Maujawál, (2)—Nehála and Golába.
In Mazara (2)—Naráin Singh and Hako.
In Jhangeriáh (1)—Fatteh Khán.
In Majhot (3)—Híra, Balliah and Boota.
In Thopiah (2)—Gandu and Kharietee.
In Dhagtána (1)—Labbah.
In Nawán Pindi (1)—Sohbah.
In Dhaul (1)—Jíwa.
In Aqualyána (1)—Sáhib Rah.
In Takarla (1)—Wazírah.
In Munsewál (1)—Saudagarh.
In Ballowál Sankri (2)—Píra and Kádir Bakhsh.
In Thanwála (1)—Bhugrea.
In Kalar (1)—Neehála.
In Mohun Majra—Kheyáli.
In Nighi—Mehdu.
In Rattawál (4)—Samun, Bhúpa, Niggai and Soobah.
In Uddanwál (2)—Sukkah and Ranniah.
In Khewewál (1)—Beeriah.
In Bulewál (2)—Wazíra and Chajju.

Dháis—None.

Compounders—None.

The Tahsíldár of this section was granted ten days' casual leave during the month of May last by order of the Deputy Commissioner on Special Plague Duty at Phagwára, during which time his work was done by the two Kánúngos.

The section is the least important in the division, having a secluded situation from all large thoroughfares. Its villages are small and situated on high land, and inspection of them can easily and thoroughly be carried out. The population of the section is a total of 15,001 persons.

SAHIBA:
The 17th June 1898.

J. T. WESTON,
Divisional Officer, Sahiba.

Letter dated Sahíba, 18th June 1898.

From—Assistant Surgeon J. T. WESTON, Divisional Officer, Sahíba,
To—Major E. INGLIS, Deputy Commissioner on Special Duty, Phagwára.

IN continuation of my letter dated the 17th June I have the honor to add the following notes :—

That for future use a list of sick persons be kept in each village, and that the Kánúngos and Tahsíldárs be required to affix their signatures to it on the occasion of their respective visits.

That a period of rest (say ten days) be granted to a fourth of the staff after a period of three months of observation work, and that this leave be spent either in the division or out of it as circumstances may permit.

The strength of the staff was found ample, excepting that the number of Kánúngos was deficient by three, as already explained, and that the services of a certificated dhái were considered very necessary.

Letter dated Sahíba, 18th June 1898.

From—Assistant-Surgeon J. T. WESTON, Divisional Officer, Sahíba,
To—Major E. INGLIS, Deputy Commissioner on Special Duty, Phagwára.

WITH my letter dated the 17th June I submitted a list showing the distribution of the members of the observation staff. I now have the honor to send a few remarks in a tabular form regarding the manner in which each member performed his work.

Name and designation.	REMARKS.
Mirza Muhammad Naqdi, 4th Grade Tahsíldár, Soroa.	Has worked very well. Is strong, active and intelligent, and quite suitable for such work.
Lála Mittha Mal, Naíb Tahsíldár of Sahíba.	Has worked very well, and is suitable for such work.
Bábu Gurdás Mal, Náib Tahsíldár.	This officer has worked well when taking into account the power of his endurance and advanced age, but otherwise he has been slack. He is unsuitable for such work from age and refractive temperament.
Chaudhri Allah Bux, 1st Grade Tahsíldár.	Worked exceedingly well, and was suitable for such work. He has been transferred to Ferozepore.
Muhammad Nizám-ud-din, Kánúngo of the Sahíba section.	Has worked very well and deserves credit. He is active, intelligent and quite suitable for such work, but must be kept in hand.
Tulsee Dás, Kánúngo of Sahíba section.	Has worked very well and deserves credit. He is quiet and honest, and though somewhat aged, quite suitable for such work.
Gunda Mal, Kánúngo of the Soroa section.	Has worked well, though on some occasions I have found him to be at fault. He is suitable.
Shah Mír, Kánúngo of the Soroa section.	Was transferred to Nawashahr on 29th May last. He worked well, but was slow, which I think was due to his small powers of endurance. Not quite suitable constitutionally.
Nassur Ullah Beg, Kánúngo of the Maujáwal section,	Has worked well, though somewhat slack. Is constitutionally not quite suitable.
Fatteh Singh, Kánúngo of the Maujawál section.	Has worked fairly, and is slack. The work of some of his Patwárís was after his departure found to have been scamped. He is consequently unsuitable.
The Zaildárs of Soroa, Rattawál and Sahíba, namely Madeh Khán, Soobah and Wazír Khán.	*Madeh Khán* is sluggish, and possesses little or no influence over the action of his Lamoardárs and villagers. It plague matters he has been useless, and is quite unsuitable. *Soobah* has been neglectful in matters regarding quarantine, and has been of little or no assistance to the Divisional Officer. He is unsuitable.

Name and designation.	REMARKS.
	Wazír Khán of Sahíba. This Zaildár worked badly at the beginning, but has improved since. There is grave suspicion that he tried to evade the detection and segregation of a case of plague which occurred in Chaukoha, a village of his zail, and was also instrumental in stirring the villagers into a state of excitement and dissatisfaction. He is a leper, and is unsuitable for such work. This matter has already been communicated.
Sufed Posh Labba of the Chandpur Patwári section.	Was deputed to work in seven villages on account of the transfer of Shah Mír, Kánúngo, to Nawashahr. He has worked satisfactorily, and is suitable.
Sufed Posh Gulám Mustafa of the Patwári Circle of Soroa.	Was deputed to work on account of the transfer of Kánúngo Shah Mír to Nawashahr. He has worked very well. Is intelligent and smart, and would make an excellent Zaildár. Is suitable and deserves praise. The other members of the Sufed Posh order are not worthy of mention and are unsuitable for such work.
The Patwárís of Malewál and Takarla, namely Gokal Chand and Gauri Shankar.	Have worked badly. Thay have systematically neglected to keep up the lists of absentees correctly, and are unsuitable for such work. The other Patwárís have worked satisfactorily in a general way, and are suitable.
Kowdu, Lambardár of Buccapur.	Has worked badly. He does not maintain village quarantine, and has little or no influence over the action of villagers. He is unsuitable.
Madi Khán, Gámu Khán, Amír Khán, Imám-ud-dín, Samand Khán and Muddal Khán, Lambardárs of Shimli.	Conjointly have opposed the authority of the Zaildár, and have neglected sanitation and quarantine. Have been disobedient to orders given them by the Tahsíldár of Soroa, and have displayed little or no interest in matters relating to plague duties. A separate statement will follow in due course. They are unsuitable.
The Lambardárs of Alowál, Simal Mazara and Buchauri, namely Jhanday Khán, Nabbee Bux, Summay Khán, Harnám Singh, Boota Singh, Dittu, Jodh Singh, Bullah, Rama, Ditta and Bhullah.	Have been neglectful of sanitary duties, and apathetically assist the Patwárís in the preparation and keeping up of the lists of absentees. They are therefore unsuitable. The other Lambardárs have worked well, and are suitable.
Hawan Dás, Hospital Assistant.	Has worked very well. He is honest and zealous, and is therefore suitable under medical supervision, as he lacks experience in the diagnosis of plague.
Beli Rám, Compounder.	Worked well and is partly suitable.
	The temporary village dháis have worked obediently and are partly suitable.

SAHIBA,
The 18th June 1898.

J. T. WESTON,
Divisional Officer, Sahíba.

APPENDIX E.

Letter dated 22nd June 1898.

From— F. H. BURTON, Esquire, Divisional Officer, Apra Division,

To—Major E. INGLIS, Deputy Commissioner on Special Duty, Phagwára.

BEFORE commencing my note about the matters mentioned in your letter No. 1095, dated 11th June 1898, I should like to remark that I have only been in charge of this division from the 13th ultimo, and as there are no notes left by my predecessors, and not even a permanent Munshi attached to the office, my information is necessarily limited, and mostly acquired from the staff under me.

The observation work in this division apparently commenced about the 22nd March. The staff then consisted of one Tahsíldár, two Náib Tahsíldárs, six Kánúngos, one Hospital Assistant, and some dháis. Each Tahsíldár or Náib Tahsíldár had two Kánúngos attached to him. The division was split up into three parts of some 30 villages each, and each sub-division allotted to a Náib Tahsíldár or the Tahsíldár and two Kánúngos. The Tahsíldár and Náib Tahsíldárs were stationed at some village within their sub-division, as were also the two Kánúngos attached to them. Each Kánúngo was supposed to visit every village in his charge every day, and each Náib Tahsíldár and Tahsíldár to visit every village under him once in three days. The Tahsíldár of this division, Ghulám Haidar, was, however, very soon sent away, and two of the Kánúngos also. Each Náib Tahsíldár then retained one Kánúngo, and Ghulám Haidar's sub-division was split up between two Kánúngos, Gopál Singh and Bahár Shah.

The following villages became infected in this division:—Masáni, Lail, Sirhál Mandi, Aujla, Chokran and Turan. With the exception of Masáni, which had been discovered to be plague-infected before the observation staff came into existence, all the above villages were found out by the observation staff. In Lail, Gopál Singh, Kánúngo, whilst making his rounds, found some sick persons, whom he inspected, to be suffering from plague. The same Kánúngo also found plague-stricken persons in Sirhál Mandi. Plague in Turan is generally supposed to have been first detected from the report of the Zaildár; but I am told by Gopál Singh—and his statement is corroborated by the Hospital Assistant—that the facts are as follows. One a certain day Gopál Singh was making his rounds and found a man sick with plague in a house at Turan—this man had a bubo—(Gopál Singh reported this to Dr. Ewens) at the time there were two or three other persons in the house of the Zaildár himself who had bubos, and who had been ill with plague for 7 or 8 days. The Zaildár, on hearing that the plague had been detected, went off on the evening of the same day and reported to Dr. Coleman, who was living close by, that there was plague in Turan. Plague in Aujla was in the same way first detected by the observation staff, and the first detected case was segregated outside the village, and a note sent to the Banga Executive Officer informing him of the fact.

At Chokran plague was first suspected from information given to Shám Lál, Náib Tahsíldár, by inhabitants of other villages. There the people did their best to conceal plague, and when told to bring up sick persons for inspection produced others in their stead. Suspicion in this case became very strong, when it was found that a man had died suddenly and his body immediately burnt.

The present system of working is as follows: The Patwáris keep up lists of the sick people, the nature of sickness, date, &c.; of the deaths; of the new-comers and places from which they come; and of the absentees and places to which they have gone. Also there is the Chaukídár's death roll. The inspecting officers examine these lists and sign them on the occasions of their visits, and if there is any suspicious case of sickness, the sick person is examined. Besides this information is sought from the people of the village and of other villages.

With regard to the strength of the staff, I think there should be more Hospital Assistants; with this exception it is sufficient. I think there should be a Hos[illegible] for each sub-division of 30 villages. It is obvious that Tahsíldárs and K[illegible] medical men might very easily not recognise plague. It is an easy ma[illegible] when there is a bubo; but when there is no bubo I doubt if a [illegible] plague, especially at this time of year, when there is so much f[illegible] the examination of sick people is not a very congenial duty to a [illegible] and I think there are rather apt to omit it and accept the word of [illegible] nature of the sickness. If, however, a Hospital Assistant al[illegible] Tahsíldár, and it was laid down that the former must examine ev[illegible] ill since the occasion of the last visit, I think this would always [illegible] more thorough work done.

[illegible] He is con[illegible] r no influence over the [illegible] t plague matters he has [illegible] ding quarantine, and has [illegible] Divisional Officer. He is

The combination of Tahsíldárs, Kánúngos and Hospital Assistants is in my opinion the best staff to have for observation work. Hospital Assistants alone would be useless, as the people would not obey them; and Kánúngos alone would also I think not have sufficient influence.

A useful check under the above system is always to see whether the name of every person who has died has been previously entered in the sick list. It is easy to conceal a case of sickness, but a difficult matter to conceal a death; and by this means one can see if cases of sickness have been concealed. Instances have occurred of people dying of plague, and the first notice received of anything wrong with them being that they are dead. The above lists should also be kept in properly bound books. At present they are written out on loose sheets of paper, which are tied together.

The people would at the present time endeavour to conceal plague, I think, as they dread being turned out of their villages at this time of year. If they were told that the whole village would not be turned out in case of plague, I think it would be sufficient to keep up only a very small staff—say two Hospital Assistants—making the Zaildárs responsible that all cases of plague should be reported.

I regret the delay that has taken place in answering your letter; it was, however, unavoidable, as it has taken me a few days to collect the necessary information.

Letter dated Phillour, 21st June 1898.

From—F. H. BURTON, Esquire, Divisional Officer, Apra Division,

To—Major E. INGLIS, Deputy Commissioner on Special Duty, Phagwára.

WITH reference to your letter of the 9th of June, which you sent to Mr. Barr enquiring about the staff, the present staff is as follows:—

Shám Lál, Náib Tahsíldár.
Dín Diál ,,
Chandu Lál, Kánúngo.
Gopál Singh ,,
Atma Rám ,,
Bahár Shah ,,
Ganga Singh, Hospital Assistant.

With regard to their work, I regret to say that my information is rather limited. I have only been here a few days, and the only record left by my predecessors is the certificates given these men by Surgeon-Captain Ewens when he left here. According to these certificates Shám Lál is a most intelligent and energetic officer, and Dín Diál a painstaking man who has worked well. Chandu Lál, Gopál Singh and Bahár Shah have got very good certificates from him, that of Chandu Lál being slightly the best; whilst Atma Rám gave satisfaction. Ganga Singh, Hospital Assistant, worked well and took an interest in his work. I may here remark that there was at first a Tahsíldár here named Ghulám Haidar; he went away in April I think, and his part of the division has been since worked by Gopál Singh, Kánúngo. From enquiries I find that the following villages were discovered to be plague-infected in this division, *viz.*, Lail, Sarhál Mandi, Aujla, Masáni, Turan and Chokran. Of these, Masáni was discovered before this observation staff existed. Chokran and Turan were in the charge of Shám Lál, and he discovered plague in Chokran, but it is rumoured that the plague there had been going on for some time. Shám Lál then applied that Turan might be taken from him as it is at some distance from his other villages. Dr. Ewens therefore made it over to Gopál Singh, Kánúngo. It is generally believed that Turan, which was discovered to be plague-infected a day or two after it had been made over to Gopál Singh, was found out on the report of the Zaildár Sundar Singh made to Dr. Coleman. Gopál Singh, however, tells me—and he is corroborated by the Hospital Assistant—that he discovered the plague in Turan, the facts being as follows: that on a certain day when Gopál Singh was examining Turan he found a person with plague there in a house; this was in the morning; he reported it to Dr. Ewens, who was not at the time in Phillour; besides this person, there were two other persons with plague in the village (these people all had buboes), one or both of whom were members of the Zaildár's household (I fancy one was his uncle); and these latter people had had the plague for 7 or 8 days. The Zaildár, on hearing that Gopál Singh had found out about the plague at Turan went and reported to Dr. Coleman on the evening of that day that there was plague in Turan. Gopál Singh also discovered the plague [illegible] Lail when he was inspecting the village there one day, and he also found it in Sirhál [illegible]andi. With regard to Aujla, from what I recollect when I was at Banga, the inhabi[illegible]nts refused to show certain people to Dr. Coleman who were reported ill, and the village [illegible]as then turned out, when it was found that these people had plague. I think, therefore, [illegible]hat Gopál Singh has undoubtedly done good work. With regard to the work of the [illegible]others, with the exception of Shám Lál's case, there are no facts to mention as evidence of good or bad work; perhaps Dr. Ewens would be able to report more fully about them.

APPENDIX F.

Report on Observation Work at Banga.

LETTER No. 1094 of the Deputy Commissioner on special duty calls for (1) a brief note as to the working of the staff since its institution, (2) a statement of opinion as to the system in force.

1. The instructions issued to observation officers are dated March 18th, 1898. It was not till May 11th that I took over charge. Thus for all information as to events between March 18th and May 11th I am indebted to Mr. Vanrenen, Assistant District Superintendent of Police, the first Divisional Officer.

The work of this division was first distributed between three Náib Tahsíldárs stationed at Banga, Pharála and Heeon. Banga was the centre of a sub-division of 29 villages, Heeon of 31, Pharála of 24. Owing to the outbreak of plague in the two latter villages, the head-quarters of the Náib Tahsíldárs were transferred to Padi Matwála and Jandiala. Under each Náib Tahsíldár were 2 Kánúngos. There were also 2 Hospital Assistants, 2 Nurses and 2 Compounders attached to the staff. Of these, 1 Hospital Assistant and 1 Compounder were stationed at Pharála, 1 Compounder at Heeon, and the remainder at Banga. This staff has since been reduced to 3 Náib Tahsíldárs, 4 Kánúngos and 1 Compounder.

Since the institution of the observation staff 20 villages in the Banga division have become infected.

2. The list is as follows :—

	Date of discovery.
Mazara Nawabad	21st March 1898.
Satron	24th ,,
Khánpur	30th ,,
Baharwál	1st April 1898
Mazári	2nd ,,
Salh Khurd	3rd ,,
Heeon	3rd ,,
Langeri	4th April 1898.
Lálpur	5th ,,
Bisla	6th ,,
Bíka	10th ,,
Dhandhua	14th ,,
Gobindpur	15th ,,
Chak Kalál	17th ,,
Punián	18th ,,
Gosal	22nd ,,
Mallah	26th ,,
Pharála	19th May 1898.
Ladhán Jhika	21st ,,
Bhaura	25th ,,

Of these, 15 were first brought to light by means of the observation staff, 5 by outside report. These figures, however, do not fairly represent the work of the observation staff. Of the 5 villages mentioned above, 3 are the first three on the list. The staff had not had time to settle down to their new work. In the case of the remaining 2 villages, Dhandhua and Chak Kalál, reports were brought in by the observation staff within a short time of the first and unofficial report.

Strength of staff and class of official.

The staff now consists of 3 Náib Tahsíldárs, 4 Kánúngos and 1 Compounder.

I have found the agency of the Náib Tahsíldárs and Kánúngos most satisfactory. The Patwári is accustomed to working under these officers, and we depend chiefly upon the Patwári for information as to sickness or death in the villages.

Further, the mere presence of the Náib Tahsíldárs has done much to keep alive among the Lambardárs a sense of their responsibility. The rank of Náib Tahsíldár is just that calculated to produce the required effect.

The Kánúngos readily fall into their places between the Náib Tahsíldár and the Patwári. But their failure on disinfection work shows that their work requires careful supervision, and that it is a dangerous experiment to detach them from their place in the ordinary civil machinery.

The medical strength of the observation staff was at one time considerable; it has since been greatly reduced.

There is no doubt that both Hospital Assistants and Nurses are a valuable addition to the observation staff. The only objection to their inclusion in that body is that there is not enough work for them to do. Two weeks may pass without their services being called into requisition. Then again skilled medical aid may be called for three times in one day.

To confine as large a medical staff as was formerly employed to purely observation purposes seems a waste of good material. But there is no doubt that the services of at least one Hospital Assistant should be at the disposal of the observation staff, if not exclusively, at any rate whenever the Divisional Officer cares to call for them. There is also much to be said in favour of attaching a nurse to this staff. Owing to the less open-air life led by the women, first cases are almost invariably female patients. Now these are the cases with which the observation staff hardly comes in contact. It was necessary to bring a nurse to Ladhan Jika. Hospital Assistants are shy about making thorough investigations in the case of women. Thus at Pharála and Bhaura a European doctor had to be called in to diagnose the cases. This represents my personal experience of plague cases, and certainly tends to show the utility of a nurse.

With regard to the Compounders as a class, my experience may have been unfortunate, but I have found them absolutely useless. They are no more qualified to diagnose plague than the ordinary layman, and further I do not think they are to be trusted in this kind of work. Plague work affords many opportunities to the unscrupulous.

The strength of staff that should be maintained on observation depends on two considerations, the activity of plague and the attitude of the people. Thus as large a staff is not required when three new villages become infected in six weeks as when seventeen.

Thus, too, when Government depended on daily roll-calls for detection of plague a large staff was required. Now that a mere visit is sufficient, this necessity no longer exists. In the same way when sickness was concealed and deaths unreported it was necessary to keep a far closer watch on the villages. Now cases of sickness are shown to the visiting officer without hesitation, and deaths are reported within two or three hours night or day. The decrease of plague and the changed attitude of the people both point to a reduction of the staff.

I should now say that one Náib Tahsíldár would be sufficient with one Kánúngo placed over each of the former Náib Tahsíldári divisions. The services of at least one Hospital Assistant should be at the disposal of the Divisional Officer. It would also be a distinct advantage if the assistance of a nurse could occasionally be obtained.

At present there is no Medical Officer attached to the staff. If observation is to be efficiently kept up during the rains, this gap should be filled at once.

The 16th May 1898.

R. I. R. GLANCY,
Divisional Officer, Banga.

No. 32, dated 11th June 1898.

From—R. I. R. GLANCY, Esquire, Divisional Officer, Banga,
To—The Deputy Commissioner on Special Duty, Phagwára.

HAS the honor to send the report of the observation staff of Banga Division.

List of Observation Staff, Banga Division.

NAIB TAHSILDARS.

(1). *Náib Tahsíldár Shankar Dás.*—His work has been most satisfactory. In the only case where plague was discovered in his circle, *i. e.* Pharála, it was discovered through his staff and reported within 24 hours of the outbreak.

(2). *Náib Tahsíldár Lála Jánki Parshád.*—His work has also been most satisfactory. It is a testimony to his work that no case of plague has been discovered in his circle except on his own personal report. I must add that at one time scarcely a day passed without a false report of plague in his circle being brought in by some other agency. Further, his rapid preparation of absentee lists very much facilitated dealing with the spread of infection.

(3). *Náib Táhsíldár Táj-ud-dín.*—Since my arrival no case of plague has occurred among the villages under his observation. Thus I am unable to give any particular instance of good work on his part. But I am satisfied that he carries out his duties with care and regularity. He has passed his whole time in the centre of the infected area. I believe his predecessor, Tek Chand, left Banga owing to fear of plague. Táj-ud-dín has certainly shown no symptoms of following this example.

R. I. R. GLANCY,
Divisional Officer.

Banga Observation Staff.

MEDICAL BRANCH.

(1). Hospital Assistant Ishar Dás was with Shankar Dás, where his work was most satisfactory. He has since been transferred to Pharála Hospital at the special request of the inhabitants,—a testimony to his popularity. He was the first to see the cases at Pharála and pronounced them to be plague. He accompanied me to Chetah, where there had been two deaths and a case of sickness in one day, and declared that the village was not infected Subsequent events proved him to have been right in both cases. I found him most reliable in every way.

(2). Compounder Hassan Beg has been with Lala Jánki Parshád. His diagnoses have generally been correct with the notable failure at Lidhana Jhika. I do not think Compounders are of much use to the observation staff.

I may say with regard to Hassan Beg that it was necessary for him to keep a horse. His pay is Rs. 8 a month and he gets no allowance. He is thus put to great expense on this work, and he is not of much assistance. I think he does his best, but the medical experience of a Compounder is very limited. I should recommend his speedy return to the medical staff.

(3). Of those officers whose services have been transferred to Surgeon-Captain James before my arrival, I can not speak from personal experience, but Mr. Vanrenen tells me that their work was in every case satisfactory.

R. I. R. GLANCY,
Divisional Officer.

Observation Staff, Banga Division.

KANUNGOS.

(1). Kánúngo Nazír Ahmed has been under Náib Tahsíldár Shankar Dás, who reports very well of him. He was left in charge of this circle while Shankar Dás was on leave. During that time I accompanied him on his rounds. I consider that he did his work most satisfactorily.

(2). Kànúngo Jiwan Singh.—This man was transferred to disinfection work, where he not only displayed great idleness, but actually hampered work. Surgeon-Captain James tells me that it was owing to Jiwan Singh's influence that a disinfection gang of 40 coolis deserted their work. Up to this time I had heard nothing against him. A Kánúngo on observation work is so directly under the notice of his Náib Tahsíldár that it would be very difficult for him to shirk his work in that department.

(3). Muhammad Sadik has been under both Náib Tahsíldár Táj-ud-dín and Lála Jánki Parshád. They both speak well of him.

(4). Khuda Bakhsh has been under Náib Tahsíldár Táj-ud-dín. I have had more to do with him than with the other Kánúngos. I found him willing and industrious.

(5). Telu Mal has been under Lála Jánki Parshád, who reports well of him.

(6). Kirta Rám was transferred to disinfection work. I have not heard how he did since his transfer, but he was considered very reliable on observation work.

R. I. R. GLANCY,
Divisional Officer.

APPENDIX G.

Letter dated Camp Ráhon, 23rd June 1898.

From—B. H. BIRD, Esquire, Assistant Commissioner and Divisional Officer, Aur,
To—Major E. INGLIS, Deputy Commissioner on Special Duty.

THE following is the list of the various members of the inspection staff in the Aur division:—

Náib Tahsíldár

1. *Pandit Bhagwán Dás.*—I was well pleased with his work, the average of which was high. He gets about the country quickly, and was careful in noting any instances of slackness on the part of village officials which came to light at times of visit or inspection.

He is a thoroughly reliable man.

2. *Lála Devi Dás*—Took an interest in his work, and was conscientious in its performance.

His record of villages visited and inspected was an excellent one.

He has been constantly on the look out for useful information in connection with plague infection and prevention.

I may mention that it was he who drew attention to the practice of sending clothes from one village to another.

3. *Sheikh Muhammad Yunus.*—I have carefully examined the record of this Náib Tahsíldár. His average of villages visited and inspected is a fair one, but I think he might have been a little more active. Otherwise I think him a capable officer, as he is not wanting in intelligence.

Girdáwar Kánúngos.

1. *Rám Chand*—Was subordinate to Pandit Bhagwán Dás, but left for Banga on 21st May. I have had no fault to find with him, and believe him to be industrious and capable.

2. *Ganda Mal*—Was subordinate to Pandit Bhagwán Dás. He worked well and looked after his Patwáris properly. He gets over the ground quickly.

3. *Chaju Mal*—Was subordinate to Lála Devi Dás, and from April 8th had the whole of that Náib Tahsíldár's villages under his care. He also had the disadvantage of having four of his Patwáris in quarantine. He is a hard-working and intelligent official, and his conduct has been quite satisfactory.

4. *Bhág Mal*—Up to April 8th was subordinate to Lála Devi Dás.

His work was good.

Since then he has been acting as Munshi to the Divisional Officer. He is very industrious and sensible, keeps his papers in good order, and gave me much help.

5. *Imám-ud-dín*—Was subordinate to Sheikh Muhammad Yunus and was sent away to Banga on the 21st May.

I had no fault to find with him whilst he was in this division.

He was zealous and hard-working.

6. *Odey Chand*—A subordinate of Sheikh Muhammad Yunus.

His work and conduct were satisfactory.

Hospital Assistants.

1. *Asa Rám*—Left on May 24th from Banga. I cannot give an absolute opinion as to his medical qualifications, but he seemed to be very fairly capable and hard-working. I think he made a mistake when he said there was plague at Arapar, but his record is a good one. He has the credit of detecting plague in five villages.

2. *Jowahir Singh*—Has been working from the commencement up to the present time. He detected plague at Rahpa but seems to have been very stupid in the case of Kariha.

At the same time he is very hard-working and gets over the country in a creditable manner. Since the departure of Asa Rám he has had a great deal to do, and I am very well pleased with his industry.

No. 32, dated 11th June 1898.

From—R. I. R. GLANCY, Esquire, Divisional Officer, Banga,
To—The Deputy Commissioner on Special Duty, Phagwára.

HAS the honor to send the report of the observation staff of Banga Division.

List of Observation Staff, Banga Division.

NAIB TAHSILDARS.

(1). *Náib Tahsíldár Shankar Dás.*—His work has been most satisfactory. In the only case where plague was discovered in his circle, *i. e.* Pharála, it was discovered through his staff and reported within 24 hours of the outbreak.

(2). *Náib Tahsíldár Lála Jánki Parshád.*—His work has also been most satisfactory. It is a testimony to his work that no case of plague has been discovered in his circle except on his own personal report. I must add that at one time scarcely a day passed without a false report of plague in his circle being brought in by some other agency. Further, his rapid preparation of absentee lists very much facilitated dealing with the spread of infection.

(3). *Náib Táhsíldár Táj-ud-dín.*—Since my arrival no case of plague has occurred among the villages under his observation. Thus I am unable to give any particular instance of good work on his part. But I am satisfied that he carries out his duties with care and regularity. He has passed his whole time in the centre of the infected area. I believe his predecessor, Tek Chand, left Banga owing to fear of plague. Táj-ud-dín has certainly shown no symptoms of following this example.

R. I. R. GLANCY,
Divisional Officer.

Banga Observation Staff.

MEDICAL BRANCH.

(1). Hospital Assistant Ishar Dás was with Shankar Dás, where his work was most satisfactory. He has since been transferred to Pharála Hospital at the special request of the inhabitants,—a testimony to his popularity. He was the first to see the cases at Pharála and pronounced them to be plague. He accompanied me to Chetah, where there had been two deaths and a case of sickness in one day, and declared that the village was not infected Subsequent events proved him to have been right in both cases. I found him most reliable in every way.

(2). Compounder Hassan Beg has been with Lala Jánki Parshád. His diagnoses have generally been correct with the notable failure at Lidhana Jhika. I do not think Compounders are of much use to the observation staff.

I may say with regard to Hassan Beg that it was necessary for him to keep a horse. His pay is Rs. 8 a month and he gets no allowance. He is thus put to great expense on this work, and he is not of much assistance. I think he does his best, but the medical experience of a Compounder is very limited. I should recommend his speedy return to the medical staff.

(3). Of those officers whose services have been transferred to Surgeon-Captain James before my arrival, I can not speak from personal experience, but Mr. Vanrenen tells me that their work was in every case satisfactory.

R. I. R. GLANCY,
Divisional Officer.

Observation Staff, Banga Division.

KANUNGOS.

(1). Kánúngo Nazír Ahmed has been under Náib Tahsíldár Shankar Dás, who reports very well of him. He was left in charge of this circle while Shankar Dás was on leave. During that time I accompanied him on his rounds. I consider that he did his work most satisfactorily.

(2). Kànúngo Jiwan Singh.—This man was transferred to disinfection work, where he not only displayed great idleness, but actually hampered work. Surgeon-Captain James tells me that it was owing to Jiwan Singh's influence that a disinfection gang of 40 coolis deserted their work. Up to this time I had heard nothing against him. A Kánúngo on observation work is so directly under the notice of his Náib Tahsíldár that it would be very difficult for him to shirk his work in that department.

(3). Muhammad Sadik has been under both Náib Tahsíldár Táj-ud-dín and Lála Jánki Parshád. They both speak well of him.

(4). Khuda Bakhsh has been under Náib Tahsíldár Táj-ud-dín. I have had more to do with him than with the other Kánúngos. I found him willing and industrious.

(5). Telu Mal has been under Lála Jánki Parshád, who reports well of him.

(6). Kirta Rám was transferred to disinfection work. I have not heard how he did since his transfer, but he was considered very reliable on observation work.

R. I. R. GLANCY,
Divisional Officer.

APPENDIX G.

Letter dated Camp Ráhon, 23rd June 1898.

From—B. H. BIRD, Esquire, Assistant Commissioner and Divisional Officer, Aur,
To—Major E. INGLIS, Deputy Commissioner on Special Duty.

THE following is the list of the various members of the inspection staff in the Aur division:—

Náib Tahsíldár

1. *Pandit Bhagwán Dás.*—I was well pleased with his work, the average of which was high. He gets about the country quickly, and was careful in noting any instances of slackness on the part of village officials which came to light at times of visit or inspection.

He is a thoroughly reliable man.

2. *Lála Devi Dás*—Took an interest in his work, and was conscientious in its performance.

His record of villages visited and inspected was an excellent one.

He has been constantly on the look out for useful information in connection with plague infection and prevention.

I may mention that it was he who drew attention to the practice of sending clothes from one village to another.

3. *Sheikh Muhammad Yunus.*—I have carefully examined the record of this Náib Tahsíldár. His average of villages visited and inspected is a fair one, but I think he might have been a little more active. Otherwise I think him a capable officer, as he is not wanting in intelligence.

Girdáwar Kánúngos.

1. *Rám Chand*—Was subordinate to Pandit Bhagwán Dás, but left for Banga on 21st May. I have had no fault to find with him, and believe him to be industrious and capable.

2. *Ganda Mal*—Was subordinate to Pandit Bhagwán Dás. He worked well and looked after his Patwáris properly. He gets over the ground quickly.

3. *Chaju Mal*—Was subordinate to Lála Devi Dás, and from April 8th had the whole of that Náib Tahsíldár's villages under his care. He also had the disadvantage of having four of his Patwáris in quarantine. He is a hard-working and intelligent official, and his conduct has been quite satisfactory.

4. *Bhág Mal*—Up to April 8th was subordinate to Lála Devi Dás.

His work was good.

Since then he has been acting as Munshi to the Divisional Officer. He is very industrious and sensible, keeps his papers in good order, and gave me much help.

5. *Imám-ud-dín*—Was subordinate to Sheikh Muhammad Yunus and was sent away to Banga on the 21st May.

I had no fault to find with him whilst he was in this division.

He was zealous and hard-working.

6. *Odey Chand*—A subordinate of Sheikh Muhammad Yunus.

His work and conduct were satisfactory.

Hospital Assistants.

1. *Asa Rám*—Left on May 24th from Banga. I cannot give an absolute opinion as to his medical qualifications, but he seemed to be very fairly capable and hard-working. I think he made a mistake when he said there was plague at Arapar, but his record is a good one. He has the credit of detecting plague in five villages.

2. *Jowahir Singh*—Has been working from the commencement up to the present time. He detected plague at Rahpa but seems to have been very stupid in the case of Kariha.

At the same time he is very hard-working and gets over the country in a creditable manner. Since the departure of Asa Rám he has had a great deal to do, and I am very well pleased with his industry.

Dháis.

1. *Mussammát Umri*—Came on April 16th. Her conduct and work have been satisfactory.

2. *Mussammát Bhari*—Came on April 16th. Her conduct and work have been satisfactory.

Compounders.

1. *Kallu Mal*
2. *Gopi Chand*

—Arrived on 29th March, but were given no work to do, and on May 26th were sent to Dr. Smith at Nawashahr.

Letter dated Camp Ráhon, 25th June 1898.

From—B. H. Bird, Esquire, Assistant Commissioner, Divisional Officer, Aur,
To—Major E. Inglis, Deputy Commissioner on Special Duty.

Distribution of work.

OUR division was at first in charge of Surgeon-Lieutenant J. Davis, who arrived on the 21st March and left on the 26th April. Mr. R. Clarke, Assistant Commissioner, Ráhon division, was then in charge of Aur till the 11th May, when I arrived from Jejon, Hoshiárpur.

The Girdáwar Circle contains six zails, which were appropriated as follows:—

Náib Tahsíldárs.	*Girdáwar Kánúngos.*	*Zails.*	*No. of villages.*
Lála Devi Dás	Chhaju Rám, Bhág Mal	Bakhlour, Mukandpur	31 (3 deserted).
Pandit Bhagwán Dás	Ganda Mal, Rám Chand	Aur, Jula Majara	31 (5 deserted).
Sheikh Muhammad Yunus	Imám-ud-dín, Odey Chand	Gunachour, Músapur	30 (1 deserted).

Sheikh Muhammad Yunus had some villages also of the Aur Zail.

Two Hospital Assistants, Jowáhir Singh and Asa Rám, arrived on March 29th, and two Dháis, Umri and Bhari, on the 16th April; 2 Compounders, Gopi Chand and Kallu Mal, were also allotted to this division, but were given no work to do.

The following villages were already under quarantine when the observation staff commenced operations:—

Shikohpur.
Sirhál Qázián.
Gunachour.
Sahlon.
Kumam.
Jagatpur.
Núrpur.
Lodípur.
Mohrámpur.
Mahmúdpur.

Infected villages how detected.

The villages given below were placed under quarantine after the arrival of the observation staff, and a brief note is appended showing how the disease was discovered:—

Músapur, March 23rd.—The plague officers took this village over direct on receipt of information without previous reference to the observation staff.

Sodián, March 28th.—Nagina Singh, Zaildár, reported plague on March 28th. Dr. Davis and Sheikh Muhammad Yunus went there and found a case.

Ladhar Kalán, 28th March.—Patwári, through Bhág Mal, Girdáwar, reported a man ill from plague. Lála Devi Dás made an inspection of the mohalla and found another case.

Chahal Khurd, 6th April.—A Lambardár reported to Sheikh Muhammad Yunus that a person had died and another was ill. Sheikh Muhammad Yunus sent a report to Aur as he was proceeding to *Karnána* to take charge. The executive plague officers heard of the state of Chahal Khurd as they passed by to Kumam, and at once took over charge.

Aur, 6th April.—Lála Devi Dás was informed that a Chamár was suffering from fever. He saw the boy and told Dr. Davis, who declared it plague. The family was removed to Mohrámpur plague camp.

Karnána, 6th April.—The Patwári made a report. Asa Rám, Hospital Assistant, found three persons with plague. Dr. Davis confirmed this.

Malpur, 9th April.—The Patwári, through Rám Chand, Girdáwar, reported 4 ill with fever. Dr. Davis detected plague on the 9th.

Hansron, 12th April.—On the 11th April Pandit Bhagwán Dás was led to suspect this village. Dr. Davis made an inspection and found plague there on the 12th.

Mukandpur, April 15th.—On 12th-13th April Chhaju Rám, Girdáwar, reported a woman as ill with fever. She died on the 14th. Asa Rám, Hospital Assistant, declared the corpse to be suspicious, and found two other persons suffering from plague. Dr. Davis confirmed this on the 15th.

Rahpa, 22nd April.—On the 21st the Patwári reported the death of a woman from plague and her daughter's illness. Jowáhir Singh, Hospital Assistant, pronounced it a case of plague, which was confirmed by Dr. Davis on the 22nd.

Rasúlpur, 21st April.—On the 20th April Asa Rám declared two persons to be suffering from plague. Dr. Davis confirmed this.

Prágpur, April 19th.—Sheikh Muhammad Yunus reported that he suspected plague on April 13th. Dr. Davis on examination did not endorse this, but detected 5 cases of plague a week later.

Kariha, April 19th.—The Patwári reported deaths and illness from fever.

On the 15th Jowáhir Singh, Hospital Assistant, saw three dead bodies, one that of a newly born child, the other two those of women who he said had died from fever. He also reported three persons as ill from fever.

On the 16th Jowáhir Singh examined three bodies; two he had pronounced cases of fever the day before. His report was two deaths from fever, one from consumption.

More illness being reported, Asa Rám, Hospital Assistant, was sent on the 18th. He found one case of plague among the Chamárs and three women with very suspicious symptoms.

Bajon, 25th April.—Sheikh Muhammad Yunus reported two persons ill with fever on the 24th. Dr. Davis found plague there on the 25th.

Laroya, 15th May.—This village was probably infected from Parágpur, which adjoins it. I find Mussammát Aisher, caste Aráin, died there on 3rd May. The case was pronounced fever.

On 15th May Mussammát Hukm Dei, caste Ját, died of plague. Patwári reported.

Asa Rám, Hospital Assistant, and Lála Devi Dás saw the corpse before it was burnt.

Jhingrán, 24th May.—Was visited by Sheikh Muhammad Yunus on the 19th and the 21st May.

On the 19th Anúp Singh died in 24 hours of what Asa Rám, Hospital Assistant, described as colic.

On the 22nd Mussammát Attri died after five days' illness of what Jowáhir Singh said was pleurisy. Asa Rám had also seen her before death.

On the 24th one Bola was reported by the Girdáwar Odey Chand as having died of plague.

On the 22nd Sheikh Muhammad Yunus had reported this man as ill, but better. In fact he had been at work in the fields. Odey Chand, Girdáwar, was living in Jhingrán at the time, yet he seems to have had no suspicions that there was plague in the village, though it must have been there fully a week.

Arapar must also be referred to. Plague was never declared there, but it was cordoned for ten days and some 50 persons were segregated.

On the 11th May Devi Dás, Náib Tahsíldár, when visiting Arapar found a man, Bhagwán Singh, suffering from what Asa Rám, Hospital Assistant, said was plague. He was segregated. On the 12th I visited the village. Bhagwán Singh had died. I saw the body. Devi Dás and Asa Rám said it was a case of plague. I had never seen but one case before, so I thought they were probably right, and ordered the body to be burnt.

The same day some four perons were found in the same courtyard. Asa Rám and Devi Dás said they had plague. I saw swellings in the groin on at least two of them.

The plague medical officer, however, said the men were not ill with plague. Disinfection of about ten houses was made and a cordon maintained for ten days, but there was no fresh death or even illness in the village.

Out of the above Hansron alone was discovered at a special inspection of the inhabitants. Músapur, Chahal Khurd were taken over direct by the plague staff.

Fitness of observation staff.

I think the staff provided was adequate for the work they had to do. Each Náib Tahsíldár, however, should have two Kánúngos. In this division Lála Devi Dás had only one Kánúngo from the 8th April, Bhág Mal being appointed Munshi.

In the middle of May Rám Chand and Imám-ud-dín were sent away on disinfection duty on the 21st May. A little later Asa Rám was also sent away to Banga on 23rd. This threw heavy work on Jowáhir Singh, Hospital Assistant, who was left.

In a badly infected division such as Aur was there should not be less than two Hospital Assistants. At that time, however, the plague was abating somewhat.

Two dháis were provided for this division. Their duties were—

(*a*) Examination of parda nashín women at times of inspection.

(*b*) Examination of sick women and bodies of females.

Both were ordinary ignorant women. They may be able to detect obvious fever or the presence of a bubo, but beyond this I have no reason to believe that they have any medical knowledge whatsoever.

Two Compounders were sent, but they did no work, and at last received orders to proceed to Nawashahr for work under Surgeon-Captain Smith.

It would be as well if all those engaged in observation work, Divisional Officer Náib Tahsíldár, Kánúngo, Hospital Assistant and Dhái, had some previous lessons in the diagnosis of plague.

This might, I think, be done by taking them to a hospital and showing them some typical cases.

Of course the opinion of a qualified medical officer is alone conclusive, but such a training might lead to the earlier discovery of plague and so villages may be taken in hand before they become badly infected.

Method of working. Inspections.

There were parda nashín women in 17 villages, and there was, I believe, a little difficulty about their inspection at the first.

This difficulty was got over when the Dháis arrived.

I have found the people very ready to assemble and answer their names when called.

I do not regard a special inspection as an infallible method of detecting plague. Firstly, because the villagers always know when an inspection is to be held. Secondly, when the people have assembled the village if searched would probably disclose some stragglers. I refer particularly to guests.

I had a practical illustration in one village, where I sent the Tahsíldár in to the village after all the people were reported out, and he found some recent new-comers 8 or 10 in number.

Visits.

These proved useful in keeping the village officers up to their work. A register of sick and guests was kept up in addition to the absentee list. This list was brought up to date on the occasion of the visit and the sick persons inspected.

Other means of information.

Deaths were reported in two ways. They were mentioned in the ordinary Patwári's report, and they were also reported at the thána by the chaukídár. These two reports acted as a check on one another.

Further, when a death occurred permission to bury or burn the corpse was only given after inspection by a Náib Tahsíldár or Hospital Assistant.

I think the inspection of every dead body is most important, and the work of the Hospital Assistants consisted very largely of this.

B. H. BIRD,
Assistant Commissioner.

APPENDIX H.

Letter dated 19th June 1898.

From—Sheikh ASGHAR ALI, Assistant Commissioner, Plague Divisional Officer, Garhshankar,

To—Major E. INGLIS, Deputy Commissioner on Special Duty, Phagwára.

IN answer to your letter No. 1098, dated the 11th June 1898, I have the honor to forward the following brief note.

Before Mr. Langley took over charge as Observation Officer towards the end of March, Dr. Datta did the observation work in this division in addition to his other duties. Mr. Langley had, I believe, three Náib Tahsíldárs, six Kánúngos, two or three Hospital Assistants, and two or more Compounders. This staff was distributed over three circles into which the division was sub-divided, and which coincided with the existing zails as follows :—

(1) Zails of Buland Khán and Ghulám Jiláni, under Náib Tahsíldár Fazal Karím.

(2) Zail of Imám Bakhsh (Garhshankar), under Náib Tahsíldár Jog Dhián.

(3) Shám Singh's zail (Iláka Bit), under Náib Tahsíldár Wadháwa Singh.

The Iláka of Bit was considered safe from plague, and taken off the list of suspected area. Náib Tahsíldár Fazal Karím was put on executive plague work at Rámpur Bilron. Hospital Assistant Nának Chand was invalided to his own district, and the other Hospital Assistants Wali Muhammad, &c., were put on cleaning work at Garhshankar

When I took over charge on 9th May I found—

(1) Náib Tahsíldár Wadháwa Singh in charge of the Eastern (Garhshankar) Circle, with Kánúngos Fateh Dín and Nathu Mal under him, and the Compounder Farzand Ali.

(2) Náib Tahsíldár Jog Dhián in charge of the Western Circle (Zails of Buland Khán and Ghulám Jiláni), with Kánúngos Hátim Ali and Muhammad Khán, and Compounder Muhammad Dín.

On the 27th May I changed places of the two Náib Tahsíldárs only, and the staff has remained the same ever since. Fateh Dín has acted as my Reader in addition to his observation work in the mornings.

I have no records to refer to. But it seems only three villages were found after the observation staff was put on,—Garhi in Mr. Langley's time, and Bhagwain and Palewál after I had taken over charge. I am not sure about Garhi as to how it was found. But I hear the Chaukídár of the place brought information to Mr. Langley. About Bhagwain and Palewál I have sent detailed reports (in my diaries) of the circumstances under which the two places were found. A death under suspicious circumstances had occurred at *Bhagwain* on 13th May, and the village was placed under close observation. The staff had strict orders to look up the place every day, and I myself paid visits now and then. On the 19th May, early morning, Compounder Muhammad Dín reported two plague cases and one death to me.

Palewál.—On 20th May the roll-call of that place was held in my presence. One man, Nigáhia, was found with fever, bad suspicious tongue and shaky walk. Nurse Browne and Compounder thought it was plague, but Dr. Hunter (whom I sent for) declared it was ordinary fever. But as a matter of precaution the man was segregated out of the village. Two days after the doctor allowed him to return to the village, and the same evening he died. On 23rd May a woman named Chandi died. Doctor Clark examined the body and declared it was not plague. On 2nd June had information about illness of a man named Gujjar and his wife Ralli. This Gujjar was related to Nigáhia above-mentioned, and their houses were adjoining. Compounder could not see any signs of plague. But next morning I took Drs. Hunter and Clark to the place. Gujjar had plague, but the doctors were not sure about his wife. Later on she was also declared with plague.

From these remarks it may be judged through what means the villages Bhagwain and Palewál were brought to light. I am thoroughly convinced that they were found through the personal exertion of the observation staff, without whose strict and close watch either the villages would not have been found at all (especially when it is seen that there have been very few cases indeed in either of the villages, and they could have very easily passed without being noticed), or they would have been found when the disease had assumed vast proportions. As it is, the disease has been nipped in the bud in the two places, and there is a consensus of opinion that these two villages were the earliest-found in the district. I say this only to show in what direction the usefulness of the observation staff may be looked for,—to keep in contact with the villagers, to get information and hints and follow them up, and to bring to light cases at the earliest possible opportunity. The turning out a village and holding the roll-call is, I think, more vexatious and annoying than useful.

I may say that the strength of my staff was altogether insufficient, especially the medical portion of it.

I had only two Compounders, and I kept them flying from place to place in quick succession. They have done well, however, especially Muhammad Dín, who deserves a reward. The fate of the Compounders seems to me to be the hardest; they are hardest worked and worst paid. Náib Tahsíldár Jog Dhián improved towards the end. But he is an old man, and ought not to have been sent on plague duty. Náib Tahsíldár Wadháwa Singh has done well, and deserves commendation. Nathu Mal, Hátim Ali and Muhammad Khán, Kánúngos, have all been energetic. Fateh Dín, Kánúngo, used to go out in the mornings for inspection work and act as my Reader in the afternoons. He is an intelligent man, and ought to make a splendid Reader.

As to the class of officials most suitable for observation work, I think it depends more upon the quality of the officials themselves than the class to which they belong. In any case a strong medical element is an absolute necessity. The Assistant Surgeon and Hospital Assistant would perhaps be more useful on account of their medical knowledge. But it would be difficult to replace the administrative ability of the Tahsíldár and his Náib. An admixture of both would be best. I may suggest, however, that young, energetic, *graduate* (B. A's. M. A's.) Extra Assistant Commissioners may be tried as observation officers, especially those who have had some experience in the revenue line. I may further suggest that on a future occasion a little more care should be shown in the selection of the subordinate officers of the observation staff. Men of energy, honesty and strength of character should be sent.

APPENDIX I.

No. 81, dated 22nd June 1898.

From—Díwán Tek Chand, Divisional Officer, Baláchour,
To—Major E. Inglis, Deputy Commissioner on Special Duty.

In reply to your letter No. 1100 of 11th instant, I have the honor to submit the following report on the plague administration of the Baláchour division during the last three months.

The observation staff consisting of three Náib Tahsíldárs and five Kánúngos arrived at Baláchour on the 28th March, and commenced inspection work on the 29th. The sixth Girdáwar arrived soon after on the 4th April, so that each Náib had two Kánúngos under him. Till the 11th April I had not the assistance of any Munshi, but on that date I took one Kánúngo in my peshi, using him also as a flying Girdáwar to run up and down when occasion demanded.

The division consisted of 110 villages, but as 14 of them were *becharag*, the number of villages for purposes of plague administration was only 96. Of these, 34 villages were in charge of the Náib Tahsíldár of Káthgarh, while the Náibs of Baláchour and Bana had 31 villages each to superintend. But this distribution had to be altered as Lakhpat Rái, Náib of Bána, was invalided on the 11th April. Since then Bana sub-division was amalgamated with Káthgarh, and the Náib of Káthgarh remained in charge of both sub-divisions, keeping three Girdáwars under him. Some more villages were added to Baláchour sub-division; but, as owing to its close proximity to the affected area the work there was heavy, its circle was purposely kept much smaller than that of Káthgarh, though assistance was offered to the Náib Tahsíldár of Káthgarh in the form of additional Girdárwar and so forth.

Kullewál was the only village in this division which became infected with the plague. But two other affected villages, Simal Mazra and Chaukoha, though situated in the Sahíba division, were also very close to Kullewál. So that the whole border from Phirne Mazara to Auliapur remained in constant danger, and utmost watch had to be exercised over it.

The disease is alleged to have been imported into Kullewál from Simal Mazra. The first case was promptly communicated to us by Lájpat Rái, Patwári of the circle in which Kullewál lies. At the same time the news was brought to the police station by Sáhib Dád Khán, Lambardar of Rurki, a village in the Sahíba division.

The observation work was carried on according to the written instructions I received from you at Phagwára. The unit of work was a Patwári. He was required to visit every village in his circle once daily, and send by noon to his Kánúngo a roznámcha showing new cases of death, illness, new arrivals and absentees, and any other matter connected therewith. The Kánúngos had to pass on these diaries to the Náib Tahsíldárs by 4 P. M., and the Náibs noted down the necessary items in their note-books, and sent them on to me by 6 o'clock the same evening. I disposed of them usually the same night or the first thing the following morning. I also received daily reports of deaths from the police station, and compared them with the death statistics contained in Patwárís' diaries. The Lambardárs used to send reports of new arrivals and absentees to the police station before my arrival, but I stopped that, as there was no necessity for double record on that subject.

This system worked very well, though some of the Patwárís had a very hard time of it. I might perhaps suggest that in future in large circles one assistant should be appointed to give relief to each Patwári. As a rule, all Patwárís should get such assistance whose circles, measured from village to village, exceed a distance of 15 miles.

The supervising agency was eminently suited for the observation work. Only I am inclined to think that among the three grades of supervisors—Kánúngos, Tahsíldárs, Assistant Commissioners—one was perhaps superfluous. I cannot exactly say which should be knocked on the head, but I am inclined to hold that Tahsíldárs might be dispensed with. They are very useful Revenue officials, and it is a waste of power to employ them on work which they by no means do better than the Kánúngos. The control over the latter can well be exercised by the Assistant Commissioners direct. As the chief work of supervision will pass into the hands of the Kánúngos, their rank might be raised, and they might receive some special plague allowance—say 8 annas a day—which would augment their pay. Instead of Kánúngos it would be better to call them inspectors for the purposes of special duty. These inspectors should be very carefully selected. We want young and active men who have made some reputation for honesty in their own districts. It is not necessary that they should all be Kánúngos, but if Kánúngos possess the above qualities they should be indented on first. I lay stress on this because one of my Náib Tahsíldárs was an invalid when he joined his duty, and three of my six Girdáwars were old men, and the fourth was suffering from a kind of white leprosy, and should never have been deputed on plague duty.

If my proposal of dispensing with the services of Tahsíldárs and Náibs be negatived, I would respectfully suggest that their number be reduced in future. To place three highly paid officers like Tahsíldárs and Náib Tahsíldárs along with six Kánúngos in a small tract of the length of about 15 miles appears to me to be unnecessary. Accordingly when one of my Náib Tahsíldárs was invalided on the 11th April I reported to you that I did not want any substitute for him. For mere observation one Tahsíldár or Náib is quite sufficient for each division of the present size. Certainly he could do all the work in winter, when he could be out all day. At present the tendency has been for the Tahsíldárs to make the Kánúngos accompany them in their inspections. I discouraged it very much, for I don't see any use of two officers doing the same observation work together.

But if in my opinion the observation staff in the *suspected* area was somewhat over the required strength, that employed on the *affected* area was perhaps under it. I was not in charge of the affected villages, and feel great hesitation in expressing an opinion on their administration. But being close to three affected villages, and hearing all about them, I hope you will kindly allow me to say one or two things which are uppermost in my mind.

In my opinion more stringent measures should be adopted in the administration of affected area, and as to the suspected area the rigour of watch and ward hitherto in force might be relaxed. If we can better superintend the disease at its fountain-head, there would be comparatively speaking less need of guarding it elsewhere. That the plague is a contagious and a travelling disease does not admit of any doubt. Even the people now believe in it. They will all tell you in the exactest detail how the disease was imported from one village into another, and by whom. Choukoha became infected from Kullewál, Kullewál from Simal Mazra, Simal Mazra from Shikohpur, and so forth. Granting the travelling nature of the contagion, it is really astonishing that in spite of an enormous executive and observation staff it should have spread even so much as it has. The want of co-operation of the people, their dread of the doctors, their objection to taking English medicine, their distrust of the police, their want of faith in our plague measures, are no doubt potent factors in the spread of the disease. Yet, making sufficient allowance for the apathy and even opposition of the people, it cannot be denied that our management has to answer for a great deal. It is my firm belief that the corruption of the lower officials has not only alienated the public sympathy with the Government and smothered all feelings of gratitude towards it, but has been instrumental in the growth of the disease. Not only they have given the innocent people lot of trouble to extort some money, but, what is much worse, they have allowed the escape of plague suspects for that nefarious purpose.

I may perhaps illustrate. Kullewál is a village in my division, and it became affected. It was alleged at the time that the first man (Dula Singh, Lambardár) who caught the disease died of cholera after taking lot of plums and *sharbat*. But it is now an open secret that he did import it from Simal Mazra, the neighbouring village, where the plague had been raging ever since 9th February, and import it too from segregation camp! The question arises how could he get admittance there since the whole village was *cordoned*. The simple answer is by bribing the police. The constables on segregation or cordon duty would always flock to Dula Singh's house at Kullewál begging provisions, dine in the village and then return quietly to Simal Mazra as if nothing had happened.

Again, from the same village (Simal Mazra) a servant in charge of the segregation hospital made good his escape and could not be traced afterwards. I hardly believe he could fly without the connivance of the constabulary.

Even the other day I spotted one Deputy Inspector of Police on plague duty with the segregation camp at Choukoha paying a stealthy visit to Baláchour Deputy Inspector of Police.

Now all this is nothing short of scandal. What is the use of cordons and segregations if such dangerous loopholes are possible. But as long as the agency at our disposal is rotten, so long will these loopholes evidently occur. But how to stop them or reduce them to a minimum is a problem which at this juncture demands the serious consideration of the authorities, for on its solution principally depends the proper working of the plague rules.

I do not think all the current rumours of corruption are unfounded. I would suggest that a bench of two Assistant Commissioners be appointed to hear all the charges of malpractices that might be brought against the Police, the Medical and the Civil minor officials during the recent plague campaign. If Government appoint half a dozen detectives to bring to light these malpractices, the money spent on them would not be wasted Unless the guilty are severely punished, a better tone of morals and discipline cannot be expected.

For the future also I have a suggestion to offer. The services of the Police Department are no doubt necessary for the cordon work. But I imagine it would be a great improvement if every affected village should have a *double* cordon. The first cordon would consist of the police as heretofore. The second cordon, which might be at a distance of quarter or half a mile from the first, should be manned by the Civil officials. Both will act as a check on each other. Further, to avoid a chance of their conspiring and making a common cause, they should not be allowed to mix with one another, and to ensure this between the Police and the Civil beats an executive officer (who will also be in charge of the plague operations in that village) should be stationed. If this officer is a Magistrate and is also invested with summary powers, he would wield greater influence and be more useful.

If each affected village is treated in this way, it ought to be hardly possible for any outsider to come into the village or any person belonging to it to escape therefrom unnoticed.

What the rank of the minor Civil officials should be is a matter of detail. Perhaps chaprásís carefully selected and better paid might do. Perhaps volunteers from the affected villages might be forthcoming to do the work. All I suggest is that we might *try* a system of *double* cordon composed of men not belonging to the same Department.

I may probably be expected to say a few words as to the popular opinion about the plague measures prevalent in my division. I took great pains to gather the views of zamíndárs direct from them. I interviewed most of the Lambardárs and quietly talked to them on the subject. It will be idle to examine all the silly stories which I heard and which have been current here as widely as elsewhere. But it is possible to separate the grain from the chaff, and I think some of their complaints are worth listening to. They don't object to the segregation of patients or their households, but consider the evacuation of the whole village unnecessary and vexatious. They consider quarantine very good, but complain that persons undergoing it are not properly fed or otherwise well looked after. Occasional house-to-house inspection is perhaps inevitable, but they would rather have it done quietly by the Lambardárs than the Government officials, who are always accompanied on these visits by a crowd of rude and idle lookers-on. They have great faith in the small-pox inoculation, but they wish that plague inoculation should only be resorted to after some further experience of its utility, and then only in places where the fell disease has made its appearance.

Last, though by no means the least, comes their indignant and woeful clamour about the violation of purdah. This Kandhi iláka of the Rájpúts is perhaps the most strict observer of the purdah system, and boasts of its observance since time immemorial. They have very queer notions about it. For instance, a Rájpút woman will by no means allow herself to be seen even sitting like a bundle of clothes, with veil all over and her back towards the door. Nay, the Rájpúts would not willingly allow you to see their zenánkhána, even though the ladies may have removed themselves. Yet one step more. When I engaged a dhái for the purpose of inspecting Rájpút women of Baláchour they grumbled because the *woman* did not belong to Baláchour and was a stranger, inasmuch as she came from another village, though that village is only three miles from Baláchour! Of course I did not give in to such nonsense. But I mention these things so as to show that inspection of purdah nashín women [and all Rájpút women are such, whether Hindús or Muhammadans] even with a view to ascertain their presence as explained in your written instructions is impossible unless done forcibly, for which up to this time there has been luckily no necessity. In future men should not be expected to do this work, and trained nurses should be stationed in the division, for no reliance can be placed on local dháis, who could easily be bribed.

I might also add that in this division particular attention was paid by the observation staff to conservancy matters. The sight of the villages was simply unbearable. There were no drains to carry the refuse water to its receiving tanks, and the surroundings were filthy with stagnant water. I am now glad to report that after three months of constant supervision all the village wells now possess regular drains (a few even pakka ones). Again, in all the 96 villages people were persuaded to cleanse their houses and plaster them with three coatings,—first with mud and bhúsa, then with mud and gobar, and lastly with gohi. This last is a limy substance found abundantly in the lower range of the Siwáliks, and also near the bank of the Sutlej. It is very cheap—say 6 seers for a pice—but the zamíndárs here as a rule don't pay anything for it, if they like to dig it and carry it themselves. I would request that its properties may be chemically examined, and its effect on the plague bacilli ascertained.

I hope all these precautions will be found of some use should the dreaded disease appear again in this district.

In conclusion, I would put in a word of praise for those of my subordinates who in the hottest months of the year and in spite of the unpleasant and dangerous task allotted to them did their duty manfully and cheerfully. I have already noticed their individual merits in detail in the report which I submitted to you on the 18th instant.

TEK CHAND

Assistant Commissioner.

No. 67, dated 18th June 1898

From—Diwán Tek Chand, Assistant Commissioner, Balachour,

To—Major E. Inglis, Deputy Commissioner on Special Duty.

I have the honor to submit my report on the observation staff, as desired by your demi-official of the 7th instant.

It consists of three lists. List A deals with those officials who have been specially deputed for plague duty. List B deals with Lambardárs and others belonging to the District Establishment, through whose assistance the observation work had to be carried on.

List B is again divided into classes (*a*) and (*b*). The former refers to those who are reported favourably. I have proposed certain rewards (aggregating Rs. 610), and request that they be sanctioned for the encouragement of a spirit of loyal, faithful and zealous service to the Government.

Class (*B*) pertains to those who are reported unfavourably. I trust my remarks about the worthless Lambardárs, which are the result of close personal supervision, will be given due weight, and some of them will be weeded out by the District authorities. They are simply a hindrance to good administration.

NOTICE OF OBSERVATION STAFF, BALACHOUR DIVISION.

A.—Plague Establishment.

1. Ishar Singh, Náib Tahsíldár, is a very useful officer, and worked very hard. His gentlemanly conduct and persuasive manners made the people work for him willingly and with pleasure. He is honest, and possesses a strong constitution. He is therefore eminently fitted for plague duty, and remained in charge of the affected border.

2. Zain-ul-Abdín, Náib Tahsíldár, also worked very well and honestly. He is an able man, though a little self-willed.

3. Lakhpat Rái, Naib Tahsíldár, remained for a short time under me, and was then invalided. I found him a very unsatisfactory officer. He oppressed the people, and complaints of corruption were heard against him. His character was also reported to be bad.

4. Nabi Bakhsh, Kánúngo, is an excellent official. He is well informed, and takes an intelligent interest in the suppression of the plague. He tried to make the people understand how beneficial the plague measures were. He joined the special duty from Gurgaon District, but is a Ghorewaha Rájpút of Garhshankar. He sincerely regretted the Garhshankar riot, and I think had he been there he might have smoothed matters by educating the opinion of his fellow-tribesmen. I mention this in detail, so thatif the plague were to break out again in winter, he will be a very useful man on the list.

Umráo Singh, Kánúngo, was the best of the lot. Young, hard-working, and highly intelligent, he understood my orders without any delay, and carried them out as promptly in accordance with their true spirit. I selected him lately for more active duty at Banga, where I hope he died equally well.

Ahmad Hasan, Kánúngo, is a quiet, honest man, and worked hard. But possesses little tact and influence, and is not suited for special duty.

Bansi Dhar, Kánúngo, showed much tact, influence and intelligence. He was the first person who persuaded the people to whitewash their houses without Government aid, and thus rendered a signal service.

Nasír-ud-dín, Kánúngo, is an old man, and need not be troubled again on active duty like the present. However, I have no complaints to make against him.

Bahár Beg, Kánúngo, was the chief person who troubled me. He harassed the people, and conjointly with Lakhpat Rái, Náib Tahsíldár, spread a reign of terror in the Bana Zail. He was an active official, but very corrupt.

Amrit Lál, Mandal, Hospital Assistant, has been extremely popular. He worked very hard, and spent most of his time out inspecting villages. If such men could be secured for plague duty, the popular rage against the medicals would cease altogether.

Mussammát Bhúra, Dhái, is an active old woman. Did not work badly, and should be made use of again if occasion arises.

TEK CHAND.

B.—District Establishment.

(*a*) *Reported favourably.*

Gurdit Singh, Hospital Assistant of the Balachour Dispensary, did a great deal of inspection work ever since the plague scare began in the Garhshankar Tahsíl. He often accompanied me on my tours of inspection before the special plague Hospital Assistant joined the staff on the 18th April 1898; and did good work. I hope he will be given travelling allowance up to the 18th April, and subsequently for those days only when he was actually required either by the Assistant Commissioner or the Tahsíldár to go out.

Lájpat Rái, Patwári of Garhi, did excellent work. He was the first person to report the first case of plague in the adjoining village of Kullewál, and did this promptly. Deserves a reward of Rs. 20.

Sant Rám, Patwári of Phirne Mazra, is a very zealous and energetic man, and did the general work of supervision, perhaps, best of all. Deserves a reward of Rs. 20.

Bíru Rám officiated as a Patwári of Jandi, and during that period did excellent work. I think he should be recommended to the Deputy Commissioner of Hoshiárpur for a permanent appointment.

Zaildár of Balachour. Rái Puran Chand himself is a worthless man, but his son Bishen Chand is an active fellow and rendered valuable assistance, first at Balachour and then at Kullewál, where he remained in charge of the plague camp for over two months till the village was declared free. I propose Rs. 100 reward for him.

Zaildár of Káthgarh. Sardár Shab Deo Singh is very highly spoken of by the Náib Tahsíldár Zain-ul-Abdín, whom he constantly attended and gave him all possible help. He deserves all praise that can be bestowed on him. I propose a reward of Rs. 100 for him.

Zaildár of Bána. Rái Muhammad Bakhsh himself is a simpleton, but his nephew Ghulám Jiláni, a Biswedár of Bána, acted in his place. He is a very promising young man, and did conspicuous service during the recent plague campaign. He saved the Náib Tahsíldár of Káthgarh from the hands of a maniac who had attacked his search-party at Bela Tájowál, and but for his opportune help the Tahsíldár would have received serious injury. As it was, Ghulám Jiláni himself received some of the worst blows, from the effect of which he did not recover for a long time. He was again further disabled from active service when on another occasion the same Náib Tahsíldár's mare bolted, kicked Ghulám Jiláni, who was following close, and he was thrown off. All these wounds he received during the discharge of plague duty. Moreover, he has lately been helping me by bringing to light various cases of corruption of some of the minor officials. I therefore recommend him strongly for a reward of Rs. 150.

Muhammad Bakhsh, sufed posh of Gahun, constantly accompanied the Náib Tahsíldár of Balachour, and helped the staff in various other ways at a moment's notice. I propose Rs. 40 reward for him.

Lehna Singh, sufed posh of Balachour, is an extremely useful man, and takes great delight in assisting the Government officers in every possible way. He was first absent on leave, but since his return threw himself, heart and soul, into the work of the suppression of the disease, for which he evinced a very intelligent zeal. I also propose for him Rs. 40.

Besides the above, the following persons did meritorious service by keeping guard over their villages, and cleansing and whitewashing them without any aid from the Government:—

1. Abdul Razáq, sufed posh of Hasanpur Kalán.
2. Nathu, Gujar, Lambardár of Mohar.
3. Akke Khán, Rájpút, Lambardár of Ghamour.
4. Ináyat Khán, Lambardár of Tathiála.
5. Kishen Singh, Muáfidár of Tathiála.
6. Alia, Lambardár of Mandher.
7. Dhanna, Chaukídár of Asron.
8. Kálu Singh, Chaukídár of Balachour.

I propose a reward of Rs. 20 each for the first six and of Rs. 10 each for the last two.

TEK CHAND.

(b) Reported unfavourably.

BHAGWAN SINGH, Deputy Inspector of Police. I am afraid I must include him in this list. He encouraged the secret visits of the Constabulary stationed at Kullewál and Chaukoha (affected villages) to Baláchour without my permission; and I have reason to believe that he himself went over there to meet Dalíp Singh, Inspector of Police on plague duty at Chaukoha. I reported the latter to the Divisional Officer, Garhshankar, who is taking action against him. As regards Bhagwán Singh, I think if I have to show my disapprobation of his work I must do so here. I have just lately received a serious report of bribery against him and Gurdit Singh combined in connection with segregating a part of the Bachhwan village. I am inquiring into it now, though the alleged bribery was given before the posting of the observation staff to this division. If plague were to break out again Bhagwán Singh should not remain on duty either in the affected or suspected area, for he does not use his influence in the right direction.

Kirpa Rám, Patwári of Májra, is a thorough scoundrel. He oppressed the people and threatened them with unnecessary quarantine and not letting them off till tipped. He is extremely unpopular, and should be transferred at once, if not removed from the Government service.

Punun, Chaukídár of Bela Tájowál, did not arrest the man who attacked the Náib Tahsíldár of Káthgarh when ordered to do so, and showed utter neglect of duty.

Ghulám Ahmad, Lambardár of Káthgarh, has much influence, which unfortunately he uses in the wrong direction. Work was done very tardily and very unwillingly at Káthgarh. The other Lambardárs are entirely under his thumb.

Lálu, Lambardár of Khandupur, was never present at the detailed inspections, and would never do anything. But what is worse, he tried to spread mischievous reports about the plague measures. He is too wicked and callous to hold a Lambardári.

Híra, Masana and Badháwa, Lambardárs of Baláchour, gave the utmost trouble to the Náib Tahsíldár of Baláchour by not rendering any assistance whatever. The first-mentioned is their ringleader and a scoundrel, and I am told Mr. Jones, Assistant Commissioner, imprisoned him not long ago for disobeying the Government orders. His mischief created a disturbance at Baláchour which might easily have taken the dimensions of a riot if not quelled in time.

All the seven Lambardárs of Kangan are a bad lot. The Náib Tahsíldár complained several times that when any order was given to any one of them he would tilt it on to the shoulders of others, with the result that no body will do it, but put the blame upon others. It is a mistake, I think, to have seven Lambardárs in a small village of less than 800 souls. Some of them might be weeded out with advantage.

Besides the above, complaints of more than average indolence and neglect were received of the following :—

1. Ata Muhammad, Lambardár of Ráipur.
2. Básu, Sarbarah of Fatahpur.
3. Munshi, Chaukídár of Tájowál.
4. Jamiat, Lambardár of Sarangpur.
5. Kirpa, Lambardár of Garhi.

The 17th June 1898.

TEK CHAND.

APPENDIX J.

No. 47—B., dated 23rd June 1898.

From—Dr. ATAR CHAND, Divisional Officer, Mahalpur and Jaijon Division,
To—Major E. INGLIS, Deputy Commissioner on Special Duty, Phagwára.

WITH reference to your No. 1099, dated 11th June 1898, I have the honor to submit a report on the working of the observation staff of Mahalpur and Jaijon Divisions.

Report on the working of the Observation Staff of the Mahalpur and the Jaijon Divisions.

1.—*Mahalpur Division.*

THE observation system in this division was started on the 27th March 1898 with the following staff :—

Dr. Datta as Divisional Officer at Mahalpur.

Three Náib Tahsíldárs.

Six Kánúngos.

This was supplemented later on with five Dháis and one Hospital Assistant.

Disposition of the staff.

It was found inexpedient to distribute the area to Náib Tahsíldárs according to zails in this division. The field of work therefore was arranged in a manner best calculated to afford facilities to Náib Tahsíldárs in making their rounds—

Náib Tahsíldár Bálkishan Dás at Mahalpur—40 villages.
" Muhammad Mirza at Kotfatuhi—34 villages.
" Ranjít Gopál at Nadalon—29 villages.

This area comprised 30 Patwári circles, and 5 Kánúngos (1 being employed as a clerk with the Divisional Officer) were detailed under the three Náib Tahsíldárs, giving to each six Patwári circles to supervise.

Of the Dháis, two were stationed at Mahalpur, two at Nadalon, and one at Kotfatuhi.

Changes in the Staff.

The Hospital Assistant who arrived on the 20th April was kept at Mahalpur.

Náib Tahsíldár Bálkishan Dás was withdrawn and posted to Banga on the 17th May, and the villages under his charge had to be distributed amongst three Náib Tahsíldárs, two of whom belonged to Jaijon division, which was incorporated with this division on the 9th May by the transfer of Mr. Bird to Ráhon.

Náib Tahsíldár Ranjít Gopál of this division had by this arrangement his area of work increased, and the number of villages in his charge rose from 29 to 40 villages.

Two Kánúngos were also withdrawn from the staff, as also two Dháis.

Books and registers.

The following books and registers were devised and maintained :—

1. Census register.
2. Absentees' lists.
3. Visitors and guests' lists.
4. Sick lists.
5. List of families related to infected villages.
6. Quarantine register.

The entries in these lists were made from time to time by the Patwárís and were scrutinized and checked by Kánúngos and Náib Tahsíldárs.

Mode of working.

The circular orders on this subject were duly carried out, *i.e.* the Patwárís were ordered to make their daily visits to the villages in their circles. They were to ascertain whether any one was sick or had died, whether any stranger had arrived in the village or any one had gone elsewhere, and so on, and make the requisite entries in the books provided for the purpose.

The Kánúngos were to check the Patwárís' books and exercise general control over them. They were ordered to finish their iláka in two days. The Náib Tahsíldárs were ordered to visit at least ten villages daily so as to finish their area in three days. Of these ten villages two were to be closely inspected, or roughly 1,000 souls. At the outset the close inspection of villages was carried on systematically at the rate of two a day, and no village was exempted from close inspection. It was to be done by the Náib Tahsíldárs personally with the help of Kánúngos and nurses, the latter being utilized for inspection of women where an excuse of 'purda' was put forward. As the plague decreased and the chances of its widespread propagation were lessened, the close inspection was dispensed with in the villages situated at a distance from the infected area. It was, however, continued in the villages situate close to the border of Nawashahr Tahsíl in close proximity to the infected villages.

How the observation staff have worked will be observed from the statement attached herewith—A. From it it will be seen that Bálkishan Dás, Náib Tahsíldár, inspected 407 villages, of which 78 were close inspections with a daily average of 10 villages.

Amount of work done.

Muhammad Mirza inspected 553, of which 95 were close inspections with a daily average number of 8 villages.

Ranjít Gopál inspected 608 villages, of which 69 were close inspections with a daily average number of 9.

This is a very fair amount of work done, taking into consideration that wherever there is a close inspection it takes up a long time to finish it and the Náib Tahsíldár's other ordinary inspections cannot be made on that day to an extent required of him. I have found from statistics collected that all the Náib Tahsíldárs who are still carrying on close inspections their daily average of villages is less than those who have not got close inspections to make.

The work done by Kánúngos is shown in Statement B.

The Hospital Assistants and the nurses have proved useful in a manner that their services were required.

No village in this division was infected with plague after the observation staff was appointed, and I believe in a great measure it is due to the care and vigilance exercised by the observation officers, the system of quarantining, check put upon the movements of villagers, and so on, that this division has escaped the plague.

Jaijon Division.

The observation system in this division came in force on the 27th March with—

Mr. Bird as Divisional Officer.
3 Náib Tahsíldars.
6 Kánúngos, and later on
1 Nurse.
1 Hospital Assistant.

The area of work was distributed among Náib Tahsíldárs in this division according to zails, and the disposition of the staff was made as follows:—

Disposition of staff.

Náib Tahsíldár Jánki Náth, Bachhoi Zail—34 villages.

Azíz-ur-Rahmán, Maghowál Zail—28 villages.

Shám Dás, two Zails, Paddi and Padrána—33 villages.

This area comprised 24 Patwári circles, and five Kánúngos were detailed under the three Náib Tahsíldárs, giving about five Patwáris' circles to each on an average. The sphere of work of the two Náib Tahsíldárs, Jánki Náth and Azíz-ur-Rahmán, was increased by the addition of certain villages from the Mahalpur Division on the transfer of Bálkishen Dás on the 17th May 1898, and number of villages thus increased stood 48 and 43 against the names of Jánki Náth and Azíz-ur-Rahmán respectively.

Changes.

Two Kánúngos were also withdrawn from this division.

On the 9th May this division was incorporated with Mahalpur by the transfer of Mr. Bird to Ráhon.

The method of working, close inspections, &c., are essentially the same as for Mahalpur division, and the books and registers were also made to correspond with those of Mahalpur division.

Method of working.

The amount of work done by the observation staff of this division is given in Statement A, from which it will be seen that—

Amount of work done.

Náib Tahsíldár Azíz-ur-Rahmán inspected 584 villages, of which 71 were close inspections with a daily average of 8¼.

Náib Tahsíldár Jánki Náth, 633, 70, 9⅓.

Náib Tahsíldár Shám Dás, 488, 111, 7½.

The work done by Kánúngos is given in Statement B.

The last-named Náib Tahsíldár has charge of villages in close touch with the infected area of Garhshankar, and had, and is still having, great deal of close inspections.

The only village in this division and under charge of Shám Dás which became infected with plague after the observation system was started is Rámpur Bilron. It was infected second time long after it was declared free in February or March.

Name of village infected, and how cases were discovered.

The cases were brought to light in the following manner:—

On the 12th April a man, Nihála, died in Rámpur Bilron, and the Chaukídár reported it as usual at the 'thána.' This man was not on the sick list, and no report of this was sent to the Náib Tahsíldár on observation duty. Next day the deceased's son, named Ralla, aged 12, was seized with illness. The Lambardár's son thereupon sent a report direct to the Plague Medical Officer at Garhshankar, who sent Hospital Assistant Ghiás-ud-dín to examine the patient. The Hospital Assistant pronounced it a case of plague and removed him to a distance out of the village and also segregated the family. The Náib Tahsíldár of the observation staff was not informed of this. On the 14th April he went to the village to make his usual close inspection, and came to know of the above circumstances. On this occasion the Náib Tahsíldár discovered two more cases of plague in the village and removed them immediately out of the village. He also reported to his Divisional Officer, Mr. Bird, who, along with Dr. Datta, went to the village, which was then made over to the Plague authorities.

I may, however, mention that the Náib Tahsíldár of the observation staff had grave fears of this village being reinfected owing to clandestine communication of the inhabitants of this village with Hájipur, where the disease was raging, and made three reports to the Divisional Officer to take steps to stop the communication by putting some sort of cordon round Bilron; but as it is he was not informed when the village was infected, and Hospital Assistant sent by Plague Medical Officer, Garhshankar, was the first who came, diagnosed and segregated the first case.

Observations and suggestions for both Mahilpur and Jaijon Divisions.

1. The system of book-keeping has been a thorough arrangement, and has given a complete control over the village inhabitants; no cases of sickness, much less of plague, could be hidden by such system.

2. The system of employing Náib Tahsíldárs, Kánúngos and Patwáris has in my opinion worked very satisfactorily, and I do not think any change in the class of officials to be employed in future will be desirable.

People are used to these officials, and seem to have more confidence and respect for these revenue officers, and would prefer them to any other official.

The employment of Police officers on this duty is undesirable, as people have a dread of the police, and abuses are liable to occur. The employment of Hospital Assistants on this duty is also unsuitable owing to their low pay and status.

3. I would suggest that non-official agency may be more extensively employed than has been the case. The Lambardárs of villages and some influential residents may be held personally responsible for villages, and some sort of security be taken from them by which they should be bound down. They may be made to understand that their 'muchalkás' will be forfeited if they allowed any such person to be carried to their village or allow communication with infected villages. They should report at once any cases of sickness occurring in their villages to the proper authorities. The Zaildárs and Sufed Poshes be similarly held responsible, and certain 'ilákás' should be entrusted to them. My idea is that by this time the people have realized that they can by their own efforts save themselves from invasion of plague, and I believe will be too willing to help the authorities.

Proposal for staff to be kept on.

I would propose the following observation staff to be kept on during the rains in this division:—

1 Náib Tahsíldár,
1 Kánúngo,
1 Nurse,
1 Hospital Assistant,

and similarly—

1 Náib Tahsíldár,
1 Kánúngo,
1 Nurse,
1 Hospital Assistant,

for the Jaijon division, all to be under one Assistant Commissioner at Garhshankar.

ATAR CHAND,

Assistant Surgeon,

Divisional Officer, Mahilpur and Jaijon.

Character Roll of Observation Staff of the Mahalpur Division.

Serial No.	Name.	Official designation.	From what district.	Duty on which employed.	Remarks and recommendations.
1	Bálkishan Dás ...	Náib Tahsíldár	Umballa ...	Field observation duty.	Had left before I joined. His daily average of villages inspected is good.
2	Muhammad Mirza ...	Ditto ...	Hissar ...	Ditto ...	I endorse Dr. Datta's opinion. This man is an excellent worker, strong and intelligent.
3	Ranjít Gopál ...	Ditto ...	Rohtak ...	Ditto ...	I endorse Dr. Datta's opinion. This man has worked honestly and diligently. His daily average is also very good. Worked very satisfactorily.
4	Partáp Singh ...	Kánungo ...	Umballa ...	Ditto ...	Has worked very satisfactorily. The number of villages inspected by him is the highest of all the Kánúngos Deserves promotion.
5	Sultáni Mal ...	Ditto ...	Ludhiána ...	Ditto ...	Worked satisfactorily.
6	Kusumbri Dás ...	Ditto ...	Karnál ...	Ditto ...	Ditto.
7	Allah Baksh ...	Ditto ...	Lahore ...	Ditto ...	Were transferred before I joined. Cannot form an opinion about their work.
8	Jamaiat Rái ...	Ditto ...	Ditto ...	Ditto ...	
9	Muhammad Mustafa Ali.	Ditto ...	Karnál ...	Reader and clerk to Divisional Officer.	I endorse Dr. Datta's opinion. This Kánúngo is an excellent, well educated man, has given great help in office work, and arranged and maintained his records in a thorough order. Has refined appearance, and deserves promotion.
10	Imám Ali Khán ...	Hospital Assistant.	Calcutta ...	Observation duty.	Is a good, honest and quiet man; has worked satisfactorily.
11	Mrs. Philips ...	Dhái ...	Amritsar ...	Ditto ...	Worked well, and qualifications good.
12	Daulati ...	Do. ...	Umballa ...	Ditto ...	
13	Amíran ...	Do. ...	Shahpur ...	Ditto ...	
14	Rahmat Ali ...	Chaprási ...	Umballa ...	Ditto ...	Worked with Náib Tahsíldárs No complaints.
15	Jumma ...	Ditto ...	Hissar ...	Ditto ...	
16	Jai Naráin ...	Ditto ...	Rohtak ...	Ditto ...	
17	Mirán Baksh ...	Ditto ...	Garhshanker.	Ditto ...	Orderlies to Divisional Office Worked fairly well.
18	Rúpa ...	Ditto ...	Ditto ...	Ditto ...	

MAHALPUR:
The 24th June 1898.

ATAR CHAND,
Divisional Officer.

Character Roll of Observation Staff of the Fajon Division.

1	2	3	4	5	6
Serial No.	Name.	Official designation.	From what district.	Duty on which employed.	Remarks and recommendations.
1	Azíz-ur-Rahmán ...	Náib Tahsíldár	Hissar ...	Field observation duty.	Worked very satisfactorily and diligently.
2	Jánki Náth ...	Ditto ...	Delhi ...	Ditto ...	Daily average of villages good, but the quality of work poor. Doctor Datta had to ask explanations on the meagreness of his reports.
3	Shám Dás ...	Ditto...	Lyallpur ...	Ditto ...	A very promising Náib Tahsíldár; has worked hard and very satisfactorily. Largest close inspections fell to his share as he was in close touch with plague-infected area of Garhshankar.
4	Nádir Khán ...	Kánúngo ...	Ráwalpindi ...	Ditto ...	Was first as a Reader with Divisional Officer, and then sent on field work. Work fair on the whole, and has been ailing.
5	Dehra Mal ...	Ditto ...	Ditto ...	Ditto ...	Worked very satisfactorily.
6	Fateh Muhammad ...	Ditto ...	Siálkot ...	Ditto ...	Ditto
7	Fateh Husain ...	Ditto ...	Lahore ...	Ditto ...	Ditto
8	Abbás Khán ...	Ditto ...	Ráwalpindi ...	Ditto ...	Transferred before I joined.
9	Ghulám Rasúl ...	Ditto ...	Lahore ...	Ditto ...	
10	Rám Ratan ...	Hospital Assistant.	Ferozepore ...	Ditto ...	Fairly good.
11	Barkat Rám ...	Compounder	Ludhiána ...	Ditto ...	Have not seen his work.
12	Mughláni II ...	Dhái ...	Siálkot ...	Ditto ...	Has been helpful in so far as counting up females was concerned, is unqualified and illiterate.
13	Munír Khán ...	Chaprási ...	Hissar ...	Ditto ...	No complaints. With Naib Tahsildárs
14	Shám Lál ...	Ditto ...	Delhi ...	Ditto ...	Ditto
15	Hari Rám ...	Ditto ...	Lyallpur ...	Ditto ...	Ditto

MAHALPUR:
24th June 1898.

ATAR CHAND,
Divisional Officer.

A.

Statement showing the work done by the Náib Tahsildárs of the Mahalpur and the Jaijon divisions from 27th March to 18th June 1898.

Serial No.	Name of Náib Tahsíldár.	Number of villages in each sub-division.	Number of villages inspected closely.	Number of villages visited only.	Total number of villages inspected and visited only.	Average daily number of villages inspected and visited.	Remarks.
	Mahalpur Division.						
1	Bálkishan Dás	40	78	329	407	10	Transferred to Banga on the 17th May 1898.
2	Muhammad Mirza	33	95	458	553	8	
3	Ranjít Gopál	29+11	69	539	608	9	
	Jaijon Division.						
4	Aziz-ur-Rahmán	28+15	71	513	584	8½	
5	Jánki Náth	34+14	70	563	633	9½	
6	Shám Dás	33	111	377	488	7½	

ATAR CHAND,
Divisional Officer.

B.

Statement showing the work done by Kánúngos of the Mahalpur and the Jaijon divisions from 27th March to 18th June 1898.

Serial No.	Name of Kánúngo.	Number of villages inspected.	Average daily number of villages inspected.	Remarks.
	Mahalpur Division.			
1	Partáp Singh	536	8	
2	Sultáni Mal	532	8	
3	Kusumbri Dás	456	7	
4	Allah Bakhsh	320	7	Transferred to Garhshankar on the 28th May 1898.
5	Jamiat Rái	285	6	Ditto ditto.
6	Muhammad Mustafa Ali	...	...	Employed as a Clerk with the Divisional Officer (both divisions).
	Jaijon Division.			
7	Nádir Khán	132	5	Worked on field service from 27th March 1898 to 1st April and 27th May to 18th June (was employed as a clerk with the Divisional Officer, Jaijon, from 1st April to 27th May 1898).
8	Fateh Muhammad	465	7	
9	Dehra Mal	313	5	
10	Fateh Husain	388	6	
11	Abbás Khán	370	8	
12	Ghulám Rasúl	289	6	Transferred to Garhshankar on the 28th May 1898.

ATAR CHAND,
Divisional Officer.

APPENDIX K.

Reports by senior Medical Officers.

Letter dated Nawashahr, 25th June 1898.

From—Surgeon-Captain H. SMITH, I.M.S., Plague Medical Officer,

To—Major E. INGLIS, Plague Commissioner, Phagwára.

WITH reference to your letter No. 1287 of the 18th instant, I have the honor to state my opinion as follows.

I.—*When should a village be cleared out.*—It depends on the size of the village and on the certainty that we have got the first case. We almost invariably find that we have not got the first case, though at the commencement with the extreme reticence of the people we may be led to believe that it is the first case. If we are certain that plague has been confined to a single house, I regard it as advisable to cordon the village; to turn out into camp a small section of the houses surrounding the infected house; to put on a police sentry or two on the area so evacuated and leave it perfectly alone for a period of ten days (this period has reference to the "rat" theory, which I shall discuss in all its bearings later on); then to disinfect the houses in question; unroof the houses and next adjacent houses; after exposure to atmospheric influences for a few days to have them well limewashed and after limewashing to let them remain exposed to sunlight and atmospheric influences for about a week. After this I consider they could be safely re-occupied if no more cases occur in the village in the meantime. We adopted this procedure in the case of Urapar with satisfactory results. If we are sure that there have not been scattered cases in the case of very populous villages or Municipalities, I consider that such steps should be adopted, being likely to be effective and as politically expedient. If more cases occur in a scattered fashion, then the clearing out into camp in the case of a village should be complete, and in the case of a Municipality clearing out on an extensive scale should be adopted. In the case of small villages, and considering the great uncertainty about first cases as to whether they are first cases, I think it expedient to turn out the village into camp at once, and further observation of the village in camp will give us an idea as to how far unroofing is really necessary. Here you will observe that I imply that a large amount of discretionary power should be allowed to the Medical Officer in charge.

II.—*Position and division of camps.*—In this circle the camps have been pitched practically where the people thought fit outside the village, with a reasonable distance between the healthy camp and the segregation camp, and again a reasonable distance of the hospital from either. These three divisions of the general camp are quite sufficient. If the camps are 500 yards apart, it is ample. I am personally opposed to laying down hard-and-fast rules as to the arrangements of camps in lines or in particular positions which may look neat. In such matters the village headmen should have as much of their way as possible so long as they conform to the above distances of camps. The Medical subordinates did not complain here from any inconvenience in inspecting our camps, and this is the essential point.

III.—*Whether ten days should elapse after evacuation of the village before disinfecting operations are commenced.*—The answer to this question involves a discussion of the "rat" theory, which I shall do later on in this report. If we decide that the rats carry infection from village to village, then I consider it is advisable to give them ten days to die out undisturbed, as if left undisturbed they would be less likely to migrate. If the rats be supposed to travel all over their own village when disturbed, it would also be advisable to let them alone for ten days to die out. But if the rats do not migrate from village to village and do not migrate much from their particular abode within the village, however they may be disturbed—and this I personally hold as will be seen later on—then it is useless to wait ten days. It is worse than useless. We lose ten days of atmospheric influences, which are in my opinion the most potent disinfectant we can adopt. My opinion is that when the village is turned out, unroofing of infected houses and the making of holes in the roofs of uninfected houses should commence at once, disinfection having been done first, and that these ten days should be allowed to elapse after the unroofing and cleaning operations before whitewashing so as to give the houses the full benefit of sunlight and atmospheric influences, then to limewash, and after limewashing to let it remain a week unoccupied. In all I am of opinion that a month to keep the villagers out in camp is enough, assuming that the unroofing and cleaning operations would be completed within the first week. It will be seen from the above that exposure to atmospheric influences is in my opinion about the most potent factor in destroying the infectious principle of the disease, and what applies to plague applies to any other infectious fever.

IV.—*Views on methods of disinfection.*—Under this head I include the whole process. The houses should be well syringed with a 1 in 2,000 corrosive sublimate solution before doing anything else. I understand it was tried here, but found to be insoluble in the water of the neighbourhood. This I think should have been expected, as it is a very insoluble substance in any water, and requires the use of a little of some solvent. In any preparation in medicine a solvent is always necessary for this substance. The addition

of a little crude hydrochloric acid to corrosive sublimate (mercuric chloride) is very effective and very cheap. Again, a pound of crude glycerine will dissolve a pound of sublimate, and this is also cheap. Corrosive sublimate is incomparably the cheapest disinfectant there is, and the most effective. Phenol is about the most expensive and least effective. With sublimate a concentrated standard solution could be prepared—one bottle would do a small village, so powerful is it—a few drachms added to a wooden vessel of water of known capacity would be sufficient. We would thus have an idea of the strength of the agent we were using. With any mercury preparation we would require wooden syringes, as mercury becomes deposited out of solution on many metallic substances such as iron, in which case we would be using merely water; hence the vessel used to hold the solution could not be metallic. Small kegs would do excellently. Such syringes could be made of the simplest nature by any carpenter out of *babool* wood or bamboos for a few annas. They require to be a simple wooden cylinder, a piston and a convex strainer on the distal end. The pumps used here are of a most complicated, expensive and useless kind—always out of order. Phenol we have used here, and our satisfactory results I do in no way attribute to it. The machinery was in working order when I came here, and as matters were going on satisfactorily, I was not disposed to make any alteration. It has been used of no definite strength—probably about 1 in 500. It will be sufficiently plain I think as regards its uselessness when I state that in surgery we use it now only to disinfect instruments, and for that purpose because it is the only agent which does not injure the instruments. We leave the clean instruments for half an hour in a 5 per cent. solution before they are disinfected to our satisfaction. If under such favourable circumstances it requires half an hour of a 5 per cent. solution, what are we to expect from syringing walls and roofs, off which it runs, with a solution 25 times as weak? You will see that I attribute our results in no way to phenol, but to atmospheric influences and to hot limewashing. Lime is a powerful, though old-fashioned, disinfectant. Immediately after disinfecting with corrosive sublimate, I am of opinion that the infected houses should be unroofed, and any other house in which many dead rats are found in the roof when making holes. I also think it expedient to make a hole in the roof of every house in the village 6 × 3 feet, more in the case of large houses and less in the case of small ones. If there are pakka roofs, we try to save them if we can get light sufficiently in by other means, such as by unroofing a katcha roof in connection with it which can let in the light. I have done so in many instances with satisfactory results. When the debris is removed from the houses I consider that they should be left exposed to atmospheric influences for at least a week, after which they should be limewashed and exposed to atmospheric influences for another week before they are re-occupied. We have not been able to do this exactly, as I consider we were more or less crippled by the ten days rule.

A point I think worthy of discussing is the question of digging floors. I have not adopted it, neither did Dr. Walton, and where I got it going on I stopped it. It is in my opinion irrational in the highest degree. If the germs are in the floor, it being a hard surface impermeable in practice to water, they must be on the very surface of it, in which case our disinfecting agent, if of any potency, will from the impermeable nature of the surface come in contact with them and be *retained* in contact with them. If we want to bury the germs and to preserve them, we cannot take a better way of doing it than to dig up the floor, in which case our solution falls on a very permeable surface and remains a very short time in contact with the germs. Besides, we by digging up the floor bury them deeper and diffuse them in the soil.

The agriculturalist sows the seed on the surface of the ground and ploughs it. for the purpose of burying it. The peasants in the British Islands in land which is so soft that it would not carry a horse sow the grain on the surface and dig it up so as to bury it. There is a political fact too in connection with digging up floors. The people, I presume, could be persuaded to think that our subordinates were in search of treasure—in fact we have had rumours which would justify this idea—so that it it is unnecessary from a scientific point of view, it is inexpedient also from a political point of view.

Coolie gangs.—All cleaning and unroofing and disinfecting operations should be done by coolie gangs, except the limewashing of non-infected houses, which latter the villagers can be trusted to do with a little supervision. The house-owners, if put on such work, could not be driven to obey orders, and would wince at every spadeful, so much do they object to having any injury done to their houses. Besides, such work requires much supervision, and if every house-owner were put to his own house, the staff requisite would be inconveniently great. One subordinate on such work cannot drive the labour of a gang of more than 30 men. In this connection I may mention that I understand that every village in the neighbourhood raised a special *chanda* fund for the purpose of bribing the medical subordinate establishment on such business—as well as others—and I have good reason to believe it, as I am of opinion that comparatively few of my subordinates have had clean hands in this business, though it is about impossible to get direct evidence of this fact. There is the indirect evidence that those suspected were paid by the villagers as it was practically impossible to drive them to make the holes in the roofs of the proper size, or in such a place as would not be most easily

repaired, or to evacuate the "bhúsa" and grain from the interior, and when ultimately such had to be done, those men became very unpopular with the villagers. It was evident that they had compounded with the villagers, promising to do very little damage to the roofs and to evade the orders of their superior. When all was done the villagers felt they had not got value for their money, and hence the ultimate unpopularity of such subordinates. I shall come to the importance of having a respectable staff later on.

The three weeks rule after the last case.—I think a hard-and-first rule should not be laid down on this point. If there has only been a case or two, I do not think a three weeks rule should be applied, if other circumstances are favourable. In practice it will be seen from the section on disinfecting the three weeks would elapse before re-occupation. If a dropping case occurred in camp or a case occurred in a disinfecting gang, I do not think more than 10 or 12 days would be necessary if other circumstances were favourable. Nor do I see any reason to keep the village in camp because there was a case in hospital which was unfit to discharge in the opinion of the Medical Officer being suspicious of being infectious for a few days more. By that time the villagers would have learned to dread the disease, and if not the disease, they would have learned to dread the idea of being turned out again into camp if some of them would steal into hospital and get infected. In fact by this time they would have come to constitute their chaukídárs, the most effective of all, and hence I see no reason to keep the village out simply waiting for a last case. In these matters liberal discretion should be allowed to the Medical Officer in charge.

Roll-calls.—The present system of roll-calls is, I think, sound.

VI.—I presume it is implied to use Assistant Surgeons to assist in supervision. If so, one is capable of properly supervising not more than six villages assuming that they are in close proximity. There is required one Hospital Assistant and one Compounder for each village. The service of nurses I regard as not necessary. Dháis I consider would only be necessary in the case of Municipalities in this part of the Punjab, as there is no such thing as *pardah* in the villages. It may be pretended a little as an excuse for not going out into camp, but once out we find that it at once vanishes. In this connection I may point out that while I was Civil Surgeon in Jullundur 40 per cent. of our in-door patients were women. We had no *pardah* hospital, and our patients were from Hoshiárpur, Ludhiána and Ferozepore Districts, as well as Kapurthala State and Jullundur District—Jullundur in 1896 and 1897 being, if not the largest, one of the three largest, Surgical Hospitals in the Punjab. Nurses on such a business as this I regard as more trouble than they are worth.

VII.—*Clerical establishment.*—One English clerk, one or two chaprásís according to circumstances, and two punkha coolís in the hot weather is ample.

VIII.—*Medicines*, &c.—Rum, iodoform, phenol, mustard and a little strychnia and digitalis would be ample. A few disinfecting syringes of the simplest possible class, and a supply of standardised solution of corrosive sublimate in hydrochloric acid or glycerine, but this is a question which requires to be experimented on as regards the question of its solubility as early as convenient.

IX.—I would not advise any alternative in the present pattern of hospital huts. They are very good.

X.—*The question of infection between villages and in villages, &c.—This I regard as the all-important point to be able to come to a definite conclusion on.* If we decide that rats are the carrying agents from village to village, then all interference on our part to prevent the spread of the disease is not only useless, but worse than useless. If we decide that rats are not the carrying agents from village to village, but that human beings are, then the spread of the disease becomes amenable to human control. That rats suffer from the disease, and that it is very fatal to them, does not admit of doubt. That they are a carrying agent within a village also admits of little doubt, though, as will be seen from the map of Kariha forwarded with Mr. Butler's report, there is just as much probability of the infection being carried by human agency within the village. The disease there spread amongst the people who smoke around the same *hooka*—neighbouring Chamárs. We then see it making a jump into the middle of the city in a somewhat isolated fashion and skipping neighbouring houses in a fashion which is much more suggestive of human agency. That map has been got together after a very careful scrutiny, and the men who made it did not know what theory we favoured. I think if you examine that map you will see that the spread within that village is much more suggestive of human agency than of rats, though I by no means exclude the rat theory in this respect. What I do say is that if rats are the carrying agency, they will spread it by contiguity in all directions. As to rats carrying it from village to village, this is a theory which if suggested to subordinates for investigation would at once grasp at. I would relieve Police of all blame for people passing cordons. It would be most gladly accepted by the villagers, who are most reticent about giving any information, lest there might be prosecution or something equivalent to such in the background. If you asked a leading

question, such as "do the rats die before men get ill," they would decidedly say "oh! yes." I say that if the people found that we were open to a rat theory there would be no end of romancing about rats. At the same time I have not had a deaf ear to anything concerning rats. To start with, the house rat is as different from the field rat as the British rabbit is from the British hare. They are separate and distinct species, and do not cross breed, nor associate together, and as far as I could hear there has been no epidemic amongst the colonies of field rats. House rats confine themselves to houses or to wheat stacks, and do not live in the fields. If a new house be built or a new wheat stack be built and rats appear there, this is no evidence of systematic and intelligent migration from a pending disease. I could not hear of a single instance of dead rats being found on the fields between villages. They have been found in a delirious or insane state in the villages, but not in immense numbers. To assume that they travel from village to village would require them to start before they got ill, and to assume an intelligent motive. This idea may be based on the fact that rats leave a sinking ship. But to argue from such an analogy is not reasoning from what is like to what is like. The rats live in the bottom of the ship. Water is not their medium. When water makes its appearance in a ship the first living thing it affects is the rats, and they go before it. In the roofs of houses they are in their proper medium. Epidemic disease has no analogy to the water in a ship, and there is no more reason why rats should desert their warren on the occurrence of an epidemic than that rabbits should desert their warren on the outbreak of rabbit plague. Rabbits die to the last one, and the disease remains confined to the particular warren and does not spread all over the country. The "rat" theory seems to me to be reducable to the following:—We know that water drives rats to leave a sinking ship from dread of drowning. We observe plague-infected rats when delirious—insane—staggering about in a manner in which we do not usually observe them, therefore rats before they get ill with the disease migrate to distant villages from dread of the disease. Such reasoning is too absurd to require comment. That rats should before they get ill go on the march before the disease would attack them would imply an intelligence of which we know no other animal capable except man, and even he is, as we have seen, very slow to desert his village from dread of the disease: he may desert it from the dread of our interference. I feel personally confident that rats and animals in general are perfectly satisfied to die by nature methods and don't think of dying otherwise. It might be said that these rats also live in the fields and roam about, apart from plague, and hence they spread the disease in a *non*-intelligent way. This is not a fact. Consult any villager on this point, and you will find him laugh at the idea. In the British Islands the same rat has its path, and to that it adheres as the rabbit does, and if it gets off, it is at sea, so to speak. It wanders for its living with a central home, just as much as a rabbit does, or as much as do ants, but on a larger scale than the latter. Again, if rats are carrying agents, how does it come that when you look at the map certain villages escaped, and such villages as Manguwál and Ráepore, who did their own chaukídári, are the villages which did escape. Did they prevent the entrance of the infected rats or of men from infected villages? Deductions drawn from rats are deductions drawn from negative premises. On the other hand, when we come to deal with human agency we are dealing with a subject on which we can get positive evidence of scientific value. In Mr. Butler's report the facts of this circle are detailed, and it is unnecessary for me to repeat them here. Suffice it to say that that evidence was sifted with utmost care. The people who gave it did so generally with much reticence under the impression that there might be a punishment in the background. They did not know that our hospital registers were a check on the information. I think you will see there that we have been able to trace in almost every instance unmistakably human agency. So that there is no need to go so far a-field from the agency which carries infection in other such diseases, to search out a very doubtful quantity—rats. The tracing of human agency requires great patience and much time. The question of chaukídári, whether by police or otherwise, must be ineffective unless we enlist the sympathies of the people. That people passed our cordon I have little doubt. How could 8 men to the mile, however willing, be effective in the dark? The mischief was generally done before we got information and before cordons were put on. Kariha produced a profound example here. The people object to die in crowds by nature's method, but incomparably more so by the State's method. The surrounding villages when they saw the wholesale fashion in which Kariha was being cleared out by the disease when left to itself established their own chaukídárs and escaped,—for example, Karna, Manguwál, Ráepore, Salmazara. One chaukídár so appointed is worth 100 police. The first essential in all such police work we have to do is to enlist the sympathy of the surrounding villages and get them to do their own *chaukídári*. They would thereby accept a sort of responsibility which would spur them to be effective. For as I have seen these people, both recently and in former years, the thing which impresses me is how exceedingly manageable they are if gone about in the right way. They require to be treated as children and with *firm hand*, and they will do anything. The infectiousness of plague is infinitely less than that of many well-known diseases, such as small-pox, measles, scarlet fever and typhus fever. We had only one hospital attendant and one gang coolie who suffered from the disease. In the above-mentioned diseases very many of those susceptible so exposed would have suffered.

The question of latency of the disease is also worthy of a few remarks. I understand from what was published in the daily papers in October last that the infectious principle of the disease when not interfered with is capable of remaining latent for three or four months. I traverse a few of the published facts, as the view may still be held by others. It was said that in May last a Brahmin came from Hardwár to Khatkar Kalán and died shortly afterwards of plague. No responsible person saw him. No more plague occurred until the end of September or early in October. I personally gave over charge of the Civil Surgeoncy of this district early in July to the present incumbent—Bhagwán Dás. He appeared on the scene first, and whether *bubos* were suggested to these people in the form of a leading question or not I cannot say, but I would not be surprised if they were. The man was dead and had no relatives, and to saddle him with having brought infection would throw a cloak over all others who might be considered by the villagers to be blameworthy and would be gladly grasped at and adhered to—such is their extreme reticence in giving information which might come down on some one in the form of punishment. It has been my experience that they will romance about anything suggested by a leading question, which may lead us off the track so long as they have the idea that the true cause might bring punishment on some one. I am personally of opinion that there was an importation immediately before the outbreak, and that the Brahmin in May was not a genuine case. Such would be at variance with all our knowledge of the natural history of epidemic diseases, and plague does not subvert the ordinary laws of the pathology of epidemic diseases as some would have us to believe. If when left alone in May, why did it remain latent? It in no instance in all the villages affected under observation remained latent. Why did it not spread from the May case, and why with all our care has it spread when it came under observation? Again, as regards its latency, why has it not remained latent in the villages we have disinfected and break out again? The villages in spite of all our efforts must have in them dead rats which were infected and which are incomparably more potent for a recrudescence than the case of the Brahmim, and yet we have not had a single village *re*-infected except perhaps one in the Banga Circle which I understand was re-infected from outside. Why did not plague recur in Sukkur and the villages in Sindh as well as elsewhere? The germ does not lie latent indefinitely. It has its cycle. In the warm weather all such things pass through their cycle much faster than in the cold weather. The *pabulum* becomes earth faster in the warm weather. Hence the germ, as other germs, reproduces more rapidly in warmth than in cold and consumes the *pabulum* much more rapidly and dies. An individual germ has a very short life history, but when supplied with abundant *pabulum* it reproduces, and the reproductions reproduce, and so on as long as it lasts: hence the value of warm weather as a disinfectant. In this respect the germ of plague obeys the same laws as regulate the life history of the germs of other diseases—vegetable organisms.

I now come to consider a most important matter—

Medical Subordinate Staff.—There is an impression deeply rooted in the Subordinate Medical Department that all such duty as plague and cholera are for them a sort of punishment duty, and that no honor or rewards are forth coming to them for good service on such duty. My subordinates have been in very many instances men whose character is not such as would suit them for any such responsible duty, and from the manner in which they did their work, and in which they got on with the people, I feel confident that they have not had clean hands in this business. There are a few men who did admirable services and got on splendidly with the people. One of such men from an effective point of view is worth half a dozen of the former class. You will understand that the power for good or for evil of the medical subordinates is great in a delicate business like plague, having the disinfecting operations to carry out. Many of these men made mischief wherever they were sent, besides taking an unnecessary amount of supervision. I would here respectfully point out that the greatest care should be taken to select men of good character. Men of indifferent character put in charge for a short time of an out-dispensary can do little mischief. I respectfully submit that those who have done good service should be fully recognised, and we would thus dispel the idea that there is anything of the nature of punishment in such duty, and in its place implant the idea that Government regards plague duty as a most responsible duty. We would thus find on any future occasion the best men of the subordinate medical establishment volunteering for it instead of regarding such duty as they now do as punishment.

In this connection I wish to recommend the following subordinates excellent service:—

Assistant Surgeon Jowáhir Singh for the honorable distinction of Sa[illegible] would highly value the distinction, and in gentleman[illegible]ashion consider, maintain the dignity of it.

3rd Grade Hospital Assistant Mushtaq Husain, No. 383, [illegible]cher after tion of Khán Sáhib. This is a very fine fello[illegible]ve favoured. service.

2nd Grade Hospital Assistant Kartár Singh, No. 355, fo[illegible]llage is much

3rd Grade Hospital Assistant Harnám Dás, No. 354, [illegible] the rat theory will spread it this is a theory at. I would

The first two I specially mention. I may here state that [illegible]ladly accepted assistance in his power, and that I could ask no finer fellow to [illegible] there might be [illegible]ked a leading

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APPENDIX L.

No. 2102, dated Camp Banga, 28th June 1898.

From—Surgeon-Captain C. H. JAMES, Deputy Sanitary Commissioner, on Special Plague Duty, Punjab,

To—Major E. ENGLIS, Deputy Commissioner on Plague Duty, Phagwára.

I HAVE the honor to send you a report referring to the points connected with plague named in your No. 1286, dated 18th June 1898. You have asked me to give my opinions concerning some of the rules laid down both by Government and by the Commissioner of the Division. I hope the replies I have given will be looked at from the point of view that I have only expressed my opinion because I feel sure the rules were meant as a temporary measure to guide us all in combating this terrible malady, and that those who made them are ready to hear the result of the operation of these directions and to modify any which experience shows are capable of improvement. In reading over the report I feel that I may have expressed my views in a very crude way. I hope this will be excused, and that I may be permitted to say that I have no wish to criticise, but to find out the best means of banishing plague from the province.

1.—*When should a village be evacuated?*

If there is only one case, and especially if that case is known to be "an imported one," by which is meant a case which has contracted the disease elsewhere, it is usually considered sufficient to remove the patient and those who live in the same house or in his near vicinity.

The reasons for this are—

(1) The disease if taken in hand early, sometimes, though not often, it ceases to spread. As instances may be given Jhander Khurd (second importation), Naura and Aur, where only one case occurred and where only a small number of people were put into camp.

(2) The people of the village may doubt the correctness of the doctor s diagnosis, and consequently may offer extreme opposition to what they would naturally consider unnecessary measures. This happened in a marked degree in Panián, in which the opposition was so great that the son of the first case attacked (the Lambardár) had to be arrested for preventing his family from going into camp. In Happowál also the people doubted the diagnosis and the village was not evacuated till late. In the former instance we had great opposition, which vanished when the disease began to spread. In the second case we had no opposition from the family evacuated, but there were signs to show that we should have had opposition from the rest of the village if we had not waited for other cases before we totally evacuated the place.

(3) In large villages and towns an attempt should always be made to isolate the family of the first case, and it may under some circumstances be necessary to wait for several cases. In Banga and Mukandpur I feel sure we could not have turned out the people had we not waited for more cases. On the occurrence of the first case at Banga the people showed a threatening attitude towards the Medical Officer, and yet when the order was afterwards given, and given very late, the people literally ran out.

(4) If isolated hamlets or detached houses give cases, these only should be first evacuated, and it may then be unnecessary to evacuate the whole village. But after this, on the first case occurring in the village proper, the whole village should be emptied. In the case of Heeon we had such a detached house which gave two cases and which was afterwards burned to the ground, and the disease did not spread. But Heeon was situated in the middle of other infected villages, and for this reason was evacuated. We cannot now say whether the evacuation saved the village or not.

In all cases of doubt it would be better to wait for second cases.

But in the middle of an epidemic when villages are being attacked one after the [illegible]happened in March and April in the Banga Circle, the sooner one evacuates the [illegible]e better.

In one case in many instances we did not wait for second seizures. But we were [illegible]ed to find that often several cases were found when the village came out, of which [illegible]d no previous knowledge.

In my opinion the question *whether the whole village should be evacuated on the [illegible]rrence of one case should be left to the discretion of the local medical officers in [illegible]rge. But the rule should stand that in the event of the disease showing signs of [illegible]reading in the village no time should be lost in evacuating the whole village.*

the q[illegible]
Karna, M[illegible]
The first [illegible]
[illegible]y bearing
[illegible]dár Sáh[illegible]
[illegible]for the honorable d[illegible]
[illegible]v, and has done exc[illegible]
[illegible]r a grant of land on paym[illegible]
for a khillat.
Mr. Butler gave me eve[illegible]
work with.

If, when plague exists in an epidemic form in any district, rats are found dying in villages, these should *at once* be evacuated whether cases of plague are found or not. In this way the disease can be entirely prevented from attacking human beings. This was successfully done in the village of Hamirwál and part of Banga, and would have succeeded in Chak Kalál had the inhabitants not temporarily returned without orders to their homes. On the other hand, when rats begin to die in numbers and the people do not go out, a severe epidemic of plague is almost sure to take place. Khán Khanán may be quoted as an instance. Just before the disease became very severe a large number of diseased rats were seen in the infected quarter, and after the people left their homes many dead rats were found in the infected rooms.

2.—*The position and division of the camps.*

The position of the plague camps should be settled according to the general sanitary principles which are well known. The following details, however, require special attention :—

(1). No camp should be situated near the village or near any high road, as some people are almost sure to return to the village to get out things they require, on the one hand, or to talk, sit and smoke with passers-by on the other hand.

(2). It is very important to have, if possible, a few trees near the camp. In winter they are useful to shelter the cattle from the frost and dew, and during the hot weather the people have some pleasant shade against the burning heat of the sun. We have found that it is a bad plan to place camps actually in groves, gardens or bághs, because the people do not get the full benefit of the air and sun, and the gardens are often used as latrines, and sometimes one or two of the chief men of the village take up a central position in the grove and practically exclude the rest of the camp and especially the poorer members of it. If, on the other hand, the huts are placed round or near the garden, they get the disinfecting benefit of the sun's rays, and every body in the camp has plenty of room where he is able to sit under the trees during the day, and all the huts are open to easy inspection by the Medical and Civil staff.

The ordinary rules about water, soil, high ground, position of standing crops, &c., should be observed. Sandy soil, if possible, should be avoided. We have not noticed any advantages or disadvantages in positions taken up with regard to the prevailing winds, and as far as the disease is concerned the question of the prevailing winds may be discarded.

The burning and burying grounds should, however, be situated as far away as possible, and care should be taken in selecting the former that sites are not chosen where the smoke and smell is likely to be carried to the camps. There is probably no smell so unbearable as that given off by a burning corpse. We have, however, no evidence to show that any other deleterious effects are produced.

In selecting sites of camps one is mainly guided by the amount and position of the land available. We have always attempted to avoid interfering with fields and crops, and when several health camps have been formed an attempt has always been made to select sites as near as possible to the land owned by the people in the camps, and agricultural pursuits, which keep people in the open air, have been encouraged as much as possible.

The division of the camps is important. In my opinion the smallest number advisable is three—

(1) *Hospital Camp*, in which the relatives and friends of those attacked are placed.

(2) *Segregation Camp*, in which people who, though not attacked, come from infected mohallas or from the vicinity of infected houses.

(3) One or more *Health Camps*.

In practice we have found it impossible to have only one health camp. The Chamárs and Sweepers have always had to have a separate camp, and in some places we have had to selves. From a theoretical point of view the larger number of camps formed the better it is for the treatment of the disease, as more room and air will be obtained for each individual hut. Also practically we have found that camps larger than 700 people become inconvenient, as there is usually a certain amount of crowding, and the collection of cattle which necessarily takes place in agricultural villages makes the whole camp very insanitary. Another important reason for not having large camps is that when the disease continues in the camp we have a smaller number of people to deal with and disinfect. This was especially brought home to us in the case of Dewa Singh's camp at Khán Khanán, where we had 864 persons when a case of plague occurred in it, and we had to disinfect the whole of it and break it up into two smaller camps. Again, at Mahal Gohla we had a camp containing 2,000 people, which we were obliged afterwards to disinfect and break up into four smaller camps to give the people more shelter, and to stop the spread of the disease. Had we made several smaller camps in the beginning we should not have had to disinfect

so many people, as only the camp in which the cases occurred would have needed treatment. The question of the actual number of camps required must be settled by the local conditions. The number of police available to watch the camps must always be an important item in determining the number of sites taken up. But the Government order limiting the minimum to three camps is certainly a wise one.

In laying out the camps a distance of ten paces between the huts has been usually carried out in the Banga villages. The huts have been put up in rows with a distance of from 20 to 50 paces between the huts, according to the space available.

3.—*Whether the present rule by which ten days must elapse before disinfection is commenced is good?*

The object of the ten days' delay before disinfection is started appears to be—

(1) That time may be given to allow diseased rats to die before they are driven by the disinfecting processes out of the village and possibly into other villages.

(2) That fewer of the disinfecting gang may be attacked by entering freshly-infected houses.

In the first instance it is a pure supposition that the disinfecting processes drive the rats into other villages. I have previously given instances to show that sometimes diseased rats are the first animals affected in the new villages; but I have no facts to show that our disinfecting processes drive diseased rats from one village to the next. On the contrary, I have expressed an opinion that the standing corn is probably the active factor in inducing rats to leave their villages. I have no facts to give for or against the efficacy of the ten days' rule as far as the migration of rats is concerned.

2. Chamárs working at disinfection work have been attacked over a month after the evacuation of the village, and at Mahal Gohla some persons were affected on their return to open their houses 38 days after these had been kept shut up. I do not think, therefore, that delaying the disinfection work for ten days has much influence on diminishing the infection remaining in the houses. In two villages attacked about the same time, Pharála and Baura, the ten days' rule was observed in the former, but suspended in the latter, as there were fears of the camps being swamped if the rains broke before the people returned to the village. Fresh cases took place among the disinfecting gang in Pharála, but none in Banga. This may of course only be accidental. Pharála is a large village and Baura only a small one.

Having to wait ten days before beginning the disinfection work is certainly a serious delay in the case of large villages and towns. But if it is shown that it diminishes either the tendency of the disease to spread or its power to infect the workers in the houses, it is well worth the loss in time.

4.—*Disinfection.*

In my No. $\frac{1581}{A.}$, dated May 16th, I have given a short account of the method of disinfecting houses which is carried out in the Banga Circle, giving a list of establishment, materials required, &c. But there are several points which were not referred to, or only mentioned in the briefest way possible.

We have found that the best persons for supervising the gangs have been Hospital Assistants. They have had a small sanitary as well as medical training, and as a rule worked conscientiously. European Sanitary Overseers have been entertained altogether since March last. Two of these tendered their resignation after working for a short time. One Mr. Goulbourne, I regret to say, contracted plague while disinfecting a badly-infected village, and after a short illness died. Mr. Heyland, the only one remaining, has given complete satisfaction, and his work is probably the best in the district. But in the two other cases where European Overseers disinfected villages the work had to be practically done over again with Hospital Assistants as Overseers, as there were so many defects in it. I think Europeans have more authority, but they are unable to stand about in the sun in the hot weather which this kind of work necessitates.

The best possible agency for doing the work is the low castes of the village in which the disease occurs. The Rájs, Tarkháns, &c., will all help, but we have depended almost entirely on the Chamárs. They are usually a hard-working caste, accustomed to work long hours, and are easily kept in order. They very quickly pick up the technique of disinfecting work, and as long as no harvesting operations are going on can be obtained in sufficient numbers to carry out the operations. They are the "servants of the village," and as such can be made to do the work thoroughly. The inhabitants, who are out in camp, also help by bringing pressure on the Chamárs to get the work done quickly. But in our attempts to use these men for other villages than their own we have not been very successful. The Lambardárs of the villages from which they come resent their being taken

away, and put every difficulty in the way. The men themselves are unaccustomed to being long away from their homes, and after a few weeks clamour to be allowed to return. If it had been possible to have had one or two trained gangs who went from village to village, our measures would have been very complete. But this was not possible, though several times attempted.

Inoculating the workers with Haffkine's serum before they begin a village has given encouraging results. Only one inoculated Chamár has been attacked, and he only had a mild form of the disease. It is useless to expect the villagers to thoroughly disinfect their own houses. They are much too mindful of the value of their property to allow anticeptics to flow freely over it, and when it comes to making holes in their roofs the owner feels and acts as if he was about to commit suicide. This part of the work should always be done by independent agency. But when only whitewashing is left I think the owners of the houses are as good as any one else. The risk of entering the houses is then small compared to what it was before the phenyle-spraying took place, and as the whitewash improves the appearance of the building, the owner is the person most likely to carry it out satisfactorily. Besides, he does not require payment, and is an additional help to our workers and thus saves both time and money. In the so-called healthy parts of several villages we have done the disinfecting and ventilating with our gangs and allowed the villagers to complete the limewashing. No untoward results have taken place.

In the description of disinfection already given I forgot to mention that particular attention should be paid to all rat holes. About two ounces of pure phenyle is usually poured down each. A small brick or stone is then inserted, and the hole filled up with plaster. None of the holes thus treated have, in our villages, been again disturbed by the rats.

The most dangerous work connected with plague is the house disinfecting. We have had a large number of people attacked when on this work. All gangs should be warned of the danger of having cuts and abrasions, of the importance of wearing shoes when entering any house in the infected village, and especially of the danger of raising the dust when sweeping out houses or making holes in the roofs, &c.

When I first began plague operations I always removed the entire roof in plague-infected houses, but in March I modified this to making large openings in the roofs. This was done because it was found that at Khán Khanán, where the roofs of 110 houses were removed, many people were quite unable to get their houses repaired, while the largest "moghas" or ventilation holes in the roof were repaired in a few hours. In Mallupota, Dhan, Lakhpur, Balon, Salh Khurd and Salh Kalán, Mahal Gohla and Gobindpur the entire roofs of infected houses were not removed, but only a long strip taken out. The results have been perfectly satisfactory. Not a single infected house has given a fresh case of plague on re-occupation. In winter it may be necessary, and it is certainly advisable, to remove the entire roofs, but in the hot weather I am confident that the measure is unnecessary.

5.—*Whether it is advantageous to maintain the rules by which villagers are not allowed back till three weeks after the last case, or until no patient remained ill in hospital, and whether any alteration should be made regarding roll-calls after the village has been allowed back?*

1. The three weeks' rule appears to have given satisfactory results in our villages. But in the winter, when the disease did not show the same tendency to disappear rapidly as it has done in the hot weather, we extended the time to one month. I think the rule ought to stand that the minimum time should be three weeks and not a fortnight as recommended in order No. 353, dated 8th March 1897.

2. The order about not letting the villagers return while there are patients remaining in hospital is quite unnecessary, as after three weeks' illness there is very little doubt that there is no infection remaining about the patients. Plague is a disease which runs its course in a few days, and any one who remains ill with it after 20 days is certainly suffering from complications. Most of the cases which stop on in hospital are those who have lost a large amount of tissue in the sloughing processes accompanying the suppuration of the glands. Repair in these cases is often slow, and in most cases the period of convalescence is long and protracted. These cases are not kept in hospital because they are infectious, but because they need the careful nursing, diet and treatment which they can only get in hospital. The tendency of this new rule has been to cause medical officers to turn out patients from their hospitals who certainly needed more treatment. On the other hand, it would have been very vexatious to have kept the whole village out in camp while a feeble non-infectious patient was being treated in hospital. The order stating that the Deputy Commissioner's permission to put in a village with a patient still in hospital should be granted "under very exceptional circumstances" seems to be rather unnecessary. Surely the medical officers present might be allowed to use their discretion in this matter.

The rule seems to tie every body's hands without tending at all to aid the plague measures. The rule might be changed to the following:—Before a village is allowd to return, care should be taken to see that the hospital with all its establishment and any patients which still remain are thoroughly disinfected. If the medical officer considers that any case remaining is still infectious he should delay the return of the people into the village.

3. The plan of insisting on the Hospital Assistant making a house-to-house inspection with a nominal roll in his hand each day for ten days after the people have returned and having a roll-call of all the inhabitants outside the village on the 10th day seems to have been quite sufficient in our villages, and no complaints have been received from the villagers. The medical officer in charge is usually present at the final roll-call and sees any persons who may happen to be ill before declaring the village "free." In none of the villages under our observation has there ever been a case of plague occurring within the ten days after re-occupation of the village.

6.—*Subordinate Medical Staff.*

The staff of Hospital Assistants and Compounders necessary must vary with the size of the village, but for an ordinary sized village of about 500 people at least two Hospital Assistants and two Compounders are necessary.

One Hospital Assistant and Compounder will take charge of the health camps and the disinfecting staff. The other Hospital Assistant and Compounder will be in charge of the hospital and the segregation and hospital camps.

If the village is quite a small one, a Hospital Assistant and Compounder will be sufficient. But in larger communities an increase of roughly one Hospital Assistant per thousand men and one Compounder per 500 will be necessary.

These men read the roll-call at least once a day, and if possible twice a day, examining all sick people to determine the nature of their diseases, and if cases of plague occur, send them immediately to hospital and their relatives and friends to the segregation camp, and the people occupying the same hut to the hospital camp. All huts vacated on account of plague are burnt.

In the larger hospitals trained nurses have proved themselves most useful in nursing cases and helping in the washing and disinfecting of women.

In the smaller hospitals dháis have been much appreciated by the patients, and on several occasions when we have not been able to supply them for the smaller villages the inhabitants have given us no peace. It certainly seems unreasonable to expect people to send their women to hospital when there are no females to attend them. I think that dháis should be always entertained. They are the only class of minor officials of whom we have heard no complaints.

We have had only one Assistant Surgeon (Jowáhar Singh is not included, as he was only with us a fortnight and then went to the Nawashahr side). I can quite understand that a good man would be invaluable, but a bad Assistant Surgeon is a most dangerous person, as he has authority and can use it by breaking rules with impunity. No Assistant Surgeon who has a bad character should ever be employed on this work.

I may here be permitted to say a few words concerning the Hospital Assistants and Compounders. They have had to do the greater part of the most important and most dangerous work in connection with plague. They have treated the sick in hospital, examined cases in villages and in the various camps. The disinfection of the villages has been under their immediate supervision. Their work has been extremely hard, and they have had much responsibility thrown on their shoulders. On the whole, they have acquitted themselves well and shown themselves to be quite capable of carrying out the duties entrusted them. But a few blacklegs have made themselves notorious by trying to take bribes, which has brought discredit on the whole staff. I have been through a large number of the villages in our charge after all the plague operations have ceased and when the villagers have no object in giving false accounts of what has happened, and when they speak up much more freely than they have done before. They have usually had nothing but good to report about the Hospital Assistants who have lately left them. I believe in many cases false reports were brought against the Hospital Assistants because the people knew that if these were got rid of the whole plague operations would become inoperative.

The Compounders have not had the same chance as Hospital Assistants of holding responsible positions. But they have worked very satisfactorily. I think Government would be well repaid if it gave this class of officials higher pay when they are on plague duty. They earn only Rs. 8 to 10 and get only Rs. 3 plague allowance. But this is a matter which concerns the Inspector-General, Civil Hospitals, and will be discussed in another place.

Out of a staff of 38 Hospital Assistants and 27 Compounders, 4 have been attacked with plague. Hospital Assistant Lok Náth was attacked in the Khán Khanán Hospital, Hospital Assistant Lál Chand on disinfection work at Gobindpur, and Basant Rám, Compounder, on hospital duty at Punián, and Ahmad Dín in Shikohpur while on disinfecting work.

7.—Clerical Establishment for each Medical Officer.

Each medical officer requires one clerk who can make out the pay bills of his establishment, keep copies of all correspondence, copy out the various reports and returns which are required, check the hospital patient and diet registers, and copy out the figures in the medical officer's register, and do all the miscellaneous clerical work.

The chief medical officer, who will naturally control the medicines and disinfectants supplied, and who will have more statistical work to do in his office than the other medical officers, will probably require an extra clerk, especially if a large district becomes infected. In short, the amount of office establishment will depend on the size of the district over which the medical officer has supervision. Office peons, messengers or chaprásís are absolutely necessary, as these are the only means of quick communication between the medical officer and his various hospitals. They bring in the daily sick reports and indents for medicines, &c., from the Hospital Assistants and Compounders in charge of hospitals, camps and disinfecting work, and take out written orders and any small supplies of medicines, &c., which are being constantly required. They should be given permanent passes, and should live in a camp by themselves some where near the medical officer's office. Leave to visit their homes should only be given on the rarest possible occasions. Ten to twelve of these men have been employed by the four medical officers in the Banga Circle, and it is a matter of congratulation, considering the nature of their work, that none of them have contracted plague.

8. In answer to your question No. 8, referring to medicines, disinfectants, &c., I send a copy of my No. 49, dated 7th January 1898, to the Inspector-General, Civil Hospitals, Punjab. I have made a few corrections due to further experience. This is a full list. But for small hospitals we have found a few bottles of plague mixture, a little disinfectant and some dressings quite sufficient. The patients are then not dieted from the hospital. But I must confess I have not found this kind of treatment very successful. We have had 16 * fully equipped hospitals, and from these we have supplied medicines and stores to the smaller hospitals. On a hospital being abolished the medicines have been returned to store, the bottles refilled, and the stock sent out to equip a new hospital, all damaged articles being destroyed.

* *Fully equipped hospitals.*
1. Khatkar Kalán.
2. Jhandher Khurd.
3. Khán Khanán.
4. Khatkar Khurd.
5. Sirhál Qázián.
6. Shikohpur.
7. Mallupota.
8. Gunachaur.
9. Mahl Gohla.
10. Banga.
11. Katt.
12. Bisla.
13. Pharála.
14. Punián.
15. Jagatpur.
16. Chhokran.

9.—Construction of Hospital sheds.

The construction and size of the various hospital sheds is described in the letter above quoted. I have no modifications to suggest except that there should be more thatch on the roofs. This is important for keeping out rain and also the heat of the sun.

I understand Mr. Gracey is recommending a cheaper kind of hut for the dispensary, cook-house and bath-room. The hut would do for the bath-room, but it is objectionable for the other two purposes, as it is too low to allow of a fire inside for the cook-house, and would be too cramped for the dispensary, where the Medical Officer spends a good deal of his time checking registers, writing out notes of cases, testing urine, microscopical work, &c.

10. With regard to the question of infection between villages and also inside villages, I am about to send you a separate report giving, as far as possible, the exact mode of infection from one village to another in our circle. The information is not yet quite complete, and several statements have still to be tested. I will therefore postpone this portion of the report till later.

11. I wish especially to point out that throughout the present epidemic we have had new hands constantly coming on duty, who have all had to learn their work. We ourselves have had to buy much of our experience. I think now a set of rules and directions should be drawn up for the guidance of Hospital Assistants, Compounders, Nurses and those in charge of disinfecting work. The rules should embrace the (1) diagnosis and treatment of plague, (2) the method to be adopted on the outbreak of plague, (3) the method of disinfecting people, clothes and camps, and (4) the method of disinfecting houses. Had printed rules on these matters been drawn up before and given to each subordinate on his arrival, I feel sure much of our work would have been lessened. The information given in the Government circulars up to the present, though most useful, has been too general

for reference by the officials named above. In fact, many of the processes now carried out have been developed and extended since the circulars in question were written. If practical rules were drawn up in the next two or three months, they could be printed and circulated before the coming cold weather, and Hospital Assistants and others would know something about their work before their arrival.

C. H. JAMES,

Indian Medical Service.

No. 49, dated 7th January 1898.

From—Surgeon-Captain C. H. JAMES, Deputy Sanitary Commissioner, Punjab, on Special Plague Duty, Camp Banga,

To—The Inspector-General of Civil Hospitals, Punjab.

THE following is a list of the hospital sheds, furniture, medicines, &c., which have been used and found most suitable in the plague-infected villages in the Nawashahr Tahsíl of the Jullundur District. It will be noticed that the simplest articles compatible with thorough efficacy have been selected. The things marked with an asterisk can be procured locally.

A.—Hospital Sheds.

The hospital consisted of sheds made of matting (chatái) or a material known as sirki fixed on bamboo frames and thickly covered on the outside with a long durable grass known as sarwar. The main uprights were of wood (balla). All the sheds had sloping roofs and were made so that they would remain dry inside in the event of rain. Besides the larger buildings there were four smaller huts which are known to natives as "jopri" or "kulli," and which consisted of sirki and sarwar on bamboo frames. These had no side walls; the roof sloped down to the ground after the manner of a "native pall" tent. The back and front openings were closed in with triangular moveable screens made of the same material as the huts. The hospitals for the various villages were all made in sections of the same dimensions, so that each section could hold 12 patients and was a complete hospital ward in itself. But by joining several sections, end to end, larger wards capable of holding any multiple of 12 patients was obtained. At Khán Khanán a ward was thus obtained which held 60 patients. The advantage of having the kind of sheds described above is that they are very easily and quickly constructed, are light, and can be made beforehand and kept in readiness and transported when required to the infected village. They are very cheap, and can easily be burned when no longer required.

The following is a list of the sheds with their dimensions :—

1. *Hospital Wards, 2 Sections.*—One section for males, one for females. (*a*) 28 feet × 18 feet, roof 10 feet high in centre, 6 feet at sides. Two doors in front and two windows behind.

2. *Three sheds 12 feet × 10 feet.*—Roof 10 feet high in the centre and sloping to 6 feet at the sides.

One of these sheds was the dispensary, another was the cook house, and the third the Hospital Assistant's quarters.

3. Four joprís for—
   (*a*) Bath Room.
   (*b*) Mortuary.
   (*c*) Bhistís' quarters.
   (*d*) Sweepers' quarters.

4. Two latrines, one for males and one for females, 8 feet × 8 feet. These are made of matting or sirki, and are about 4 feet high. They have no roofs.

The question as to the number of patients for whom one should give accommodation always arises when making arrangements for a plague-infected village, and cannot be settled by any fixed rules. But in the Jullundur villages it was found that by taking the

(*a*) At Khatkar Khurd only one section was used. It was converted into two wards by a central screen 8 feet high.

average number of daily new cases for as many days as could be obtained at the time of arrival and multiplying the number by ten a very fair approximate was obtained. Thus, if on arrival at the village we find that there have been five cases daily for the last three days, accommodation should be made for 50 patients. But it must be remembered that if there is any delay in getting the people of the village out into camp, the daily average of new cases will increase much above this estimate. The largest number of patients in hospital at one time usually occurs two or three days after the inhabitants have been got out into camp. After this the number falls rapidly.

B.—Establishment for Hospital.

(1) Hospital Assistant.

(2) A Female Compounder or a Dhái.
If there are many patients in hospital, a lady nurse is most valuable.

(3) Compounder.

(4) Bhisti.

(5) Hindu cook.

(6) Sweeper.

(7) Ward orderlies. These are very necessary when there are delirious patients in hospital.

C.—Furniture and sundries for Hospital.

* 24 Beds.

* 24 Bags made of country cloth and filled with grass (paroli) for mattresses. On patients being discharged the grass is removed and burned, and the bags are boiled and refilled.

Blankets, 50 in warm weather, 100 in the cold weather.

1 Bath.

* 24 Small gumlahs.

* 10 Gharras for holding drinking water and antiseptic lotions.

* 10 Kerosene tins, which have had their tops removed and wooden handles attached These are most useful for carrying about phenyle lotion, bath water, &c.

* 1 Karaha (an iron vessel in which country sugar is prepared). These can be obtained in most villages and are used in hospital for boiling patients' clothes, blankets, &c.

* 6 Native stoves or angíthís,
2 Maunds charcoal, } in winter.
* Wood as required for fuel.

4 Lanters.

1 Tin kerosene oil.

1 Hand basin, 2 towels, 1 cake carbolic acid.

* Native cooking vessels—

1 *degcha*, 2 *bátís* (one large, one small), 2 *thálís* (brass), 2 *karchís*, 3 *katoras*, 1 *parát*, 1 *garwah*, 1 *dhol*, 1 *valtohi*, 1 *loh*.

1 Table,
1 Chair, } for the dispensary.

D.—I.—Medicines, &c.

This will vary according to the method of treatment adopted by the Medical Officer in charge. But the following will be found to be a fairly complete list:—

1.	Acetas Plumbi Lq.	4 ozs.
2.	Acid Acetic	2 ozs.
3.	Acid Boric	1 lb.
4.	Acid Carbolic	2 lbs.
5.	Acid Nitric fort.	2 ozs.
6.	Acid Sulphuric dil.	8 ozs.
7.	Acid Nitro-Hydrochl. dil.	8 ozs.

8.	Æther Nitrosi Spiritus	8 ozs.
9.	Alum	4 ozs.
10.	Ammonii Aromat. Spiritus	8 ozs.
11.	Ammonii Carbonas	1 lb.
12.	Ammonii Acetatis Liq.	8 ozs.
13.	Ammonii Chloridum	4 lbs.
14.	Argentii Nitras	1 oz.
15.	Arsenicalis Liq.	1 lb.
16.	Belladonnae extrat.	1 lb.
17.	Bismuthi Subnitras	1 lb.
18.	Chlorodyne	4 oz.
19.	Chloral Hydrat.	8 ozs.
20.	Chloroform	8 ozs.
21.	Cupri Sulphas	2 ozs.
22.	Digitalis Tinct.	4 ozs.
23.	Ergot Extrat. Liq.	1 oz.
24.	Ess. Menth. Pep.	1 oz.
25.	Ferri Perchlorid. Tinct.	1 lb.
26.	Glycerinum	1 lb.
27.	Hydrargyrum Perchloridum	4 lbs.
28.	Hyd. Perchloridi Liquor	4 lbs.
29.	Hydrarg. *c.* Creta	2 ozs.
30.	Hydrarg. oxid. Flavum	1 drm.
31.	Hydrarg. Subchloridum	2 ozs.
32.	Hyoscyami Tinctura	2 ozs.
33.	Iodi Tinctura	4 ozs.
34.	Iodoform *c.* Borax	4 ozs.
35.	Ipecac. Vinum	4 ozs.
36.	Lin. Camp. Co. or	2 lbs.
37.	Lin. Terebinthinea	2 lbs.
38.	Magnesii Suph.	1 lb.
39.	Magnesii Carb.	1 drm.
40.	Morphinæ Hydrochlor.	2 lbs.
41.	Oleum Ricini	1 drm.
42.	Opium	4 ozs.
43.	Opii Tinctura	4 gallons.
44.	Phenyle	4 ozs.
45.	Pil. Rhei Co.	2 ozs.
46.	Potassii Bromidum	1 lb.
47.	,, Bicarb.	1 lb.
48.	,, Liquor	1 lb.
49.	,, Chloras	8 ozs.
50.	,, Nitras	1 lb.
51.	,, Permangan.	8 ozs.
52.	Pulv. Ipecac. Co.	2 ozs.
53.	Quiniæ Sulphas	½ lb.
54.	Sodii Bicarbonas	2 ozs.
55.	Sodii Salicylas	8 ozs.
56.	,, Sulphas	1 lb.
57.	Spiritus Rectificatus	1 lb.
58.	Spirit Methylated	½ drm.
59.	Strychnine	1 lb.
60.	Syrupus Phos *c* Quin. *c* Strych. (Easton's Syrup)	1 lb.
61.	Tinct. Scillæ	

62.	Tinct. Camph. Co.	1 lb.
63.	„ Rhei	1 lb.
64.	Unguentum Hydrarg.	8 ozs.
65.	„ Hydrarg. Nit.	8 ozs.
66.	„ Simplex	1 lb.
67.	Zinci Suph.	8 ozs.
68.	Zingiberis Pulv.	½ lb.

II.—Sundries.

Country cloth for bandages	16 yards.
Carbolic Soap	2 cakes.
Cotton wool...	½ seer.
Dressing trays	2
Enema	1
Feeding cups	2
Gallipots	1 dozen.
Hypodermic syringe	1
Lint	1 lb.
Measures ... 1 pt., 1-4 oz.	1 minim.
Pestal and mortar	1
Pocket case	1
Pill slab	1
Phials and corks	1 dozen.
Rum	10 pints.
Rod (bamboo) 6 feet long for measuring depth of graves.	
Scales and weight	1 set.
Spirit lamp.	
Stethoscope.	
Stationery—	
1. Blotting paper	2 sheets.
2. Envelopes	10.
3. Foolscap paper	½ qr.
4. Hinái paper	1 qr.
5. Ink and inkstand	1
6. Pen and pencil	1
7. Note Book	1
8. Ruler	1
9. Registers	1 for patients.
	1 for diet, &c.
Test tubes	2
Towels	2

III.—Diet.

Ata	1 maund.
Dál, Mung	10 seers.
Cháwal	10 „
Sago	10 „
Sugar	10 „
Ghi	5 „
Condiments—Haldi, Mirch, Dhannia, &c.	1 seer.
Salt	2 seers.

This is a complete list of medicines and sundries used by the various Plague Medical Officers in the Jullundur District.

APPENDIX M.

No. 653, dated Garhshankar, 12th July 1898.

From—Surgeon-Captain W. R. Clark, Indian Medical Service, Garhshankar,

To—The Deputy Commissioner on Special Plague Duty.

In reply to your No. 1288, dated 18th June, I have the honor to submit herewith a report on General Plague Administration.

As I arrived in Garhshankar only on the 8th May 1898, and my report is dated the 6th July 1898, I have personally had only a limited experience of the methods of dealing with the epidemic ; but, as I am in possession of the diaries and reports of Doctors Datta, Heard, Adie and Hunter, and having in consultation with the last named officer and from the data supplied by the other three prepared this report, it may fairly I think be said to represent the result of the experience of all these officers. It must be premised that the methods I am about to describe and the staff that I advocate as necessary to be employed would be applicable only to a limited epidemic in a small area comprising no very large towns. If the epidemic became at all general, or if large towns became affected, I do not think that such methods would be applicable.

I shall first confine myself strictly to the headings you suggest, afterwards, if necessary, going into other details.

When should a village be turned out ?

(1). This is a matter which should, I think, be left in the greater number of cases to the Medical officer. No hard and fast rules can be laid down on the matter. If the Medical officer gets early intimation of the case and can segregate within a day or two of its occurrence the sick man, his relations and all persons who have been in attendance on him I do not see the slightest necessity of turning out the whole village. Small-pox, a disease which is quite as contageous as plague, is treated in this way in Leicester, and successfully. The whole question is one of early notification. If we can obtain early notification, early isolation, and early disinfection, there is, in my opinion, absolutely no necessity for turning out a whole village ; but if, as has been the case almost throughout this epidemic, notification is delayed and cases are concealed either wilfully or through ignorance till the disease has occurred in several houses and a large number of the people have been exposed to the infection, then the village ought to be turned out on the occurrence of the first undoubted and reported case. By a careful enquiry into the history of the outbreak the Medical officer should be able to decide whether a village ought to be turned out are not, and no hard and fast rule should be laid down. In Bagwaini, for instance, and in Palewál I think we would have obtained exactly the same results that we have done had we only turned out the households that went into the segregation camp. In both cases we obtained early intimation of the disease, and no cases occurred after evacuation, except in the segregation camp, either among persons who had been infected before leaving the village or those who were infected in the segregation camp while attending on the sick.

Bilron has been urged as an instance where partial evacuation failed, but a careful enquiry into the history of the outbreak will reveal the fact that the partial evacuation which was carried out on the 6th February was completely successful. Early intimation of outbreak of the disease was obtained, three cases oocurred among the segregated families, but the disease did not spread, and the first cordon was removed on the 1st April. No cases occurred between the 23rd February and 12th April, and all would have gone well with the village had it not been for the outbreak at Hájipur, but after the removal of the cordon the villagers were naturally anxious to look to the welfare of their outlying fields, and one man Nihála, a Rájpút, went off to his field close to the Hájipur boundary, stayed there for about a week, came back to his home in Bilron very ill of plague, and died there on the 12th April. His child was the next patient, and the first cases during this second outbreak all occurred in the quarter in which he lived,—a quarter quite distinct from that in which the first outbreak had occurred. The second outbreak was undoubtedly attributable to Hájipur just as the first was attributable to Purkhowál. The fact that dropping cases have occurred in Bilron since the 8th May has been used to lend colour to the idea that the partial evacuation led to the infection becoming widely spread and deeply rooted. This is not so. Each of these dropping cases is explicable through some distinct exposure to infection. Thus the case of the 21st May was that of a chaprási who was attending in hospital on his sick wife and child. The case on the 26th May was that of a sweeper who while working at disinfection was wounded on the foot and through that received the virus ; and that on the 7th June was a Brahmin who certainly had been in the village a few days before during the cleaning of his house, but who also had some connection with a Brahmin woman, then a patient in hospital, and who is strongly suspected of having visited her there. In short, the outbreak at Bilron is not an example of a failure in partial evacuation, but one of the thorough success of a partial evacuation when early notification was obtained.

I have been told that for political reasons it is not thought proper that a Medical officer should be allowed the option of ordering a village to be turned out when he thinks fit. It is believed that a Medical man would be so red hot on sanitation that he would order the turning out of villages which from political reasons it would be unwise to evacuate, but surely a Medical officer ought to have the option of not turning out a whole village when he thinks that partial evacuation will be successful. There can be no political danger in such a course, and I am strongly of opinion that when a Medical officer thinks he can control the disease by other means, he should be allowed, at any rate, to make the attempt. I think Government may rest satisfied that ardent believers in sanitary science will not keep a village in when it appears that the disease cannot be controlled by means short of total evacuation.

Position on division of the camps.

(2). As laid down in paragraph 3 of No. 140 S. from the Junior Secretary to the Punjab Government, camps should be divided into (1) Health, (2) Segregatian, (3) Hospital Camps. These should be strictly cordoned off the one from the other and placed at a distance of at least 400 yards from each other. Provision should be made in the hospital camp (1) for the plague cases, (2) for the hospital establishment, (3) for the Medical subordinates, (4) for the temporary isolation of doubtful cases. Such cases are bound to occur in every epidemic, and the people will certainly be more satisfied if doubtful cases are treated in separate huts than if they are removed to the general plague hospital. I append a diagram of the way in which I think it most convenient to arrange a plague hospital camp. In the case of a small village with few cases affected, the large hospital huts need not be employed. It will be found that the people are much more satisfied to be isolated in small huts about 10′ × 10′ × 7′, and when there are few cases this does not entail much extra work on the hospital establishment.

Appendix No. I.

All splitting up of the health camps into sections should be avoided as far as possible. Of course the people may be allowed to arrange themselves according to caste, and slight distances may be allowed between the various castes, but the breaking up of the health camps, as at Bilron and Garhshankar, into a large number of small camps is from an administrative point of view most cumbrous and has no counterbalancing advantages.

Whether the present rule by which 10 days is allowed to elapse before disinfection is commenced is a good one.

(3). Except from the point of view of the rat theory, the present rule by which ten days must elapse before disinfection is commenced is aimless, and the small number of dead rats that I have seen in Garhshankar, Bilron and Bagwain, where disinfection has been carried out in strict accordance with the 10 days' rule, leads me to doubt whether even from this point of view it is worth while to wait ten days before commencing disinfection.

I am of opinion that a sufficient period as short as compatible with the total evacuation of the inhabitants with their property should be allowed, and then disinfection should be forthwith begun.

Methods of disinfection.

(4). With regard to disinfection, the following are the methods which I have employed for the disinfection of houses in this district. I append a list of the materials and tools which I have found it most satisfactory to employ, and a diagram of the distribution of the disinfecting gang. They are all laid down for the unit of a village with 100 houses of the usual size, and thirty separate cattle houses or havelis on the outskirts. Five of the houses in this village are supposed to be infected, while 15 are contiguous or back with infected houses. The disinfecting gang should consist of 40 coolies with one Hospital Assistant and one Compounder, and with such a gang in such a village the cleaning can be satisfactorily accomplished in three weeks provided the supervision is satisfactory. On evacuating a village a list should be made of all infected houses, which should be marked with red O and locked up:—

Appendix II.

Appendix III.

1. In accordance with the present rules ten days after complete evacuat... the inhabitants the disinfection should be begun. It should be commenced at the ...red in the house thus marked, and on any house being completed the supervising subordinate sho... lower one, I note a cross inside the former mark thus (+) signifying that he has inspected and ...o signify that he has

2. It is convenient to note the number of cases which have occur... in the upper left hand corner of the cross within the circle, while on th... the serial number of the house, No. 1 being the first house in which ... the upper right hand corner the inspecting officer places his initial t... inspected the house and has approved of the disinfection. Contiguo... houses are to be treated as infected ones, and marked on disinfecti... the circle and numbered with a serial letter A, B, C, in addi... nfected house to which they belong.

...ion by houses ...uld make approved.

...us and back to back ...on with the cross inside ...tion to the number of the

In my opinion it is important that disinfection should be commenced in the infected and contiguous houses, since (1) as long as they remain without being disinfected they are a source of danger to the workmen in the village. (2) If the rat theory is a valid one, the sooner these foci of infection for rats are got rid of the better. In my experience the rats become infected some time after the first human cases, and if the village has been moved out early and disinfection commenced immediately after evacuation we may be able to disinfect the infected houses before the rats become diseased. (3) Since if from any cause the cleaning has to be completed in a hurry and the people allowed to re-occupy the village they at any rate will have been dealt with in a thoroughly satisfactory fashion. I am aware that Dr. James prefers to clean the village from end to end, making no distinction of infected from non-infected houses, and that he says the danger in cleaning the infected houses first lies in (1) the difficulty of obtaining a complete list of them, and (2) in the fact that if the infected houses are first cleaned, subordinates may be inclined to scamp the cleaning of the remaining uninfected or supposedly uninfected ones. Although his experience gives his words of course infinitely greater weight than mine, yet I can only say that my experience such as it has been has led me to adopt the plan above stated and that the reasons which I have given above are in my opinion sufficiently weighty to lead me to continue my practice till I get distinct orders to the contrary. With a little tact and careful urgency I think it is possible to obtain in all cases an accurate list of all houses in which cases have occurred, and with careful supervision I do not think it at all necessary that the cleaning should be scamped, even after the infected houses have been completed.

Disinfection of an infected house.—(*a*) Phenyle solution (1—100) should first be pumped all over the outside of the door, the door should then be opened, and the pump turned on into the interior of the house first thoroughly all our the walls, floor and remaining furniture, which should be well soaked. All effects should then be removed outside, again sprayed with phenyle solution, and old rags, bedding and earthen vessels, &c., should be broken and burnt after valuation. I have found it quite as convenient to use a strength of (1—100) phenyle solution as to comply with Dr. James' recommendations to mix it of a strength sufficient to make a thick milky solution. I have in all cases used vessels of known capacity (5 gallon phenyle drums) for the mixing of the phenyle, and it is an easy matter for the Compounder in charge of a gang to pour 8 ozs. of phenyle into this quantity of water. After all our aim in disinfection should be to use solutions of a strength which is proved by laboratory experiments to be efficient. One cannot trust individual experience of the satisfactoriness or otherwise in practise of a solution whose strength has been proved by laboratory experiments to be insufficient.

A party of men should then get on the roof, and having first wetted the outside thoroughly to lessen the dust, should either remove the roof entirely (leaving the main ballis) or make one or more large holes as the case demands. In rooms with an open end verandah forming one side only a portion of the roof need be removed; likewise in those rooms with free ventilation by windows one or two holes in the roof of such size that the sun shall in its course penetrate to every corner may be sufficient. In all other cases the entire roof should be removed in infected houses, as it is only the direct rays of the sun which have a germicidal effect on the plague bacillus (*vide* the experiments of Kitasato, Sternberg and others). I quote these experiments at length to show you that the direct rays of the sun are necessary, and that although making holes in the roof may in conjunction with the use of disinfectants be found satisfactory in practise, yet if we want to obtain the germicidal effects of sunlight (and I think in infected houses it is necessary to aim at leaving no stone unturned which will procure as thorough disinfection as possible) we must remove at any rate a very large portion of the roof. "The contents of a bubo in which the bacilli were present in great numbers were wiped over a cover glass, and some of these cover glasses were dried in the air of a room at a temperature ranging from 28° to 30° C. Others I exposed directly to the sun's rays, and from among them after an exposure from one, two and three hours up to six days I removed some parts, putting such portions in beeftea, and placing them in the incubator. Those which had been standing in the room showed a pretty good growth in the incubator, but those exposed directly to the sun were all destroyed after from to three to four hours."

Houses in direct communication with infected houses or those adjoining or back to back with infected houses are to be considered as infected. As the work of opening the roof is going on, all dust should be prevented by the continuous use of the hand-pump or syringe with phenyle solution.

I am convinced from my experience in this district that the degree in which the workmen are infected is a measure of the care with which disinfection is carried out, and that in the great majority of instances, if the dust is kept carefully laid by the unrestricted use of phenyle solution, they will be found not to suffer except in very exceptional cases.

ideas of both Drs. James and Wilkinson, men of greater experience than my own in plague administration; but at the same time I confess I cannot see why with a little training a European Non-Commissioned officer or an Assistant Surgeon should not be trusted with the work under the Medical officer. The chief objections urged by the Banga Medical officers seem to be that a European supervisor could not remain all day at the work, which would there necessarily be left to the care of the Hospital Assistant. This, however, is what occurs at present. The Medical officer has other duties, and cannot always be present throughout the disinfection of each village. They also say that non-Medical Inspectors would not have such a clear view of the dangers attaching to careless disinfecting. This may be so, but all the disinfecting at home is done by non-Medical Sanitary Inspectors, and although these are of course trained men, yet that is necessitated by the more complicated nature of their duties, and for the simpler duties that would be entailed on a man employed on plague disinfection work in Punjab villages I cannot understand why anything more is necessary than a *trustworthy*, *intelligent*, man who on taking up these duties would be trained practically by the Medical officer and made to understand that in all matters connected with disinfecting he is distinctly under the orders of the Medical officer. The employment of young Staff Corps officers for this work has been advocated, but is, I think, impracticable on account of difficulties with the rank questions. It is a very exceptional Staff Corps officer who would take the orders of a Medical officer unhesitatingly at all times and carry them out to the letter. In the case of an outbreak like the Hoshiárpur one I think that the whole of the medical arrangements would have been carried out quite satisfactorily by one Medical officer assisted by three active intelligent European supervisors or three Assistant Surgeons.

With reference to the subordinate staff which it is necessary to employ. In the unit village of 100 houses the staff which I have found it satisfactory to employ has been as follows:—

In the segregation camp and hospital there should be one Hospital Assistant and one Compounder. The Compounder should be employed entirely in the hospital in attending on the sick. The Hospital Assistant should also have in his charge the roll-call and daily examination of all people in the segregation camp and the weeding out of plague cases as they occur. In the health camps also one Hospital Assistant and one Compounder are necessary to take the daily roll-call for the first ten days after evacuation of the village. After that time and when disinfection is commenced the Hospital Assistant in charge of the health camp is given another Compounder, and with him he commences the work of disinfection of houses, exercising at the same time supervision over the Compounder, who is left to take the roll-call of the health camps. To this Compounder it will be well to give a supply of a few simple medicines which he may administer to any people in the health camps who fall ill of diseases other than plague. The mere fact of his having this supply of medicines will often encourage people to come to him on the first symptoms of illness, and suspicious cases will thus sometimes come to light earlier than they would otherwise do. The daily visits to the hospital of a European nurse will be found advantageous. She should be instructed to dress all the female cases once a day, to assist the Hospital Assistants in the examination of any suspicious cases among females, and to send in a report daily to the Medical officer as to any deficiencies that she may have observed during her visit to the hospital.

The staff I have above described is sufficient for villages of from 300 to 600 inhabitants, and with a number of cases in hospital not exceeding 25. Where the number of cases exceeds 25, but is under 50, it is enough if a dhái is employed in addition in the hospital to dress and attend to the female cases. One Hospital Assistant, one Compounder and one dhái can attend to 50 cases. When the number exceeds 50 a proportional increase in the Medical staff is required. A second Hospital Assistant becomes necessary when the sick are over 50 in number.

For villages of from 600 to 1,000 a second Compounder is required to assist the Hospital Assistant as soon as the cleaning of the village is commenced, and a third Compounder will be required for villages of from 1,000 to 2,000 inhabitants. A village of 2,000 to 3,000 inhabitants will require a fourth Compounder. Villages of above that population will require a second Hospital Assistant and a proportional number of Compounders for the cleaning to be satisfactorily carried out. One of the Hospital Assistants should be made personally responsible for the whole of the cleaning arrangements, and the men working with him should be given to understand that they are entirely under his orders as regards all matters of disinfection.

As to the employment of nurses and dhái's, I have found both classes of women most useful when employed on the lines indicated in this paragraph of my report.

It is very important, however, with regard to all classes of Medical subordinates that they should be young, active, intelligent and trustworthy. Some of the Medical subordinates employed during the epidemic have had none of these qualifications, and it is to the employment of such persons that the Medical Department owes any odium which it incurred with the people in the early stages of the outbreak. Civil Surgeons should be warned in future that no subordinates who have not the above qualifications should be sent on plague duty. They are of course loath to send on plague duty a good subordinate who is doing useful work in the district, but the sending of a careless, lazy or untrustworthy subordinate on plague duty is much more likely to be productive of harm than the mere shutting up of a district dispensary for a few months, and Civil Surgeons should therefore be warned as to this.

Clerical establishment for each Medical Officer.

(7). Each Medical officer in charge of a circle like the Hoshiárpur one should have at least one clerk capable of drafting a docket in English and copying correctly in that language. A good knowledge of vernacular is also indispensable. One clerk, if a decently educated man, should be capable of conducting all the necessary correspondence.

(8). I append a list of medicines, disinfectants, hospital comforts, necessaries and disinfecting apparatus sufficient for the supply of a plague hospital at the unit village,—*vide* Appendix No. IV.

Appendix No. IV.

(9). The present hospital huts are, in my opinion, suitable in form and construction, but besides these at all villages or in lieu of these at the smaller villages I think a number of small huts should be provided for the isolation of doubtful cases and for the separate treatment of people who may from any cause dislike being treated in the general wards. These should be of a fairly substantial character and rather larger than the ordinary huts provided for the people in the health camps. The sirkís should be about 10′ × 10′, and they should stand about 7 feet high in the centre. One end may be closed in by sirkís with an opening for ventilation; the other end should be freely open to permit the charpoy, on which the sick man is, to be readily carried out and in; the sides should be thatched. Such huts should also be provided for the housing of the dispensary and of the Hospital Assistant, compounder and dhái.

Infection between villages.

With regard to infection between villages, I am of opinion that it is at any rate in the vast majority of instances due to human agency. Thus in the epidemic in this district the outbreak at Birámpur was, I believe, traced to one Ganesh, daughter of Kudu, sweeper, who had been away from the village in Khatkar Khurd, Jullundur District, where her mother's people are resident, and who on the outbreak of plague there came back to Birámpur. She arrived there about the 5th December and died within the week. This was the first case in Birámpur. After her, her mother Jiwi got ill and died and the disease spread.

As to Purkhowál no very clear explanation can be given of the origin of the outbreak, but from the talk of the villagers it is evident that there was no lack of coming and going between Birámpur and Purkhowál even after the occurrence of the disease at the former place. The villagers say that the Police constables who formed the cordon round Birámpur used to come and go a great deal between Birámpur and Purkhowál, where they used to buy their atta and ghi. Coming and going was not wanting between the inhabitants of the village also; in fact I was told that the Kázi Abdulla who lived in Birámpur used systematically to come through the cordon at Birámpur for the purpose of reading prayers and bathing the bodies of those who died at Purkhowál.

Bilron was the next village affected, and in it at any rate the history of infection through human intercourse is clear enough. I quote from Dr. Datta's report No. 6, dated 7th February 1898:—

"Mussammát Bakhtáwar, the leechwoman of Bilron, used to go and apply leeches to the buboes of the Gujars of Purkhowál before we knew anything of the existence of the disease there. According to her own statement the last patient she applied leeches on was Chajju, Lohár, namely on the 31st of January last. I came to know of this on the 1st and 2nd instants when examining the village of Purkhowál. At first the villagers would not tell me the whereabouts of the leechwoman, but at last one of the patients told it out. On the 3rd I went out to Bilron myself and found the leechwoman's son suffering from plague." This son she used to take with her to Purkhowál as he was a smart lad and used to give her great assistance with the work.

"On the 5th instant I examined in this village the corpse of a young infant daughter of Mandaria Lohár, and found it had died of bubonic plague and had evidently taken the infection from Purkhowál from the family of Amolak, the Lohár, in which there have

been four deaths since the 30th ultimo. Amolak and Mandaria are near relations, and it is quite certain the latter's wife with her child had gone to condole with the former on the 30th ultimo, when the first death took place in that family."

So much for the first infection in Bilron.

It seems evident that it was dependent on human intercourse, and on that alone.

Simal Mazra was the next village attacked, and in it a history of infection due to human intercourse is no less clear. The history of the infection of this village is related to that at Bachhan, and I cannot do better than relate it in Dr. Datta's words (Report No. 9, dated 10th February 1898):—

"Whilst making an enquiry into how the infection has got into this village, we were informed that two members of the infected party which had brought the poison here had gone on to a village called Bachhwan, and that one of these had died there shortly after arrival, namely on the 27th January last. * * *" The information that I had gathered at Simal Mazra was quite correct, namely that Albela, Fakír, and his son Maula had gone to Shikohpur, an infected village in the Jullundur District, to condole with Mussammát Ráli, whose father and mother (Báz and Dauli) had died of plague. This was on the 25th of January last. They stopped there that night, and the next day they travelled back along with Mussammát Riwi and her husband Shádi, Fakír, to Simal Mazra, Riwi being Albela's daughter. They stayed there also for a night, and on the 27th Albela and his son Maula started back for their own home at Bachhwan. On the road Maula became ill, had headache, diarrhœa and vomiting, and died that night at Bachhwan. The first cases in Simal Mazra were Mussammát Riwi, wife of Shadi, Fakír, and Albela's daughter, Shádi her husband, Kálu (father of Shádí).

Deron, the next village infected, is one about which there is some doubt. Several sources of infection are, however, open. (1) a fakír, Badi Shah, had some relations in a village close to Khán Khanán. He used to go begging in Khán Khanán with his daughter. They returned to Deron about the 25th January, and on the 27th the girl died of fever accompanied with cough. (2) on the 29th January Gulábi, a Chamár, died there also of fever and cough. Her parents were residents of Birámpur, in which the disease was then raging among the Chamárs. Gulábi's mother-in-law, who lived in the same house, died on the 14th February of fever also, and in this house on the 16th were found the two undoubted Chamár cases of plague.

Bhajjal, the next village on the list, was in all probability infected by human agency through one Mihun, a Kasai, who brought fruit into it for sale and was turned out on account of illness. This Mihun was a member of a Kasai family who was found suffering from plague in a Beri garden, and from enquiries made recently it appears that he actually came into Bhajjal, was turned out, and that the first persons infected in the village were amongst those who ate the fruit scattered about during the affray.

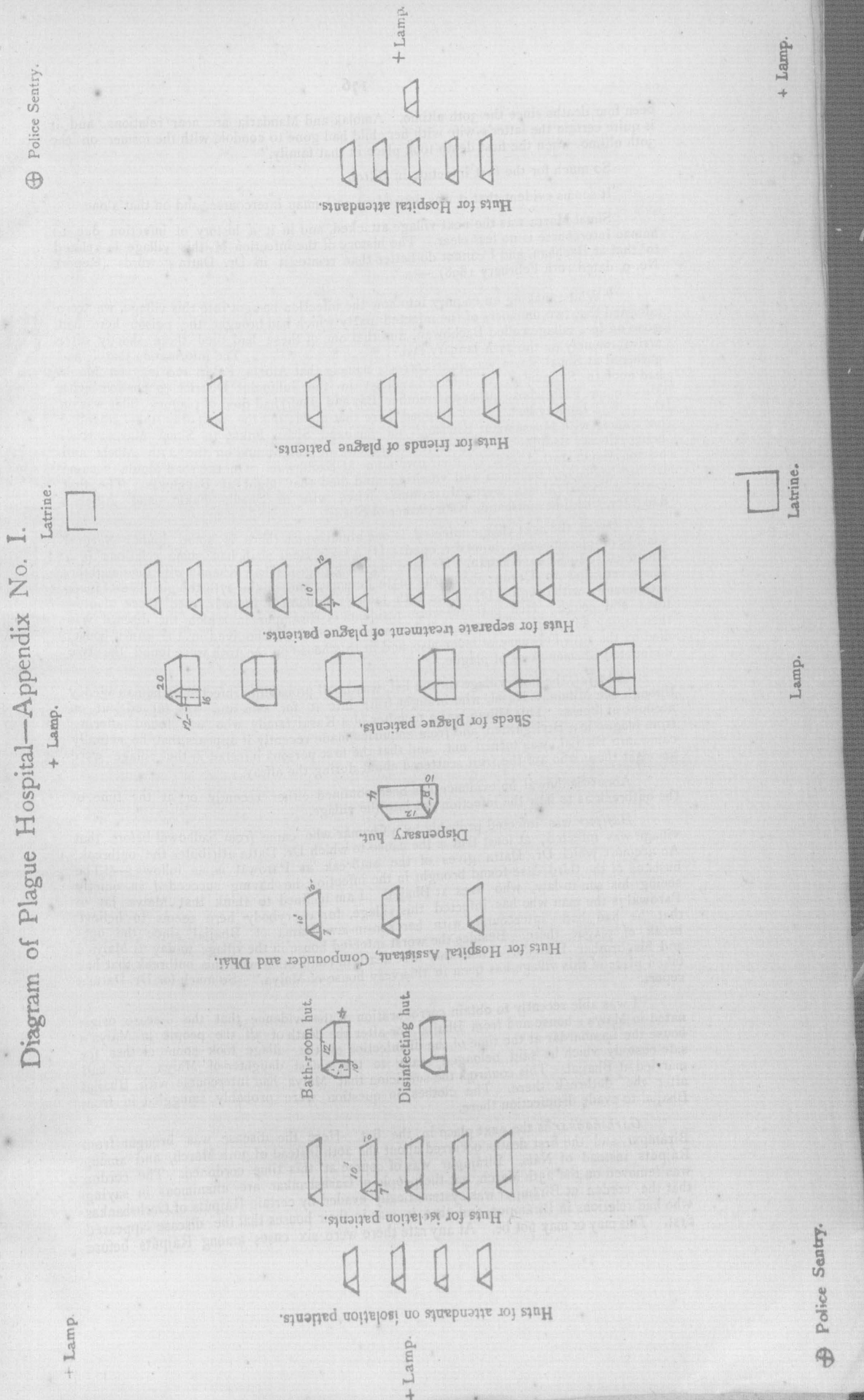
About Sadhowál no evidence has been obtained either recently or at the time of the outbreak as to how the infection got into the viilage.

Hájipur was infected probably by a Chamár who came from Sadhowál before that village was infected, at least that is the cause to which Dr. Datta attributes the outbreak. An account which Dr. Datta gives of the outbreak at Parowál is as follows:—"The husband of the third case found brought in the infection, he having succeeded in quietly seeing his son-in-law, who lives at Bhajjal. I am inclined to think that Maiya Jat of Parowál is the man who has infected this village, for everybody here seems to believe that he had had intercourse with her son-in-law Ráma of Bhajjal since the outbreak of plague there. Besides the worst infected house in the village to-day is Maiya's and his brother Dhary's. Then the first death in connection with this outbreak that has taken place in this village has been in this very house of Maiya." So much for Dr. Datta's report.

I was able recently to obtain corroboration of the evidence that the disease originated in Maiya's house and from Bhajjal, for after the death of all the people in Maiya's house the Lambardár at the time of the disinfection of the village took some clothes for safe custody which he said belonged really to the eldest daughter of Maiya, who had married at Bhajjal. This confirms the suspicion that Maiya had intercourse with Bhajjal after the outbreak there. The clothes in question were probably smuggled in from Bhajjal to evade disinfection there.

Garhshankar is the next place in the list. Here the disease was brought from Birámpur, and the first deaths occurred about the 20th instead of 30th March, and among Rájpúts instead of Náis. Birámpur was of course at this time cordoned. The cordon was removed on the 25th March, but the people of Garhshankar are unanimous in saying that the cordon at Birámpur was systematically evaded by certain Rájpúts of Garhshankar who had relations in Birámpur, and that it was in their houses that the disease appeared first. This may or may not be. At any rate there were six cases among Rájpúts before

Diagram of Plague Hospital—Appendix No. I.



we knew anything about the existence of the disease and it began among Rájpúts related to Birámpur. Sanwáli and Garhi were both affected from Garhshankar. Human intercourse is proved in both cases. Kullewál was infected by human intercourse from Simal Mazra, and Chinkoa from Kullewál. Reliable information is to hand in the case of these places. About Bagwain the information is a little doubtful, but this much I have been able to ascertain for certain.

On the 12th May Mussammát Jey Dei, wife of Saddu Jat, died of fever and cough, probably of the pneumonia form of plague. She had been ill for only three days. Four days before her death her brother, who was married in Garhi, arrived, stayed the night, and took her away with him in the early morning. She came back in the evening feeling ill, and died three days afterwards. The first cases—those found on the 19th—were all living in or in close contact with the house of Jey Dei.

At Palewál the disease started in the house of one Nathu, a Báíd, of whom there is very strong evidence that he used to go through the cordon at Garhi to treat the people there who were ill of plague.

In short, in all the outbreaks here there is suspicion, and in a considerable number there is a very clear history, of human intercourse carried on between villages infected and those which subsequently got the infection. In none of them is there any history of a sudden influx of infected rats. Such a history it would be almost impossible to obtain. In most cases, as at Garhshankar and Parowál, where I have been able to obtain any information about infection of rats, it has occurred after the first human cases. Of course I do not deny the possibility of infection of villages by rats; in fact I think it very likely that this may sometimes occur, as the rats are, we know, very susceptible to plague, and the fact that rats have died in large numbers in some infected villages is indubitable. Still that they died before any considerable outbreak of the disease occurred does not prove that they spread it from village to village, as, granted that a rat and a human being were infected at the same time, it is, I think, certain that the rat would die some time before the man provided each got the same dose of the poison. That the rats migrate from an infected village after a certain number of them have died is also, I think, fairly certain, although we have no absolute proof. In Garhshankar although a number of rats had died in the infected pattís before evacuation, yet there were a number left by the people in the city; after the people went out I did not for a long time see a single living rat either in the infected or uninfected pattís, although I was always on the look out for them and warned my subordinates to be so also.

The rats left in the city did not all die. I found only a small number of dead rats during the disinfection, and if they did not migrate what became of them?

The main fact elicited by the history of the epidemic here is, however, I think the impossibility of preventing human intercourse even through the cordons that we have been able to put on. Cordons 8 to the mile are not so reliable as might be expected. I do not allude to the statement so often made that any man possessed of 4 annas can get through any cordon that we like to put on, although I consider this extremely possible; but what I mean to infer is, that it is quite easy for a determined man knowing the ground to get through any cordon we can put on a village. This being so, what are we to do? I think what offers most promise of success in future outbreaks is early notification, early isolation, early disinfection of infected houses, encouragement of inoculation, should further experience fulfil the promise which I think it offers, daily roll-calls of the inhabitants of infected villages, and a stringent system of quarantine camps for those persons who wish to leave the village area and go to other places of residence during outbreaks of the disease.

The one method which offers the most difficulties among all these is, I think, early notification. That is dependant on the people themselves, and I think their good-will must in this case be stimulated by some system of rewards and punishments. I do not advocate the indiscriminate giving of rewards to people who notify the disease. This would in all probability lead to the importation of cases, but I think a very handsome reward should be paid Lambardárs who give early intimation of the occurrence of cases, and a severe punishment meted out to those who neglect to do this, and at the same time very handsome terms in the way of compensation for loss of employment and for damage done by disinfection should be given to those people who are unfortunate enough to have the disease among them.

W. R. CLARK,
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W. R. CLARK,

Indian Medical Service.

APPENDIX No. III.

Diagram distribution of a disinfecting gang of 40 men.

Hospital Assistant.

Compounder.

Mate with garden syringe ... ...

Man with hand pump—one ... { This man will keep up a continuous shower of phenyle solution on the interior of the house on the mud as it is being shovelled up. The mate with his garden syringe will supplement this where he sees it necessary.

Men with spades—four ... { These men will be employed in opening out the holes in the roofs, or knocking holes in the walls. Besides their spades they should have dhátrís, axes and crowbars.

Men with dry brushes—two ... { To brush cobwebs off walls and roofs after the pumping has been done.

Coolies for carrying out earth, &c.—seven. { For taking away earth and rubbish, for cleaning floors, helping with the taking out of property and the fetching of materials from depôt under Hospital Assistant.

Whitewashers—three ... { One man for the mixing, the rest for applying the limewash.

Bhistís—two.

Mate with garden syringe ... ...

Bhistís—two.

Man with hand pump—one.

Men with spades—four.

Men with dry brushes—two.

Coolies for carrying out earth, &c.—seven.

Whitewashers—three.

APPENDIX No. II.

List of Materials and Tools required for disinfecting the unit village.

I.—MATERIALS.

Serial No.	Name of material.	Amount required.	Remarks.
1	Lime, unslaked	200 maunds ...	At the rate of 2 maunds per house.
2	Geru	1 lb. ...	For marks on houses.
3	Brushes (of hair) ...	2 ...	For cobwebs, &c.
4	Phenyle	70 gallons.	
5	Perchloride of mercury ...	1 lb.	
6	Permanganate of potash ...	1 lb.	
7	Chlorinated lime ...	20 lbs. ...	For wells.
8	Crude Carbolic Acid ...	20 lbs.	
9	Stationery, pens, paper, inkstand, diary and registers.	As required.	For disinfecting clothes left in village.
10	Lantern, hurricane ...	One.	
11	Carbolic soap	1 piece.	
12	Oil	One bottle.	

II.—TOOLS AND APPLIANCES REQUIRED FOR A DISINFECTING GANG OF 40 MEN.

Serial No.	Names of tools.	Number required.	Remarks.
1	Mussaks	4	
2	Bokkha with lajj	4	
3	Garden pumps	2	
4	Hand syringes, garden	2	
5	Bamboo syringes	12	Such as are used for squirting colored water during the Holi festival.
6	Spades	8	
7	Brushes on sticks	4	
8	Dhátrís (sickles)	4	
9	Rhumtahs	4	
10	Baskets	14	
11	Empty kerosine tins fitted with handles.	12	
12	White-washing brushes	42	
13	Crowbars	4	
14	Tubs	4	
15	Iron pans (karrahs)	2	
16	Light bamboo ladders	6	

APPENDIX No. IV.

List of Instruments, Medicines, &c., necessary to be supplied to a Plague Hospital.

Serial No.	Names of articles.	Quantity.	Remarks.
	Instruments, &c.		
1	Pocket case, single	1	
2	Clinical Thermometer	1	
3	Glass syringe	1	
4	Enema syringe	1	
5	Spatula Bolus	1	
6	Slate wedgewood	1	
7	Scale and weight Grs.	1	
8	Measure glass, zii	1	
9	Ditto, minim	1	
10	Pestle and Mortar, wedgewood	1	
11	Corkscrew	1	
12	Lint, Surgeon's	1	
13	Boric Lint	1 lb	
14	Boric, cotton	8 oz.	
15	Cloth for bandages	8 oz.	
16	Cotton Wool	2 pieces	
17	Tray, cotton	4 seers	
		1	
	Medicines.		
1	Acid, Carbolic		
2	Bismuth subnit.	1 lb	
3	Boric acid	1 oz.	
4	Phenacitine	8 oz.	
5	Ammo. carb.	4 oz.	
6	Ext. Bellad.	4 lb	
7	Hyd-Sub	1 lb	
8	Glycerine	1 oz.	
9	Hyd. Perch.	2 lb	
10	Iodoform	8 oz.	
11	Liq. Hyd. Perch.	4 oz.	
12	Liq. Strychina	1 lb	
13	Mustard	4 lb	
14	Oil Recini	1 lb	
15	Potassi Bromide	1 bottle	
16	Spt. Ammo. Aromt.	4 oz.	
17	Spt. Chloroform	2 oz.	
18	Spt. Aether Nit	4 oz.	
19	Soda bicarb.	4 oz.	
20	Tr. Card. Co.	8 oz.	
21	Tr. Iodine	8 oz.	
22	Tr. Digitalis	4 oz.	
23	Tr. Camph. Co.	3 oz.	
24	Tr. Scillae	4 oz.	
25	Vini Ipicac.	8 oz.	
26	Condensed milk	4 oz.	
27	Brand's extract of mutton	1 doz. tins	
28	Rum	Do.	
29	Stoppered bottles for mixtures	6 bottles	
30	Qrt. bottles	2 ,,	
		2 ,,	

APPENDIX No. IV—CONCLUDED.

List of Instruments, Medicines, &c., necessary to be supplied to a Plague Hospital—concluded.

Serial No.	Names of articles.	Quantity.	Remarks.
	Hospital comforts, clothing.		
1	Blankets	50	
2	Mattresses	20	
3	Pillows with covers	20	
4	Charpoys	20	
5	Sheets	20	
6	Kurtas, cotton (woollen)	20	
7	Caps	20	
8	Country towels	4	
9	Dekchi with cover	1	
10	Parát	1	
11	Tháli	2	
12	Konáls	4	
13	Tawa	1	
14	Dol with rope	1	
15	Karchi	1	
16	Feeding cups	6	
17	Bed pan	2	
18	Urinals	2	
	Hospital necessaries.		
1	Table	1	
2	Chair	1	
3	Inkstand	1	
4	Pen-holders	2	
5	Pencils	1 bottle	
6	Ink	2	
7	Pocket Books	2	
8	Blank Registers	2	
9	Hurricane lamps	2	
10	Brass lamps	2	
	Disinfectants.		
1	Phenyle	100 lb	
2	Crude Carbolic Acid	10 lb	
3	Hyd. Perch.	1 lb	
4	Potassi Permanga.	1 lb	
5	Chlorinated lime	2 lb	
6	Common unslaked lime	2 maunds	
	Disinfecting apparatus.		
1	Hand pump	1	
2	Garden syringe	1	
3	Tin, old, kerosine, with handles	10	
4	Karahas	2	
5	Mashuk and bokas	2	
6	Tubs	2	

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REPORT

ON THE

OUTBREAK OF PLAGUE

IN THE

JULLUNDUR AND HOSHIARPUR DISTRICTS

OF THE

PUNJAB,

1897-98.

BY

CAPTAIN C. H. JAMES, I.M.S.,
Deputy Sanitary Commissioner, Punjab,

EMBODYING

NOTES AND REMARKS BY CAPTAIN W. RONALDSON CLARK, M.R.C.P., LOND., M.D., I.M.S.; CAPTAIN A. W. BUIST, M.B., M.CH., I.M.S.; CAPTAIN E. WILKINSON, F.R.C.S., I.M.S.; CAPTAIN H. SMITH, M.D., M.CH., I.M.S.; CAPTAIN G. Y. C. HUNTER, I.M.S.; LIEUTENANT WALTON, F.R.C.S., M.B., LOND., I.M.S.; AND DOCTORS DATTA AND FATTEH CHAND, AND OTHER OFFICERS ON PLAGUE DUTY IN THE DISTRICT.

Lahore:
THE "CIVIL AND MILITARY GAZETTE" PRESS,
Sole Contractors for Printing to the Punjab Government.

1898.

No. 655, dated Camp Garhshankar, 12th July 1898.

From—Surgeon-Captain W. O. CLARK, Plague Medical Officer, on Special Plague Duty, Hoshiárpur District,

To—The Deputy Commissioner on Special Plague Duty.

I HAVE the honor to state that before handing over charge of the Medical arrangements of plague operations in this district I should like to bring to your notice the names of the subordinates who in my opinion have done work meriting special notice. I wish to do so now as my successors, the work being virtually completed, will not have the same opportunities of seeing the men as I have had :—

(I). Náib Tahsíldár Fazal Karím has been most steady and reliable in carrying out orders, and has taken an interest in the work of disinfection, supervising the details himself with great energy, and sparing himself in no way. He is deserving of reward.

(II). Lál Chand, Lambardár of Bilron, also well deserves a reward. He has been most active in his personal supervision of the disinfection work.

(III) Kánúngo Atma Rám of the Gujrát District did excellent work during the disinfection of Garhshankar. He was, with Hospital Assistant Karm Chand, responsible for the making up of gangs and for the allotting of the work. Worked hard and conscientiously.

(IV). The following Compounders have done excellant work, and might, if possible, get pecuniary rewards :—

Received rewards of * Rs. 15 and † Rs. 25 during the first part of the epidemic.

(1) Sukh Dayál.*
(2) Jai Dayal.†
(3) Mirán Bakhsh.
(4) Ghulám Muhammad.*
(5) Sunder Mal.
(6) Kánshi Rám.

(V). The following Hospital Assistants are deserving of pecuniary reward or special promotion for the excellence of their work :—

* § Received a reward of Rs. 50 for his work during the first part of the epidemic.
‖ Received a reward of Rs. 30 for his work during the first part of the epidemic.

(1) Abrár Hussain.§
(2) Mangal Sain.‖

The one man above all the others, however whom I would signal out for reward is Hospital Assistant Karm Chand.§ He has spared himself in no way since the commencement of the epidemic. Every Medical officer under whom he has served has spoken most highly of his work, and personally I think it beyond all praise. During my period of medical charge he has himself personally supervised and arranged for the disinfection of the town of Garhshankar and has completed it in the very short time of six weeks, an undertaking of no small magnitude. He has done it too in such a way that I think the work here will compare favourably with any work done in the district under European supervision, and the care with which the work has been carried out is testified to by the fact that only a single case of plague has occurred among the cleaners and though they have worked in a town which was virtually reeking with infection.

If a titular as well as monetary reward could be given him, I think he well deserves it.

(VI). Hakím Muhammad Nawáz Shah also worked hard and well in charge of the Native Hospital at Garhshankar. He is distinctly above the average of his class, and rendered me much assistance during inoculation operations here. He is well worthy of a monetary reward of at least Rs. 100 (rupees one hundred). His actual expenditure since his weekly bills were stopped has amounted to Rs. 30, and I think the least we can do for him is to give him the pay of a 3rd Grade Hospital Assistant for 3½ months.

FORWARDED in original to the Commissioner and Superintendent.

PHAGWARA :
The 14th July 1898.

S. W. GRACEY,
Assistant Commissioner on Special Duty.

Punjab Government Press, Lahore—25-11-98—200.

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Proceedings of the Hon'ble the Lieutenant-Governor of the Punjab in the Home (Medical and Sanitary) Department, No. 1479 $\frac{L}{P}$, dated 17th December 1898.

READ—

Letter No. $\frac{2311\frac{1}{2}\ U.}{XVII—43}$, dated 25th July 1898, from the Officiating Commissioner, Jullundur Division, forwarding reports on plague operations in the Jullundur and Hoshiárpur Districts by Major Inglis and other officers.

Letter No. 3950, dated 1st November 1898, from the Inspector-General of Civil Hospitals, Punjab, forwarding report on plague operations in the Jullundur and Hoshiárpur Districts by Captain James, I. M. S., with remarks by other Medical Officers.

Read again—

The diaries of officers employed on plague duty.

The correspondence from October 1897 regarding measures for the extermination of plague in the Jullundur and Hoshiárpur Districts.

REMARKS.—The epidemic of bubonic plague which occurred in the Punjab in 1897-98 was confined to that tract of the Jullundur Doáb which lies between the Hoshiárpur Siwáliks and the line of the North-Western Railway, and to the southernmost portion of that tract. A metalled road runs westwards through the heart of it to the Railway at Phagwára, and it is also traversed by unmetalled roads connecting Hoshiárpur with Rúpar and Banga and Garhshankar with the Ludhiána District. No place was infected outside the Garhshankar Tahsíl of Hoshiárpur* and the Nawáshahr and Phillour Tahsíls of Jullundur; and in the last of the three named only seven villages were attacked. At the time that the disease was most threatening the area under suspicion included, in addition to the three tahsíls named, the Phagwára iláka of the Kapurthala State, and covered an area of 1,000 square miles with a population of $5\frac{1}{2}$ lakhs. Banga, a town with 5,010 inhabitants, and Garhshankar, with 6,000, were attacked in March 1898; but with these exceptions the disease took hold of agricultural villages only until the outbreak at Ráhon, which is referred to in paragraph 7. This circumstance, while it obviated some of the special difficulties which would be likely to hamper proceedings for the suppression of the disease in the larger towns, created others of a different nature. It was necessary to deal with an enemy which showed itself in numerous and distant centres; to establish and perfect an organization fitted to a task of which the aspect and proportions were continually changing; to maintain in a considerable tract of country destitute for the most part of accommodation for the superior itinerating staff a vigilant watch which was continued throughout the rigours of a Punjab summer; to provide for the needs of an agricultural popula-tion cut off in part from the means of transacting its ordinary business; and to secure so far as possible the co-operation, or at least the acquiescence, of a hardy race of peasants credulous of rumour and accustomed to the vigorous assertion of their rights. The outbreak was small, when measured by others which have worked havoc in less fortunate Provinces. Up to the end of September 1898 only 86 villages, with an aggregate population by the census of 1891 of 91,892, had been attacked. There were 3,409 seizures and 2,103 deaths. That the disease spread no further, across the fertile and thickly-populated Doáb,† or into those neighbouring hill tracts where the dangers of its permanent establishment are so grave; that no considerable town and no place in the immediate vicinity of the line of Railway, which is the main channel of communication from one end to the other of the Province, was attacked; and that a widespread visitation has been averted through one season of danger, is due, under Providence, to the

* A case, probably imported from Khatkar Kalán, which took place about October 26th at Jandiála (distinct from the Jandiála near Jullundur), a village 12 miles east of the town of Hoshiárpur, has not been referred to in the reports.

† The following cases which occurred to the west of the line of Railway have not been referred to in the reports, though they are recorded in the diaries of the officers on plague duty:—

An imported case discovered on March 17th at Jandiála, a large village about eight miles south of Jullundur Cantonment.

A case at Basti Sheikhán, a suburb of Jullundur, in March.

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REMARKS.—The epidemic of bubonic plague which occurred in the Punjab in 1897-98 was confined to that tract of the Jullundur Doáb which lies between the Hoshiárpur Siwáliks and the line of the North-Western Railway, and to the southernmost portion of that tract. A metalled road runs westwards through the heart of it to the Railway at Phagwára, and it is also traversed by unmetalled roads connecting Hoshiárpur with Rúpar and Banga and Garhshankar with the Ludhiána District. No place was infected outside the Garhshankar Tahsíl of Hoshiárpur* and the Nawáshahr and Phillour Tahsíls of Jullundur; and in the last of the three named only seven villages were attacked. At the time that the disease was most threatening the area under suspicion included, in addition to the three tahsíls named, the Phagwára iláka of the Kapurthala State, and covered an area of 1,000 square miles with a population of 5½ lakhs. Banga, a town with 5,010 inhabitants, and Garhshankar, with 6,000, were attacked in March 1898; but with these exceptions the disease took hold of agricultural villages only until the outbreak at Ráhon, which is referred to in paragraph 7. This circumstance, while it obviated some of the special difficulties which would be likely to hamper proceedings for the suppression of the disease in the larger towns, created others of a different nature. It was necessary to deal with an enemy which showed itself in numerous and distant centres; to establish and perfect an organization fitted to a task of which the aspect and proportions were continually changing; to maintain in a considerable tract of country destitute for the most part of accommodation for the superior itinerating staff a vigilant watch which was continued throughout the rigours of a Punjab summer; to provide for the needs of an agricultural popukation cut off in part from the means of transacting its ordinary business; and to secure so far as possible the co-operation, or at least the acquiescence, of a hardy race of peasants credulous of rumour and accustomed to the vigorous assertion of their rights. The outbreak was small, when measured by others which have worked havoc in less fortunate Provinces. Up to the end of September 1898 only 86 villages, with an aggregate population by the census of 1891 of 91,892, had been attacked. There were 3,409 seizures and 2,103 deaths. That the disease spread no further, across the fertile and thickly-populated Doáb,† or into those neighbouring hill tracts where the dangers of its permanent establishment are so grave; that no considerable town and no place in the immediate vicinity of the line of Railway, which is the main channel of communication from one end to the other of the Province, was attacked; and that a widespread visitation has been averted through one season of danger, is due, under Providence, to the

* A case, probably imported from Khatkar Kalán, which took place about October 26th at Jandiála (distinct from the Jandiála near Jullundur), a village 12 miles east of the town of Hoshiárpur, has not been referred to in the reports.

† The following cases which occurred to the west of the line of Railway have not been referred to in the reports, though they are recorded in the diaries of the officers on plague duty:—

An imported case discovered on March 17th at Jandiála, a large village about eight miles south of Jullundur Cantonment.

A case at Basti Sheikhán, a suburb of Jullundur, in March.

devoted labours of the Civil, Medical and Police staffs engaged in the operations. The efforts made, the staff employed, and the funds expended will cease to appear disproportionate to the task in hand when that which has been is compared with that which might have been.

2. The circumstantial and interesting account of the outbreak at Khatkar Kalán, which has been given by Captain James, I.M.S., establishes the probability of original infection from Hardwár in April 1897. The disease seems to have lain almost dormant throughout the hot weather, but at least two more centres of infection at Jhander Khurd and Khán Khanán appear to have been established from Khatkar before plague was officially diagnosed at the latter place on October 17th. On receipt of that day's report orders issued for the complete evacuation of the village site, and the isolation of the inhabitants by a police cordon; and an Assistant Commissioner, Mr. L. Jones, was placed on special duty to superintend the operations, while Captain James, I.M.S., Deputy Sanitary Commissioner, was put in medical charge. These measures under the supervision and control of the Commissioner of Jullundur, Colonel Massy, who was succeeded on April 20th by Mr. Silcock, formed the basis of the system which was followed throughout with but few and temporary modifications, and experience has justified them. They were received with very varying degrees of cordiality by the people; hearty co-operation was occasional; passive obstruction was common; but no active resistance to authority occurred till April 1898, when the number of centres of disease had so greatly increased that the same close attention to individual needs on the part of the superior European staff ceased to be possible, and when some degree of encouragement had perhaps been given to opposition by the attempt to conciliate popular sentiment. The opposition culminated in the attack which took place on the Police at Garhshankar on April 28th. The Police fired on the mob, and the town was forcibly evacuated, after which there was no more resistance to the measures taken for the eradication of the disease in either the Jullundur or the Hoshiárpur District. Mr. Glancy, Assistant Commissioner, writing from Banga on May 16th, observed: "When sickness was concealed and deaths unreported it was necessary to keep a far closer watch on the villages. Now cases of sickness are shown to the visiting officer without hesitation and deaths are reported within two or three hours night or day." Henceforth infected villages were promptly evacuated and the remedial measures received full and fair trial.

3. The disease, which had spread very slowly up to the end of December, when only 5 villages had been attacked, and one of these almost at once freed from the infection by prompt evacuation, appeared in January to be dying out, as no fresh centres were discovered (though it would appear that 8 were attacked), and the number of recorded attacks had fallen to 1 or 2 per diem; but in February 15 more villages were found to be infected, and in March 27 more; while at the end of April the number in which operations were in progress was 63, and the number of seizures on the 21st of that month reached the high figure of 52. The recorded number of seizures for the 1st of May is a good deal higher, but it includes many cases which were discovered after the incidents at Garhshankar had broken down opposition. The mode of spread from village to village was, without question in the vast majority of cases, human agency, and probably in all others the importation of infected clothing, which must of course have been carried by human beings. The evidence that rats or other vermin spread the disease from house to house is strong, but it is not so clear that they carry it from one village to another, though Captain James does not reject the theory altogether. The practical conclusions to be drawn are, first, that a cordon, if perfectly efficient and established at once, should have the effect of checking the spread of plague to new areas, and secondly, that, as the disease can be carried throughout a village, after all human beings have left it, unless the seat of infection is discovered and dealt with at a very early stage, disinfection must in all but exceptional cases be complete and not confined to the infected houses and their neighbourhood. In point of fact the disease was carried to new villages in 26 instances before any cordon was established, and in 48 instances after the establishment of the cordon and in spite of it. The bearing of these facts will be further discussed below.

4. The Civil, Medical and Police staffs were steadily increased as the field of operations extended. In March the whole of the suspected area was entrusted to a separate observation agency, consisting of 10 European Officers, 5 Civil and 5 Medical, with a large subordinate staff, which replaced the 2 Commissioned Medical Officers who had originally been employed to seek out fresh centres of the epidemic; and Major Inglis, Deputy Commissioner, Hoshiárpur, was placed on special duty to supervise the whole field of operations under the immediate control of the Commissioner. At the beginning of May the staff employed on plague duty was constituted as follows:—

IN GENERAL CHARGE.

1 Deputy Commissioner on Special Duty.

OBSERVATION STAFF.

Civil.

4 Assistant Commissioners.
27 Tahsíldárs and Náib Tahsíldárs.
60 Kánúngos.

Medical.

4 Commissioned Officers.*
11 Hospital Assistants.
22 Compounders.
3 Female Practitioners.
22 Dháís.

EXECUTIVE STAFF.

Civil.

8 Assistant Commissioners.
6 Tahsíldárs or Náib Tahsíldárs.

Medical.

5 Superior Officers.†
52 Hospital Assistants.
27 Compounders.
7 Dháís.
5 Nurses.
3 Sanitary Inspectors.

POLICE.

1 District Superintendent of Police on Special Duty.‡
4 Assistant Superintendents of Police.
4 Inspectors.
27 Deputy Inspectors.
272 Sergeants.
2,564 Constables.

By this time the control and conduct of operations had been greatly facilitated by the establishment in the month of April of special postal arrangements and of a field telegraph line from the Railway at Phagwára through the infected tract *viâ* Banga to Garhshankar.

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* By May 7th there were 5.

† By May 9th there were 3 more.

[NOTE.—These figures include Commissioned Medical Officers, one officer of the Uncovenanted Medical Service, one Military Assistant Surgeon and one Private Practitioner.]

‡ Later on a second District Superintendent of Police was on Special Duty for a short period.

5. Mr. Silcock, Officiating Commissioner of Jullundur, has remarked in paragraph 6 of the letter with which he forwarded Major Inglis' report, on the inadequacy of the staff immediately before the additions were made to it which raised its number to that given in the preceding paragraph; he has said that at this time "no rules had been laid down for the systematic conduct of operations; that there was no sufficient definition or distribution of duties by which responsibility could be enforced; that the Police cordon was so defective as to be of very little use; that the branch concerned with the purchase and provision of huts and materials for shelter was being starved; and that finally there was, among the executive staff, very great hesitation and doubt how far evacuation of village sites should be insisted on and how far the disinfection of such sites should be pushed." The remarks on the subject of the Police cordon will be discussed below. With regard to the provision of huts and shelters the Lieutenant-Governor is not certain whether Mr. Silcock's strictures are directed against the scantiness of the funds provided; but if this is the meaning, they are hardly justified by the facts, for *carte blanche* was given to the local authorities in the matter of expenditure. No doubt there were difficulties in the collection of materials at the time when the discovery of fresh centres of disease was a daily occurrence; but they were not difficulties which a more liberal supply of funds could have averted. There were times of course when the staff available on the spot was weak for the duties to be done; but this was a necessary consequence of the rapid and sudden increase in those duties, and the difficulty of adjusting establishment to a constantly growing task. The formulation of rules and the definition and distribution of duties were necessarily deferred till experience had marked out the appropriate lines of action. General principles were laid down for the guidance of the staff; particular questions and particular difficulties were dealt with as they arose; and Sir Mackworth Young is of opinion that much would have been sacrificed by premature attempts to stereotype the system of Plague Administration in all its details. The work was emphatically one in which it was desirable for Government and its officers to feel their way; and it is only now when all the facts are accessible for comparison and deduction that it becomes possible, without forestalling a doubtful experience, to formulate certain definite conclusions.

6. In writing of the hesitation and doubt among the executive staff as to the extent to which operations were to be pushed, the Lieutenant-Governor believes Mr. Silcock to refer to a misunderstanding which arose after the issue on April 9th of certain instructions enjoining caution in the event of an outbreak of plague in any of the *large towns* of the Punjab. These instructions were addressed to Commissioners, and directed them to make a *report* to Government before enforcing *in any such town* any measure which would be likely to compromise the public peace. It is understood that the impression which was conveyed to the Plague staff on the communication to them of these orders by the then Commissioner was that remedial measures were everywhere, even in rural areas, to be subordinated to the consideration of preserving the public peace. At this time (on March 29th) the outbreak of plague in Garhshankar, a town of 6,000 inhabitants, had been recently discovered, and on April 10th the evacuation of the infected mohalla in that town was recommended by the Medical Officer. Orders were issued by Lieutenant-Colonel Massy, Commissioner, Jullundur, that evacuation was not to be enforced and that the policy of waiting for the people to be convinced by events was to be followed. Though Garhshankar was not one of those large towns for which the instructions already referred to had been designed, Sir Mackworth Young approved of these orders, on the understanding that the sick and their immediate connections were being removed, as only a portion of the town had been attacked, and it was desirable to give a fair trial to the system of persuasion with a view to possible contingencies in other towns of larger size. The policy of persuasion failed conspicuously: Garhshankar became the centre of a number of recusant villages, in one of which (Bhangal) an assault was made on the Plague officials sent to arrest some obstructive headmen; it was reported that the disease was gaining a serious hold on the town, and that dead bodies were being buried inside the houses; and on the 24th of April the Lieutenant-Governor telegraphed to Mr. Silcock, Officiating Commissio

discretionary authority to compel evacuation. Mr. Silcock at once asked for a similar discretionary authority in respect to other villages, when his attention was drawn by a telegram dated April 26th to the fact that he had misread the instructions, which were not applicable to rural areas. These are the facts on which Mr. Silcock has based his remarks regarding doubt and hesitation among the Plague staff. It will be seen that there was a misunderstanding, which doubtless led to such doubt and hesitation, but that it was a misunderstanding of short duration. The adoption of a conciliatory policy in the town of Garhshankar was deliberate, and it would serve no useful purpose now to enquire whether the disturbance which ultimately took place here might have been averted if there had from the outset been no hesitation in enforcing evacuation in the teeth of opposition.

7. From the second week in May the epidemic was on the wane. From the 8th to 9th of that month the number of daily attacks fell abruptly from 44 to 11, and never again rose higher than 13. Eight new villages were infected during May, 7 of them during the cool spell which occurred in the latter portion of that month, and there were a few cases, mostly of a mild type, in June and July. Early in the latter month large reductions were effected in the Plague staff. The Deputy Commissioner on Special Duty was withdrawn, and the direct supervision of the remaining measures entrusted to the Deputy Commissioners of Jullundur and Hoshiárpur respectively. The area under observation was considerably reduced and divided into three instead of five circles, with three Civil and one Medical Officer, and the executive staff, with the exception of the officers engaged in still uncompleted operations in recently affected villages, was withdrawn. There has never up to the present date been a complete cessation of operations; for, on July 23rd and 24th, 4 mild cases of plague were discovered at the village of Aur, to which reference will again be made; in the course of August there were cases at Garhi and Sirhál Qázián, both of which had suffered and been freed from the disease at an earlier period, and also at Dosanj Kalán; at the end of September and beginning of October there were outbreaks of a serious, but not fatal,* kind at Kariam in Jullundur, and Majra-Dingrián in Hoshiárpur; and from October 31st to November 2nd there have been 3 cases with no deaths among the coolies employed in disinfection work at the former place. On November 15th and 16th five cases† were discovered in the Municipal town of Ráhon (population 10,667), showing that the poison is not extinct.

8. The cost, direct and indirect, of the operations up to the end of June has been given by the Accountant-General, Punjab, at Rs. 2,11,377, including the salaries of officers and subordinates and their travelling and other allowances, and the pay of chaukídárs substituted for the Police withdrawn for plague duty; but this sum does not include the expenditure from the District Funds of Jullundur and Hoshiárpur. The total cost up to the end of September was probably but little short of four lakhs; but a portion of this expenditure would have been incurred even if there had been no operations against plague.

9. It is certain that the virulence of the epidemic varied not only at different periods, but also in different localities, and these variations cannot be shown to have been due to differences in the system of dealing with the disease. They show themselves partly in the proportion of the inhabitants of different villages who were attacked, and partly in the local percentages of deaths to attacks. Thus in the two small villages of Lakhpur and Núrpur, in which outbreaks occurred within three days one of the other, the percentage of attacks to the population, as recorded at the first roll-call, was, in the one 7·4, in the other 3·93, and that of deaths to attacks 74 and 59 respectively. The differ-

*Though no deaths from plague were recorded either at Kariam or Majra-Dingrián, one death which occurred at the former place before the discovery of plague there is suspected to have been due to plague. Among the five cases at Ráhon there have been three deaths.

†Two more cases at Rahon were reported on December 20th while these remarks were passing through the Press.—H. J. M.—21·12·98.

ences are not to be explained by differences in the period which elapsed before evacuation, for at Lakhpur this only amounted to 13 days, and at Núrpur to 11; nor by reinfection after evacuation, for whereas in the more gravely affected village the last case occurred 12 days after evacuation, in the more slightly affected one the interval was as long as 37 days. Similar illustrations might be multiplied indefinitely. Hapowál, a village with Hindu Játs as its predominating element, which was evacuated 17 days after the first case (not immediately, as is erroneously shown in the tabular statement on page 118 of Captain James' Report), had a percentage of attacks of only 2·2, while only 23 per cent. of those attacked died; whereas Dahan, another Hindu Ját village, which was attacked five days earlier and evacuated eight days after the first case, had 8·7 per cent. of its population attacked, with a death-rate among the sick of 74 per cent. To show how the virulence of the epidemic had diminished in its closing phases it is sufficient to instance the cases of Bhaura and Jhingrán, where the outbreak occurred on May 1st and April 28th, and the delay in evacuation was 25 and 28 days respectively. The percentage of attacks was 06 and 1, and that of deaths 50 and 54, while Lodipur, a village of similar size, which was attacked in the middle of February, and was evacuated after a delay of 24 days, had a percentage of attacks of nearly 4 with a death-rate of 67. Later on, when Aur, Kariam and Majra-Dingrián were attacked, no deaths occurred. The Commissioner of Jullundur has instanced the case of Laroya, where the death-rate was 77 calculated on the somewhat small number of 13 cases, to show that the disease was not less virulent in its later stages; but the first case at Laroya seems to have occurred on April 21st. Garhshankar, which is another of his instances, was infected on March 23rd: Garhi, though not reported till April 20th, was possibly attacked at an earlier date: while Kariha seems to have had its first case as early as April 5th.

Analysis of measures.

10. The measures taken for the eradication of the disease and the prevention of its spread group themselves under the following heads:—

I.—Discovery of outbreaks;
II.—Isolation of infected village;
III.—Evacuation of infected site;
IV.—Disinfection of site;

together with the important subsidiary measures of—

V.—Medical treatment of sick;
VI.—Prophylactic inoculation;
VII.—Inspection, detention and disinfection at Railway Stations.

These subjects will be treated in their order in the paragraphs which follow.

I.—Discovery of outbreaks.

11. In connection with the discovery of outbreaks it must be noted that concealment, though sometimes deliberate, has not always been so. When plague first makes its appearance in a new area it is not readily recognized by the people, and in its non-bubonic form at all events it is often difficult for a medical man to diagnose it correctly. There can be no doubt that the people of Khatkar Kalán were ignorant of the nature of the disease which had established itself among them till the occurrence of four deaths in one day roused their alarm, when they at once drew the attention of the authorities to what was happening. This difficulty of obtaining the recognition of plague at its first onset is a serious danger, and it shows the importance of very close attention to all indications of unusual mortality in any locality so long as the disease continues to exist in India.

12. On the assumption that the germs of infection are generally, if not always, imported by human agency, orders have for some time been in force in the Punjab under which lists of new arrivals from suspected localities and of places known to have relations with such localities are maintained by the Police. The object of this system is to provide for immediate and careful

enquiry into cases of death and illness occurring among persons who have recently been in a plague-stricken neighbourhood or in places where such persons are likely to be found. It furnishes an important means of self-protection to free areas, and the orders in respect to it were in force throughout the epidemic of 1897-98, and remain in force still, as against all suspected areas whether within or without the Province. No cases are known to have been discovered by its means; but no cases outside the infected tahsíls are known to have occurred.

13. Deliberate concealment in the Jullundur and Hoshiárpur Districts was combated by a system of punishments and a system of rewards. Under Punjab Government Notification No. 352, dated 8th March 1897, which was afterwards superseded by No. 490, dated 23th March 1898, certain persons are bound to report to the Police the occurrence of cases of bubonic plague. This obligation rests upon the eldest adult male residing in the house where the case occurs, upon serái-keepers and their servants, upon medical practitioners, upon Municipal Commissioners and Municipal servants, and upon village lambardárs and chaukídárs, Kánúngos and Patwárís, Police officers, jágírdárs, máfidárs and pensioners. Violation of the rule is punishable under the Epidemic Diseases Act; and a few lambardárs were sentenced to imprisonment and fine for failing to report cases which had occurred in their villages. It is observed that there is some difference of opinion as to the effect of these successful prosecutions, and that some officers are of opinion that they operated mischievously by closing the mouths of the people. It appears to the Lieutenant-Governor that Mr. Silcock is right in holding that prosecutions for concealment should be instituted only in exceptional cases, at all events in dealing with rural outbreaks. They stand on a footing different from that occupied by prosecutions for violation of the cordon or breach of orders, not because these offences are necessarily more injurious to the Plague Administration, but because they present themselves in a different light to the people; and the enlistment of general sympathy with the measures for the eradication of the disease is among the most important of the objects to be achieved. There is also the practical consideration to which Major Inglis has drawn attention, that the time when plague is in a village is not the time for imprisoning the headman through whom the plague officials work.

14. On the 4th of March,* when the spread of the disease was becoming serious, it was decided to pay a reward of Rs. 50 for each authenticated report of the first case in a newly infected village; and this system in the opinion of all the officers best qualified to judge gave valuable results, though it was discovered by the Commissioner early in June that great delay had taken place in the payment in several cases, a circumstance which must have deprived the stimulus of some of its effect. The system was suggested by one adopted in a portion of the Bombay Mufassil, where, however, the amounts paid appear to have been too small to form any inducement to informants; and it is understood that something similar was done in the town of Leicester in the United Kingdom in dealing with a threatened epidemic of small-pox there in 1884, though it is not known that the reward in this instance was claimable by any person other than the householder in whose family an attack occurred. Lieutenant Walton, I. M. S., has drawn attention to the ill-feeling which the grant of rewards has in some instances aroused between neighbouring villages; but this would presumably have existed even if the information had been given without the stimulus of a reward, and it is an absolute essential that information should be obtained. The idea that rewards would disgust and alienate the better classes was entirely refuted by experience; for in most cases it was by the more prominent and well-to-do that they were claimed. A charge was brought against a Municipal Commissioner of Banga of having brought a case of plague into the town expressly for the purpose of claiming the reward, but was disproved; and it is evident that in a rural village where each vidual and his antecedents are known to every one else, such clandestine portations could not escape disclosure, while general connivance at an act

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* Not in February, as stated by Major Inglis.

which would bring so much trouble on the community is clearly out of the question. There is more force in the suggestion that the offer of large rewards arouses suspicion of the motives of Government; for it must be recollected that the people, and more particularly those at a distance from the actual operations, were prepared to believe not only that plague patients were being poisoned in the hospitals, but that deliberate efforts were being made to spread the disease. On the whole, the Lieutenant-Governor is of opinion that the dangers arising out of such false impressions must be faced, and the right way to face them is not to abstain from useful measures merely on the ground that they may be grossly misrepresented, but to persevere in the hope that tact and devotion will hold the field against ignorance and suspicion.

15. From a very early stage in the outbreak two Medical Officers, each assisted by a Hospital Assistant, were employed in touring in the neighbourhood to examine the registers of deaths which are maintained by the village watchmen, to follow up all indications of the presence of disease and investigate suspicious cases. In March this elementary Observation Agency was widened by the appointment of three more Medical and five Civil Officers to supervise systematic enquiries over the whole of the suspected tract. The basis of the system was the preparation of a nominal roll of inhabitants and absentees by the regular Patwáris, under the control of a large special staff of Kánúngos and Náib-Tahsíldárs. There was one Kánúngo to every four or five Patwár Circles, and one Náib-Tahsíldár to every two Kánúngos. An attempt was made to attach to each Naib-Tahsíldár one male and one female medical subordinate for the diagnosis of cases, but the number, especially of female practitioners, fell below this standard. The system in the form which it first took was that the whole village was inspected in front of the Inspecting Officer when he made his visit, each individual being medically examined and enquiries made into the case of each absentee. Later on it was found that these roll-calls were not efficacious owing to the facility with which absentees could be personated; that they were a fruitful cause of vexation, particularly in villages too far removed from actual centres of disease to realise the imminence of danger; and finally that the Observation Staff achieved its results not by making actual discoveries either by roll-calls or house-to-house search, but by providing a regular and ubiquitous agency for the reception of reports and for the following up of those clues which indicated the need of concentrating attention on specially suspicious centres. Under these circumstances the system of roll-calls by the Observation Staff was abandoned except for the occasional verification of reported outbreaks; and it became merely a visiting agency, a collector of information and a constant reminder to the people that information was expected. In this capacity there can be no doubt that it achieved most useful results with little annoyance.

16. There is some difference of opinion as to the nature of the agency which should be employed in work of the character referred to in the last foregoing paragraph, and some officers would increase the professional element while others would diminish it. The position, if the Lieutenant-Governor understands it correctly, is this: that bubonic plague in its more obscure forms almost defies diagnosis even by the most high skilled medical agency without prolonged and elaborate bacteriological investigations, while in its simpler and more obvious forms it is fairly easily recognizable from the symptoms, and an unprofessional man after a short experience of the disease is likely to identify it correctly in the majority of cases. The supply of the superior class of Medical Officers is strictly limited, and it is essential to economise it by confining them to those functions for which a professional agency is indispensable; while the medical subordinate is hardly better qualified to diagnose the disease than a non-professional man with some experience of its symptoms. The practical conclusion seems to be that the Observation Agency should be mainly non-medical, though it should include as large as possible a proportion of dháis or other female, practitioners for the purpose of dealing with purdah women, and arrangements should be available for calling in the assistance of the best medical opinion where diagnosis is doubtful. These are the principles on which the reduced Observation Agency has been constituted since July last. The area under suspicion is

divided into circles, each supervised by a Civil Officer, and there is one Commissioned Medical Officer available in cases of doubtful diagnosis, but employed in the meanwhile in executive measures.

17. Sir Mackworth Young is unable to accept without question the view put forward by Mr. Silcock and Major Inglis that officers of the Kánúngo class should not be employed on Observation duty. The Kánúngo has a recognized place in the ascending series of revenue functionaries, intermediate between the Patwári and the Náib-Tahsíldár and Tahsíldár: and it is not possible to eliminate him altogether from the work of supervision without casting an undue burden upon the officer immediately above him. The idea which lies at the base of the system of observation is the utilization of the revenue agency with improved and increased supervision to fit it for the discharge of a specially delicate duty, and the preliminary work is of the nature of a census for which revenue functionaries of all grades have a special aptitude and a special experience. The Lieutenant-Governor is satisfied that the arrangement by which one Kánúngo was provided for the supervision of four or five Patwáris, and one Tahsíldár or Náib-Tahsíldár for the supervision of two Kánúngos, was suitable at the time when Observation operations extended over a large and strongly suspected tract, and that it would have been absolutely impossible for the Tahsíldárs or Náib-Tahsíldárs to do their work properly without the help of an intermediate agency such as the Kánúngos supplied. That these officers were not considered to be entirely useless is clear from the long list which Major Inglis has given of Kánúngos whose work was such as to merit approbation. The Lieutenant-Governor takes this opportunity of saying that the arrangement by which the Tahsíldárs and Náib-Tahsíldárs were unprovided with tents and left to find "somewhere to live in" near the centre of their circles, was not a good one. Application should have been made for the supply of tents to these officers.

18. Recourse has been had to the system of house-to-house inspection generally with the object of verifying suspicions created by rumours of the existence of plague, but it is not known that any discoveries have been made by its means. Corpse inspection was tried, but there are many considerations which make against it. The non-bubonic variety of plague is never discoverable by its means. The supply of Medical Officers with the qualifications for accurate diagnosis is small. Corpses from a number of villages over a large rural area could not be brought into a single centre for examination, even if there were no danger of spreading disease by this means. Female corpses cannot be examined otherwise than by female practitioners of whom there are few and those few mostly ill-qualified. Finally, the system cannot be carried out without delay and interference or fancied interference with necessary rites, and probably as a rule its results are not worth its dangers, though it may properly be utilized, in highly suspicious cases, as an alternative to which the relatives of a deceased person may submit in preference to having action taken on the assumption that plague was the cause of death.

19. The results obtained by the measures for the discovery of outbreaks are shown in the second column of the tabular statement which is appended to these remarks. The delay in detection was worst at the beginning of the epidemic, when organization was incomplete or altogether lacking, and at the end of it when the disease was assuming a milder and perhaps less obtrusive and easily recognizable form. In the 13 villages in which the first cases are recorded to have occurred in February, the period before discovery averaged 11½ days. In the 23 villages in which the original outbreak has been referred to the month of March, when the system of rewards was introduced and the expanded Observation Agency began to get into working order, the average period was 9 days. For the 24 villages in which the first case has been traced to April it was 7½ only, although in 3 of the 24 (Chokran, Laroya and Jhingran) taken alone it was as high as 26.

II.—Isolation of infected village.

20. The most important of the measures taken for the isolation of infected villages was the establishment of a Police cordon. So long as the number of centres was small each village was separately cordoned, the sentries being stationed along the boundary of the village lands during the day so as to allow free access to the fields, and drawn in round the camps at night. Later on the practical exhaustion of the resources of the Police Department by the employment of over 2,800 men on this duty compelled recourse to the plan of cordoning blocks of infected villages with no attempt at cutting off intercommunication between them. The strength of the cordons varied from time to time, but was ultimately fixed at 24 per mile so as to allow of three reliefs of 8 per mile. Whether it would be worth while in the event of another rural epidemic greatly to increase this strength in the villages first attacked in the hope of completely stamping out the infection in its beginnings would be a question for consideration. In some cases, but not in all, there were additional cordons round the village site to prevent the people in the camps from surreptitiously re-entering their infected houses. The desirability of these second cordons is a moot point. On the one hand, the number of available Police is limited, and constables in the immediate neighbourhood of the site are specially liable to infection, and specially subject to temptation or to charges of having succumbed to it. On the other hand, it appears to be impossible to trust the villagers not to return occasionally to their houses, if there is no cordon at all or only a cordon established by themselves, as the dangers of the village site before disinfection are not realized.

21. Except in the one village of Mokandpur, where a delay of two days occurred, the cordon was in every instance established as soon as the disease was discovered, though it was not always practicable to give it its full strength from the outset. A strong reserve was maintained near the infected area, but this was very rapidly depleted at the time that the disease was at its worst, and reinforcements had to be brought up from the most remote districts of the Province. The mobilization of these reinforcements was effected with remarkable rapidity and reflected great credit on the organization of the Department. A force of 1,000, about 5 per cent. of the total strength of the Provincial Police, was withdrawn from the districts without the provision of substitutes, and nearly 2,000 more were found by replacing constables in rural thánas by village watchmen and by engaging watchmen in place of a proportion of the Municipal and Cantonment Police. The strain on the Police Administration which these demands involved was no doubt considerable, particularly as there was a simultaneous, though far smaller, drain for the protection of military lines of communication and for the guarding of overcrowded jails. But no difficulties were raised or suggested, and the cordial co-operation of the Inspector-General, Colonel Tucker, C.I.E., and his subordinates greatly facilitated the task of coping with the outbreak.

22. Major Inglis has remarked on the small number of British Officers available for duty with the Police, and has expressed the opinion that this circumstance rendered proper supervision impossible. No doubt there were considerable difficulties in the maintenance of discipline in so large a force collected from many districts and split up into numerous small camps, but they were difficulties which experience and the introduction of method and system would be likely to some extent to overcome. One weak point in the arrangements which were adopted seems to have been this: that Civil Officers, with no previous experience of such matters to help them, were required to organize supplies of food and hutting materials for nearly 3,000 men, under the exceptional ordinary circumstances created by the interference with the ordinary course of trade and travel which the plague measures rendered necessary. As a practical Inglis has observed, these were functions which on any future similar occasion might appropriately be made over to officers of the Police Department, medical, more likely to know the needs of their own men and to have some of the female, required for the proper discharge of such duties. The attention of the Inspector-General of Police will be drawn to these remarks.

23. The number of cases in which infection was carried through the cordon after it had been established has already been noted. But, as has been very pertinently remarked in the course of the reports under review, to argue from this against the establishment of cordons is to confound imperfection with uselessness. In every village no doubt there are a certain number of people who do not particularly wish to leave and who would be sufficiently deterred from doing so by a simple order prohibiting departure. There are others whose motives for leaving are so strong that they would be deterred by nothing short of the Astrachan system of a triple military cordon armed with ball-cartridge, and perhaps not even by that. But between these two classes there are numbers who have business elsewhere, or friends or relatives to visit, and who would certainly leave if nothing were done to stop them, but may be deterred by the reflection that there is a cordon to be passed. Even if the Police took money to allow people to pass, as was freely alleged against them, the fact that there was a toll to be paid and the chance of running across an honest constable or a vigilant officer must have diminished the number of those who crossed the cordons. When it is remembered that each evasion may mean the establishment of a fresh centre of disease which may multiply itself ten or a hundred fold in as many days, the practical advantage of stopping even a moderate proportion of those who would otherwise travel from infected to uninfected places will be at once apparent.

24. In a town the facilities for oppression and extortion which cordon duty would give might be considerable, unless the publicity of crowded places acted as a countervailing influence. But in the villages of the plague-stricken tract the Police were rarely in immediate contact with the people and had no functions except that of guarding the line. There were a few cases in which they came into collision with the villagers, but on the whole their conduct was excellent, and the Lieutenant-Governor is decidedly of opinion that their presence contributed largely to the prevention of the further and wider spread of infection. It has been suggested that military cordons would be preferable owing to the superiority of the discipline of troops and the large proportion of European officers attached to them; but though in the event of a widely extended epidemic it might be necessary to ask for military assistance to supplement the Police (and this was at one time contemplated in the Punjab), Sir Mackworth Young's inclination would be to trust, in preference, to the establishment of cordons by the people themselves, when the resources of the Police Department were exhausted.

25. Though Mr. Silcock's view to which he has given expression when writing of the arrangements in force up to the second half of April, that "the Police cordons were so ineffective as to be of very little use" seems to overshoot the mark, it must be remembered that in March and part of April the high crops must greatly have facilitated the evasion of the cordons, and it is probable that in the early stages of the operations they were less efficient than they became after more experience had been gained—a fact which may have been due in part to the absence of definite instructions such as those which were promulgated later on. The proper course no doubt is to order the Police to allow no one to pass the line except superior officers and nurses and persons accompanying them, and pass-holders; and, as practically all constables are illiterate, all passes except those of which the colour indicates them to be permanent should be given up at the time of passing the cordon. The power to give passes should be conferred freely on responsible officers both Civil and Medical in order to viate unnecessary obstruction of persons on duty such as appears occasionally ave occurred.

easu6. It is important even in rural areas to provide means by which to hwho have urgent business requiring them to leave the infected centres In the saved from the temptation to violate the cordon. This was furnished of Mairantine camps, the largest of which was formed near Bahram, a Observarly half-way between Banga, the practical centre of the infected 9 days. hagwára, a station on the North-Western Railway, with which it was ted by a metalled road. In these camps persons underwent ten days' taken al and a final disinfection, after which they were furnished with a

certificate and allowed to leave. Not many people availed themselves of this means of getting away on business, but the camps were useful also for officials and Police under orders of transfer elsewhere and for prisoners whom it was necessary to remove to head-quarters. Something was done to lessen the strength of the motives for cordon breaking by providing subsistence for persons cut off from their ordinary means of livelihood, by importing through the agency of the Tahsíldár necessary stores of provisions and miscellaneous supplies, and by arranging for the cultivation of lands held outside village limits by cordoned agriculturists, for the institution of civil suits on claims nearing limitation in the courts of the officers in charge of the operations, for the postponement of cases in other courts in which residents of cordoned villages were concerned, and for the sale of stamps and preparation and registration of deeds on the spot. The functions of the Post Office within the infected villages were discharged by the Plague Staff; and extension of leave was obtained for sepoys resident in them. Uninfected villages were encouraged to protect themselves by posting chaukídárs to keep out outsiders. In order to effect the partial isolation of the whole of the suspected area the Head-quarters Punjab Command, the Educational authorities and other Deparments were warned against allowing persons under their control to visit it; the Courts of the Munsifs of Nawashahr and Garhshankar were closed except for the reception of plaints; the whole tahsíl establishment at the latter place was transferred to Mahalpur, 12 miles to the north; and fairs located within the three dangerous tahsíls or at places to which persons would be likely to travel *viâ* infected routes were prohibited. The crossing of the Sutlej between Phillour and Rúpar was forbidden to all except Government servants on duty and persons holding a permission from a 1st Class Magistrate; posts for the inspection, detention and disinfection of travellers were established on the line of railway, to which further reference will be made below; and the transportation by rail of used apparel and bedding, except the personal luggage of travellers, from all stations between Jullundur and Ludhiána, was prohibited.

III.—Evacuation of infected site.

27. Some valuable remarks have been recorded by Captain James, I.M.S., on the selection of ground for camps and the construction and arrangement of them. For every village there should, as provided in Punjab Government Resolution No. 43, dated 11th January 1898, be three classes of camps,—first, the hospital camp for those suffering from plague, to which may be admitted a small number of the friends and relatives of those attacked, in close proximity to the actual hospitals if actual hospitals are established; secondly, the segregation camp, in which the people though not attacked come from infected mohallas or the vicinity of the infected houses; and thirdly, the health camp. There is no objection to having as many separate camps of each class as may be convenient; it is generally undesirable to mix up different castes together; and always difficult to control camps of unmanageable size. A useful note on the subject of the construction of huts by Mr. Gracey, Assistant Commissioner, is incorporated in Major Inglis' report. The best system in the Lieutenant-Governor's opinion is that which was adopted at the outset of the operations: to encourage the people to put up their own huts, to help them with materials, and to allow them to build as they please, subject to necessary regulations regarding the space to be occupied, the distances between the structures and the maintenance of proper passages. There is no reason why huts and materials for huts should not be supplied as freely as possible by the plague staff to those who need them, but it would be a false step to admit any obligation to do so or to allow the idea to arise that the absence of huts justifies delay in evacuation; for in the event of a sudden and great increase in the number of centres of disease Government would find it impossible to provide accommodation, if the people themselves remained apathetic. Captain James, I. M. S., has remarked that the huts made by the villagers may be and usually are more comfortable than the Government ones, and this in itself is a strong argument in favour of encouraging voluntary construction, since everything which diminishes the discomforts of the encampment tends to the more cordial acceptance of plague measures. The fact that privately-made huts admit less light and air is no doubt unfavourable to the

early extermination of the infection, but it does not outweigh their practical advantages, even if it be impossible to insist on such a mode of construction as secures free ventilation. The difficulties which arise from the burning of huts made by individuals for themselves would have to be met by a judicious apportionment of compensation when timber or agricultural implements have been used in the construction.

28. The extent of the delay which occurred in arranging the evacuation of villages after the discovery of the disease in them is shown in the fourth column of the statement in the Appendix to these remarks. So far as the 48 villages of the Banga Administrative Circle are concerned the causes of such delays as occurred have been explained in a report submitted by Mr. Gracey, Assistant Commissioner. In some cases of course, as in the town of Banga and the large village of Mokandpur, evacuation was a gradual process, each mohalla being emptied in succession as it was attacked. In some cases, particularly during the heavy rain which fell in February, the inclemency of the weather, and in some others the want of a sufficient supply of huts occasioned delay. The opposition of which the town of Garhshankar became the centre about the middle of April accounts for the interval which elapsed before evacuation in such villages as Kariha and Pirágpur. Generally speaking, although there were departures from the system, as at Hájipur where special difficulties were created by deficiencies in the water-supply, the attempt was made to arrange for the evacuation of each village as early as possible after the discovery of the first case, until the later stages of the epidemic when it was decided to wait as a rule till the occurrence of the second case, only the infected family being removed and segregated in the meanwhile. From the purely sanitary standpoint there can be no question that the best course is to require the evacuation of the whole village; and it must always be borne in mind that one of the reasons for evacuation is that disinfection, which alone can kill the germs of the disease, cannot be complete or perfect otherwise. But practical considerations may outweigh the advantages of unhesitating promptitude, particularly when work is growing and the staff has a difficulty in keeping pace with it; and Sir Mackworth Young does not consider that the rule requiring evacuation when a second family has been attacked, is an unduly liberal one. Of course if immediate discovery of the fisrt case at the earliest moment could be depended upon, it would be possible to make further concessions, as stringent measures with the known centres of infection would under these circumstances suffice; but experience, Sir Mackworth Young fears, has shown that this condition is not likely to be fulfilled, and that there is always a probability that rats or other vermin have carried the poison to some other house before the plague staff can get to work.

29. On pages 118 to 121 of Captain James' Report are two tabular statements illustrating the effects of the evacuation of the village site on thecourse of the epidemic. It has, of course, never been contended that removal exercises any remedial influence on plague actually present or incubating in the individual; and it is not expected to produce either a diminished mortality among the actual sufferers at any time, or a fall in the number of seizures before a sufficient period has elapsed to allow the disease to develop in all persons who may have contracted it before leaving the village. The time of evacuation is, indeed, in one respect a specially dangerous one; for when people leave their houses and remove their property, they handle articles in which the germs of disease may be lying dormant, and disturb dust, which is always a potent vehicle of infection. Further, if the removal takes place, as it generally did, while the disease is still on the increase, the figures for the first few days spent in camp will naturally show an upward tendency. Under these circumstances it is in the number of attacks after the people have been in camp for a period equal to the average period of incubation that the results of the evacuation of the site can best be traced. The period of incubation cannot of course be determined with certainty, though Captain James thinks that it varies from two to eleven days, and that the great majority of the sufferers were attacked between the second and fifth days.

30. Apart from this, there is another consideration to be borne in mind when comparing the figures for the periods before and after evacuation has had

certificate and allowed to leave. Not many people availed themselves of this means of getting away on business, but the camps were useful also for officials and Police under orders of transfer elsewhere and for prisoners whom it was necessary to remove to head-quarters. Something was done to lessen the strength of the motives for cordon breaking by providing subsistence for persons cut off from their ordinary means of livelihood, by importing through the agency of the Tahsíldár necessary stores of provisions and miscellaneous supplies, and by arranging for the cultivation of lands held outside village limits by cordoned agriculturists, for the institution of civil suits on claims nearing limitation in the courts of the officers in charge of the operations, for the postponement of cases in other courts in which residents of cordoned villages were concerned, and for the sale of stamps and preparation and registration of deeds on the spot. The functions of the Post Office within the infected villages were discharged by the Plague Staff; and extension of leave was obtained for sepoys resident in them. Uninfected villages were encouraged to protect themselves by posting chaukídárs to keep out outsiders. In order to effect the partial isolation of the whole of the suspected area the Head-quarters Punjab Command, the Educational authorities and other Deparments were warned against allowing persons under their control to visit it; the Courts of the Munsifs of Nawashahr and Garhshankar were closed except for the reception of plaints; the whole tahsíl establishment at the latter place was transferred to Mahalpur, 12 miles to the north; and fairs located within the three dangerous tahsíls or at places to which persons would be likely to travel *viâ* infected routes were prohibited. The crossing of the Sutlej between Phillour and Rúpar was forbidden to all except Government servants on duty and persons holding a permission from a 1st Class Magistrate; posts for the inspection, detention and disinfection of travellers were established on the line of railway, to which further reference will be made below; and the transportation by rail of used apparel and bedding, except the personal luggage of travellers, from all stations between Jullundur and Ludhiána, was prohibited.

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certificate and allowed to leave. Not many people availed themselves of this means of getting away on business, but the camps were useful also for officials and Police under orders of transfer elsewhere and for prisoners whom it was necessary to remove to head-quarters. Something was done to lessen the strength of the motives for cordon breaking by providing subsistence for persons cut off from their ordinary means of livelihood, by importing through the agency of the Tahsíldár necessary stores of provisions and miscellaneous supplies, and by arranging for the cultivation of lands held outside village limits by cordoned agriculturists, for the institution of civil suits on claims nearing limitation in the courts of the officers in charge of the operations, for the postponement of cases in other courts in which residents of cordoned villages were concerned, and for the sale of stamps and preparation and registration of deeds on the spot. The functions of the Post Office within the infected villages were discharged by the Plague Staff; and extension of leave was obtained for sepoys resident in them. Uninfected villages were encouraged to protect themselves by posting chaukídárs to keep out outsiders. In order to effect the partial isolation of the whole of the suspected area the Head-quarters Punjab Command, the Educational authorities and other Deparments were warned against allowing persons under their control to visit it; the Courts of the Munsifs of Nawashahr and Garhshankar were closed except for the reception of plaints; the whole tahsíl establishment at the latter place was transferred to Mahalpur, 12 miles to the north; and fairs located within the three dangerous tahsíls or at places to which persons would be likely to travel *viâ* infected routes were prohibited. The crossing of the Sutlej between Phillour and Rúpar was forbidden to all except Government servants on duty and persons holding a permission from a 1st Class Magistrate; posts for the inspection, detention and disinfection of travellers were established on the line of railway, to which further reference will be made below; and the transportation by rail of used apparel and bedding, except the personal luggage of travellers, from all stations between Jullundur and Ludhiána, was prohibited.

III.—Evacuation of infected site.

27. Some valuable remarks have been recorded by Captain James, I.M.S., on the selection of ground for camps and the construction and arrangement of them. For every village there should, as provided in Punjab Government Resolution No. 43, dated 11th January 1898, be three classes of camps,—first, the hospital camp for those suffering from plague, to which may be admitted a small number of the friends and relatives of those attacked, in close proximity to the actual hospitals if actual hospitals are established; secondly, the segregation camp, in which the people though not attacked come from infected mohallas or the vicinity of the infected houses; and thirdly, the health camp. There is no objection to having as many separate camps of each class as may be convenient; it is generally undesirable to mix up different castes together; and always difficult to control camps of unmanageable size. A useful note on the subject of the construction of huts by Mr. Gracey, Assistant Commissioner, is incorporated in Major Inglis' report. The best system in the Lieutenant-Governor's opinion is that which was adopted at the outset of the operations: to encourage the people to put up their own huts, to help them with materials, and to allow them to build as they please, subject to necessary regulations regarding the space to be occupied, the distances between the structures and the maintenance of proper passages. There is no reason why huts and materials for huts should not be supplied as freely as possible by the plague staff to those who need them, but it would be a false step to admit any obligation to do so or to allow the idea to arise that the absence of huts justifies delay in evacuation; for in the event of a sudden and great increase in the number of centres of disease Government would find it impossible to provide accommodation, if the people themselves remained apathetic. Captain James, I. M. S., has remarked that the huts made by the villagers may be and usually are more comfortable than the Government ones, and this in itself is a strong argument in favour of encouraging voluntary construction, since everything which diminishes the discomforts of the encampment tends to the more cordial acceptance of plague measures. The fact that privately-made huts admit less light and air is no doubt unfavourable to the

early extermination of the infection, but it does not outweigh their practical advantages, even if it be impossible to insist on such a mode of construction as secures free ventilation. The difficulties which arise from the burning of huts made by individuals for themselves would have to be met by a judicious apportionment of compensation when timber or agricultural implements have been used in the construction.

28. The extent of the delay which occurred in arranging the evacuation of villages after the discovery of the disease in them is shown in the fourth column of the statement in the Appendix to these remarks. So far as the 48 villages of the Banga Administrative Circle are concerned the causes of such delays as occurred have been explained in a report submitted by Mr. Gracey, Assistant Commissioner. In some cases of course, as in the town of Banga and the large village of Mokandpur, evacuation was a gradual process, each mohalla being emptied in succession as it was attacked. In some cases, particularly during the heavy rain which fell in February, the inclemency of the weather, and in some others the want of a sufficient supply of huts occasioned delay. The opposition of which the town of Garhshankar became the centre about the middle of April accounts for the interval which elapsed before evacuation in such villages as Kariha and Pirágpur. Generally speaking, although there were departures from the system, as at Hájipur where special difficulties were created by deficiencies in the water-supply, the attempt was made to arrange for the evacuation of each village as early as possible after the discovery of the first case, until the later stages of the epidemic when it was decided to wait as a rule till the occurrence of the second case, only the infected family being removed and segregated in the meanwhile. From the purely sanitary standpoint there can be no question that the best course is to require the evacuation of the whole village; and it must always be borne in mind that one of the reasons for evacuation is that disinfection, which alone can kill the germs of the disease, cannot be complete or perfect otherwise. But practical considerations may outweigh the advantages of unhesitating promptitude, particularly when work is growing and the staff has a difficulty in keeping pace with it; and Sir Mackworth Young does not consider that the rule requiring evacuation when a second family has been attacked, is an unduly liberal one. Of course if immediate discovery of the fisrt case at the earliest moment could be depended upon, it would be possible to make further concessions, as stringent measures with the known centres of infection would under these circumstances suffice; but experience, Sir Mackworth Young fears, has shown that this condition is not likely to be fulfilled, and that there is always a probability that rats or other vermin have carried the poison to some other house before the plague staff can get to work.

29. On pages 118 to 121 of Captain James' Report are two tabular statements illustrating the effects of the evacuation of the village site on thecourse of the epidemic. It has, of course, never been contended that removal exercises any remedial influence on plague actually present or incubating in the individual; and it is not expected to produce either a diminished mortality among the actual sufferers at any time, or a fall in the number of seizures before a sufficient period has elapsed to allow the disease to develop in all persons who may have contracted it before leaving the village. The time of evacuation is, indeed, in one respect a specially dangerous one; for when people leave their houses and remove their property, they handle articles in which the germs of disease may be lying dormant, and disturb dust, which is always a potent vehicle of infection. Further, if the removal takes place, as it genera[illegible] did, while the disease is still on the increase, the figures for the first few da[illegible]ent in camp will naturally show an upward tendency. Under these circum[illegible]es it is in the number of attacks after the people have been in camp [illegible] period equal to the average period of incubation that the results of the evacu[illegible] of the site can best be traced. The period of incubation cannot of course be d[illegible]ined with certainty, though Captain James thinks that it varies from two to e[illegible]n days, and that the great majority of the sufferers were attacked between the second and fifth days.

30. Apart from this, there is another consideration to be borne in mind when comparing the figures for the periods before and after evacuation has had

time to take effect. There are dangers of reinfection and influences which partially neutralise for a time the good results of the move. As has been already pointed out, many carry the disease in their systems when they go out, and some of these probably pass it on to others while in camp. A certain amount of property, including such specially susceptible articles as clothes and bedding, is carried out from the village, and although it is a counsel of perfection that all persons and all property should be disinfected at the time of evacuation or as soon after it as possible, this process is a lengthy one and the staff generally has its hands too full to undertake it; while, admitting the value of evacuation as a means of checking spread, it would clearly be unjustifiable to keep the people or some of them inside the village till arrangements for the disinfection of them and their belongings could be effected. It follows that even the health camps contain from the outset the possible germs of disease, though they exist there under conditions less favorable to spread than in the ill-ventilated and ill-lighted houses in the village site, and that these germs may establish a new, though more precarious, home in a new soil. Again, the heavier and more bulky articles of property and the large stores of grain are necessarily left in the houses to be disinfected when the cleaning of the village begins. This circumstance and the occasional inclemency of the weather, particularly when rain falls, are standing temptations to an unthinking people to pay surreptitious visits to the seat of the danger, and no second cordon round the actual site of the village, whether of police or of villagers, will entirely stop these visits. There are moreover other communications between the site and the camps, which are necessarily permitted by authority. People must occasionally go in to fetch necessary articles which have been left behind: or to turn over and expose to the cleansing rays of the sun their stores of grain. A disinfecting gang must be organized among the village menials, and whatever precautions may be taken here lies another danger of the reimportation of the infection into the camps. Finally it is desirable to allow the owners to be present in the village when their property there is exposed for disinfection, even if not to take part in the actual operations or at least in the final process of white-washing.

31. Beside the establishment of site cordons (which may or may not be effectual and may or may not be practicable) and the disinfection of all the camps and all the people and property in them (which is generally impracticable at the time when needed, *viz.*, at the time of evacuation), it may be noted, by the way, that there are other means of diminishing danger. One of these is to reduce temptation by encouraging the removal of as much property as possible into the camps; and this, when feasible, has the further advantage of checking thefts and false claims based on alleged thefts. Another is to increase the facilities for access to the site under proper precautions. It is the surreptitious visits which are most likely to be prolonged and to be made under risky conditions. It is not stated that any of the persons who were allowed to return for the purpose of exposing their grain to the sun or to watch disinfection and assist in white-washing were attacked by plague, and it may be suggested that this indicates the lines on which measures against the infection of the camps could perhaps be based. Admitting, however, that nothing will provide completely against the danger of reinfection, this fact does not discount the value of evacuation, if it can be shown that the hold which the disease obtains under the conditions of camp life is comparatively a feeble and precarious one.

32. The total number of attacks in the two districts taken together, as shown in Captain James' tabular statement, was 3,409. Out of these 2,228, a percentage of 67, took place before or within four days after evacuation. If we allow the longer period of seven days for the incubation of the disease, the percentage of cases in which the infection might have been contracted before evacuation had had time to take effect would be nearly 78. The total number of cases in both districts which occurred after the 20th day from evacuation was only 312, or 9 per cent. of the whole: and the average period for the cessation of the epidemic after evacuation was 21 days in Jullundur and 26 days in Hoshiárpur. There were nine villages in which partial evacuation was tried and in which there was subsequently a reappearance of the disease, and in only one of these nine (Rámpur Bilron) has it been established that this second outbreak

was due to reinfection and not to a survival or recrudescence of the latent poison. In all the nine recourse was ultimately had to complete evacuation. In one village (Naura) where the outbreak was discovered within five days one case occurred; three houses only were evacuated, and notwithstanding this there were no further attacks. But this instance, together with the doubtful one of Arapa (to which reference is made on page 82 of Captain James' Report) is the only exception to the rule established by the history of this epidemic that outbreaks are prolonged unless evacuation is complete.

33. These facts are eloquent of the results of evacuation of the village site in stopping the spread of the disease, and Sir Mackworth Young has been able to satisfy himself during his recent tour in the Hoshiárpur District that they have carried conviction to the minds of the people generally. This general conviction of the value of one of the most important of the measures for the extirpation of plague will, it may be hoped, bear valuable fruit, in the event of another outbreak in the same neighbourhood.

34. The period spent in camp is shown in the seventh column of the statement in the Appendix to these remarks. The date of return is conditioned by the completion of disinfection operations (though there were four instances in which return was allowed earlier, a departure which appears to the Lieutenant-Governor to have been a dangerous one) and cannot be fixed till a certain period has been passed without fresh attacks. The Medical Officers are probably right in the view that three weeks of freedom is the minimum period which can be taken as guaranteeing the cessation of an epidemic; but it might in practice be desirable to waive this rule under certain circumstances, *e. g.*, if a long period had been spent in camp, if the weather were inclement, or if the final attack were a dropping case in some isolated portion of the camp. As a matter of fact the interval which expired between the last attack and the return to the village was in most cases more than three weeks, a fact which is sometimes attributable to delay in commencing and completing the disinfection, but is not always thus explicable. The Lieutenant-Governor understands that it is quite unnecessary to wait until the last case under treatment in hospital is discharged; for a person may remain under treatment for the sequelæ of the disease long after he has ceased to be a source of danger to others. The whole subject is important, because unduly prolonged detention in camp adds to the unpopularity of the plague measures and therefore to the difficulty of enforcing them. Delays in disinfection will appropriately be discussed under the heading which deals with that subject. Sir Mackworth Young will only observe here that there is no apparent reason why villages such as Mahálgahla, Táhirpur, Baharwál, Punián and Parágpur should have been kept out so long after the completion of disinfection notwithstanding the length of the interval of freedom from disease. Some time must of course be allowed for the final disinfection of the people which takes place before they leave the camps, but in these instances at all events the detention appears to have been excessive, though the Lieutenant-Governor does not overlook the heaviness of the duties of the plague staff at the time.

IV. Disinfection of site.

35. Captain James has given a clear account on pages 108 *sqq.* of his report of the process of disinfecting a village in the four stages of (1) disinfecting with liquid antiseptics, (2) cleaning, (3) ventilating and (4) white-washing. The antiseptic used was phenyle in a solution of about 1 in 200, exact measurements being found in practice less serviceable with a half-taught staff than an instruction to pour enough phenyle into the water to make a dense white fluid looking like milk. In head A of the Instructions which were promulgated with Circular No. 1025, dated 19th June 1897, and republished with Circular No. 1342, dated 8th November 1897, the use of perchloride of mercury was advocated. It was observed that this forms an inert compound with albumen, and two methods of getting over this difficulty, one recommended by the Local Government Board of the United Kingdom, and one in use at that time in the Bombay Presidency, were suggested. Sir Mackworth Young is quite open to conviction that there were practical advantages in the use of phenyle in preference to perchloride of mercury in the Jullundur and Hoshiárpur Districts. But he observes that the medical opinion on the subject

is not unanimous, Lieutenant Walton criticising the use of phenyle as unreliable, and as the instructions above referred to were drawn up after careful consideration by the Inspector-General of Civil Hospitals and the Sanitary Commissioner, a departure should not have been made from them without reference to Government. The Lieutenant-Governor will be glad to have the opinion of the Inspector-General of Civil Hospitals and the Sanitary Commissioner as to the practical suitability of the disinfectant which was employed, and the propriety of altering the standing instructions on the subject. It is noticed on page 28 of Volume I of Mr. Nathan's compilation "The Plague in India, 1896, 1897," that Mr. Hankin found that phenyle when in a quarter per cent. solution in all cases destroyed the microbe, under the conditions of the experiments made by him.

36. In theory, no doubt, the best agency to employ in disinfection work is a permanent trained gang in which each man has been inoculated with M. Haffkine's prophylactic. The men available for this work in Jullundur and Hoshiárpur were for the most part village menials, whose patrons objected particularly at the time of the spring harvest, when plague operations were heaviest, to their being employed at a distance, and who were naturally unwilling, for the sake of temporary high wages, to quarrel with the men with whom their relations are life long. It was moreover a convenient method of arranging for the subsistence of the poorer villagers, when cut off from access to the outer world, to employ them on disinfection work. Partly for these reasons, and partly because of the large number of centres in which disinfection work was proceeding at one and the same time, it was not practicable except to a very small extent to employ permanent disinfectors, and the need of specially careful supervision of the work was therefore particularly urgent. The immediate supervising agency consisted ordinarily of Hospital Assistants. One Assistant Surgeon was employed on this work under Captain Wilkinson in the Banga Administrative Circle and several Compounders were also engaged in it. Experiments were also made with non-medical agency. Four European or Eurasian Sanitary Inspectors on Rs. 100 per mensem each were engaged, but with one exception the selections made do not appear to have been fortunate. Some Tahsíldárs were employed, and Captain Coleman, I.M.S., is said to have found Kánúngos satisfactory overseers. Sanction was given to the employment of some British Non-Commissioned Officers also, but was not utilised, and no experience of this agency was obtained. The controlling and inspecting officers were in all cases Commissioned Medical Officers.

37. A very important question with reference to the economisation of professional staff in the event of a widespread epidemic of plague is the extent to which Medical Officers and Medical subordinates could properly be replaced by a non-medical agency in the supervision and inspection of disinfection operations. The general opinion among Medical Officers is understood to be adverse to the employment of laymen, although it is believed that in the United Kingdom operations of this character are ordinarily entrusted to non-medical men, carefully trained. Sir Mackworth Young is unable to see why it should be necessary to employ a professional agency to supervise those portions of the process which consist in the making of ventilation holes in the roofs and the lime-washing of walls, pillars, doors, corn-receptacles and fixtures; and in regard to the use of the liquid disinfectant he cannot but think that what is required in the supervising staff is conscientiousness and a grasp of certain simple principles rather than expert knowledge. Captain James has observed that when the inspecting officer came on his rounds a few hours after the disinfectant had been sprayed on the buildings, not a sign of it could be seen, so that there was practically no means of verifying the fact that the process had actually been performed. It may be suggested by the way that the mixture of aniline blue with the disinfectant as suggested in the instructions cited in paragraph 35 of these remarks might have rendered it easier to check the work done, and the Inspector-General of Civil Hospitals will be asked to consider whether there is any way of colouring the disinfecting solution which without causing unnecessary damage to property will make verification possible. But for the purposes of the point now under consideration, the conclusion to be drawn from Captain James' remarks clearly is that a highly skilled Medical agency is not in a better position than the civil staff to ascertain that orders have been carried out. There are, however, many difficulties of detail which arise in the conduct of the operations: and some of these are of a character in which medical advice is indispensable. On the whole Sir Mackworth Young is disposed to hold that it is a counsel of perfection that disinfection should be controlled and inspected by Medical Officers and supervised by Medical subordinates; though he quite sees that in the event of a widespread epidemic, making very large demands on the Medical Staff, this might be impracticable, and it might be necessary to work with a non-professional agency assisted as much as possible by expert opinion. From what class the disinfecting overseers should be drawn, if medical subordinates were not available, is a question to which it is unnecessary to find a final answer here. But in the event of another rural outbreak of plague Sir Mackworth Young is inclined to give a trial to British Non-Commissioned Officers, and to pensioners and reservists from Native Regiments, the trial of whom has been recommended by Major Inglis. It is essential no doubt that the final inspection should be done by Europeans, and if the drain on Commissioned Medical Officers for other duties were great, and the supply of Assistant Commissioners were short, Staff Corps Officers would probably be suitable for this work.

38. The possibility has been suggested by Captain James that more was done in the way of disinfection than was actually necessary, and that possibly one or more of the processes employed might have sufficed to eradicate the poison. The figures in the sixth column of the statement in the Appendix shows how prolonged the operations sometimes were. It is of such paramount importance to conciliate the people who are the subjects of the plague measures by reducing damage to property and delay in camp to the minimum, that the Lieutenant-Governor would like the Inspector-General of Civil Hospitals and Sanitary Commissioner carefully to consider whether, in the event of another outbreak, it would be safe to curtail or abandon any portion of the various processes employed. The adoption of some satisfactory means of verifying the work done as suggested in the last foregoing paragraph might help in the attainment of this end. The rule which required an interval of 10 days to elapse between evacuation and the commencement of disinfection, in order to give time for the rats to die off or leave, was doubtless unnecessary, and should be expunged from any future plague code, but the fifth column of the statement in the Appendix shows that the interval was not infrequently far longer than that prescribed by the rule, and there will no doubt always be practical difficulties, when the centres of disease are numerous, in the organization of disinfecting gangs and the early commencement of operations. All that can be said is that it is desirable to aim at beginning immediately after evacuation has been effected. The work or at all events the preliminary part of it, is of course extraordinarily dangerous, and this is an argument against expediting operations by allowing the owners to take part, as arrangements can be made for isolating the menials of the disinfecting gang while it might be impracticable to keep other villagers away from their fellows, but the owners should be allowed to be present so that they may see what is being done with their property, and Sir Mackworth Young thinks that there is a balance of advantage in favour of allowing them to make the required holes in their roofs and to do their own white-washing, under proper supervision, as the worst, though not the whole, of the danger is over when the liquid disinfectant has been properly applied. One cause of delay in some instances is understood to have been a deficiency in the supply of lime. It may be noted that unslaked lime (which is the kind required) can be obtained in considerable quantities close to the Railway Station of Pind Dádan Khan at the rates of five annas six pies per maund: and further information on the subject could no doubt be furnished by the Deputy Commissioner of Jhelum.

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is not unanimous, Lieutenant Walton criticising the use of phenyle as unreliable, and as the instructions above referred to were drawn up after careful consideration by the Inspector-General of Civil Hospitals and the Sanitary Commissioner, a departure should not have been made from them without reference to Government. The Lieutenant-Governor will be glad to have the opinion of the Inspector-General of Civil Hospitals and the Sanitary Commissioner as to the practical suitability of the disinfectant which was employed, and the propriety of altering the standing instructions on the subject. It is noticed on page 28 of Volume I of Mr. Nathan's compilation "The Plague in India, 1896, 1897," that Mr. Hankin found that phenyle when in a quarter per cent. solution in all cases destroyed the microbe, under the conditions of the experiments made by him.

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37. A very important question with reference to the economisation of professional staff in the event of a widespread epidemic of plague is the extent to which Medical Officers and Medical subordinates could properly be replaced by a non-medical agency in the supervision and inspection of disinfection operations. The general opinion among Medical Officers is understood to be adverse to the employment of laymen, although it is believed that in the United Kingdom operations of this character are ordinarily entrusted to non-medical men, carefully trained. Sir Mackworth Young is unable to see why it should be necessary to employ a professional agency to supervise those portions of the process which consist in the making of ventilation holes in the roofs and the lime-washing of walls, pillars, doors, corn-receptacles and fixtures; and in regard to the use of the liquid disinfectant he cannot but think that what is required in the supervising staff is conscientiousness and a grasp of certain simple principles rather than expert knowledge. Captain James has observed that when the inspecting officer came on his rounds a few hours after the disinfectant had been sprayed on the buildings, not a sign of it could be seen, so that there was practically no means of verifying the fact that the process had actually been performed. It may be suggested by the way that the mixture of aniline blue with the disinfectant as suggested in the instructions cited in paragraph 35 of these remarks might have rendered it easier to check the work done, and the Inspector-General of Civil Hospitals will be asked to consider whether there is any way of colouring the disinfecting solution which without causing unnecessary damage to property will make verification possible. But for the purposes of the point now under consideration, the conclusion to be drawn from Captain James' remarks clearly is that a highly skilled Medical agency is not in a better position than the civil staff to ascertain that orders have been carried out. There are, however, many difficulties of detail which arise in the conduct of the operations: and some of these are of a character in which medical advice is indispensable. On the whole Sir Mackworth Young is disposed to hold that it is a counsel of perfection that disinfection should be controlled and inspected by Medical Officers and supervised by Medical subordinates; though he quite sees that in the event of a widespread epidemic, making very large demands on the Medical Staff, this might be impracticable, and it might be necessary to work with a non-professional agency assisted as much as possible by expert opinion. From what class the disinfecting overseers should be drawn, if medical subordinates were not available, is a question to which it is unnecessary to find a final answer here. But in the event of another rural outbreak of plague Sir Mackworth Young is inclined to give a trial to British Non-Commissioned Officers, and to pensioners and reservists from Native Regiments, the trial of whom has been recommended by Major Inglis. It is essential no doubt that the final inspection should be done by Europeans, and if the drain on Commissioned Medical Officers for other duties were great, and the supply of Assistant Commissioners were short, Staff Corps Officers would probably be suitable for this work.

38. The possibility has been suggested by Captain James that more was done in the way of disinfection than was actually necessary, and that possibly one or more of the processes employed might have sufficed to eradicate the poison. The figures in the sixth column of the statement in the Appendix shows how prolonged the operations sometimes were. It is of such paramount importance to conciliate the people who are the subjects of the plague measures by reducing damage to property and delay in camp to the minimum, that the Lieutenant-Governor would like the Inspector-General of Civil Hospitals and Sanitary Commissioner carefully to consider whether, in the event of another outbreak, it would be safe to curtail or abandon any portion of the various processes employed. The adoption of some satisfactory means of verifying the work done as suggested in the last foregoing paragraph might help in the attainment of this end. The rule which required an interval of 10 days to elapse between evacuation and the commencement of disinfection, in order to give time for the rats to die off or leave, was doubtless unnecessary, and should be expunged from any future plague code, but the fifth column of the statement in the Appendix shows that the interval was not infrequently far longer than that prescribed by the rule, and there will no doubt always be practical difficulties, when the centres of disease are numerous, in the organization of disinfecting gangs and the early commencement of operations. All that can be said is that it is desirable to aim at beginning immediately after evacuation has been effected. The work or at all events the preliminary part of it, is of course extraordinarily dangerous, and this is an argument against expediting operations by allowing the owners to take part, as arrangements can be made for isolating the menials of the disinfecting gang while it might be impracticable to keep other villagers away from their fellows, but the owners should be allowed to be present so that they may see what is being done with their property, and Sir Mackworth Young thinks that there is a balance of advantage in favour of allowing them to make the required holes in their roofs and to do their own white-washing, under proper supervision, as the worst, though not the whole, of the danger is over when the liquid disinfectant has been properly applied. One cause of delay in some instances is understood to have been a deficiency in the supply of lime. It may be noted that unslaked lime (which is the kind required) can be obtained in considerable quantities close to the Railway Station of Pind Dádan Khan at the rates of five annas six pies per maund: and further information on the subject could no doubt be furnished by the Deputy Commissioner of Jhelum.

39. Attention has already been drawn to the important fact that infection can be and is carried from house to house by other than human agency. No doubt if the disease could be detected and dealt with at the very outset and

in its first centre, no germs would remain for rats or other vermin to carry elsewhere, and it would suffice to disinfect those houses in which the existence of the poison was ascertained. In practice, however, such early discovery and prompt treatment are not to be looked for, and though the Lieutenant-Governor is willing to believe, with Captain Clark, I.M.S., that it is best to begin with the known centres of infection, there can be no doubt that the best course from the sanitary standpoint is ultimately to carry the operations of disinfection throughout the entire village.

40. There are four or possibly five instances in which the experiment of partial disinfection or no disinfection at all was tried. Naura, Aujla and Aur were visited with plague, and not disinfected; and if the disease which occurred at Arapar was really plague, which is doubtful, this village falls into the same category. Rámpur Bilron, on the occasion of the first outbreak there, was partially but not completely disinfected. Out of these five instances, in one of which the original outbreak is doubtful, there were in two cases, Aur and Rámpur Bilron, fresh outbreaks at a later date, but in the latter of these two the fresh outbreak is attributed to reimportation of the disease and not to recrudescence. In Naura, Aujla and Arapar there was no second outbreak, but it must be added that the first outbreak in each of the three was an exceptionally slight one. These facts cannot be taken as proving that there is no necessity for disinfection as a means of providing against recrudescence.

41. There were five villages in which disinfection was complete, or intended to be complete, which nevertheless suffered from a recrudescence of plague, as opposed to proved reinfection from an outside source. These were Pharála. Khatkar Khurd and Baharwál and two others, Garhi* and Sirhal Qazián†, to which no reference is made in Captain James' Report. At Pharála there is reason to suspect that the operations of disinfection had been hurried on to allow the return of the people before the autumn rains. In the other four cases it is of course possible that the disease was reimported, but this is not proved and cannot be assumed. None of the instances, however, impeaches the value of complete disinfection. The fact no doubt is that, if the second outbreak was really a recrudescence, there was something deficient in the original disinfection. That some nook in which infection lurked should have been overlooked or incompletely dealt with where so many villages and so many thousands of houses were concerned would, in the Lieutenant-Governor's opinion, be no matter of surprise. What is surprising is that there were at most only five cases of recrudescence in villages in which an attempt was made to disinfect completely, and this fact appears to Sir Mackworth Young to be an evidence of the great value of the process.

42. Apart from the efficacy of disinfection as a means of preventing the recrudescence of the disease, Captain James has laid stress on its effects in reducing to very small dimensions any second outbreak which may occur in a completely disinfected village. It is the case that the second outbreaks in the completely disinfected villages of Pharála, Khatkar Khurd, Baharwál, Sirhal Qázián ‡ and Garhi ‡ (where they were due to recrudescence) and of Jhander Khurd (where the second outbreak was due to reinfection) were of the slightest possible character; while Rámpur Bilron, which had been incompletely disinfected, suffered severely in the second visitation. The contrast may have been due to the fact that the disinfectants still continued operative, or that the free use of them had driven away the rats or other vermin who generally carry infection with them, or that the general cleanliness of the village concerned was unfavourable to the growth of the disease. But as the easy escape of the six completely disinfected villages at the second visitation may possibly have been due to the

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V.—Medical treatment of sick.

43. The Lieutenant-Governor understands that the system of treatment of plague consists mainly in rest and the administering of stimulants to keep the patient alive until the height of the disease is passed. There is no means of ascertaining to what extent the treatment in hospitals under European management was successful, but it would be unreasonable to suppose that many lives were not saved in cases where the struggle between nature and the disease was not too unequal. For practical purposes, however, there is no need to estimate the success attained; for while European medical treatment must, so far as possible, be given to all who wish for it, it is the fixed policy of Government not to force that treatment on any one if he or his friends in his behalf have any objection to it. Absolute freedom to receive or reject European treatment and medicines, free access on the part of baids, hakíms and other private practitioners to all patients who wish to be treated by such, and free access on the part of a limited number of friends and relatives to the sick whom they desire to tend, are unalterable canons of any hospital system to which Government can give its approval, and public announcements, which amount to public pledges, have been made on all three points. Mr. Silcock, Officiating Commissioner, has remarked that the removal of plague patients from their families was one of the greatest of their grievances; but it is not known to what period of the operations he refers. His experience of the measures dates from April 20th, and in paragraph 6 of the Resolution of this Government, No. 43, dated 11th January 1898, it was distinctly declared that "friends or relatives in reasonable number will be allowed to accompany the sick; but if they elect to do so they will be subjected to precisely the same restrictions as if they were themselves sufferers from the disease." If this important principle was extensively ignored or violated, as Mr. Silcock's remark implies that it was, attention should have been drawn to the matter at an earlier date. That it was not realized or acted upon by all the Medical Officers is evident from Lieutenant Walton's remark that the hospitals were inadequately guarded and that "there would have been little difficulty at night in persons visiting their friends in hospitals;" clearly implying that some attempt was made to prevent their doing so. On the other hand, Major Inglis has distinctly stated in his report that persons in the segregation camps have been allowed to visit their friends in hospital.

44. The Lieutenant Governor fully recognizes that practical difficulties of some magnitude have to be faced if effect is to be given to the principles which have been above enunciated, and that a fundamental change in the arrangement of hospitals built without due regard to them may even be necessary. Subject to a reasonable limitation as to numbers and to the condition quoted in the last foregoing paragraph the friends or relatives who wish to do so must be able to come to and remain with the patient when they please and as long as they please. If they contract infection, it is in the performance of the natural duties of humanity. Either they must have free access to the hospitals, and the hospitals must be so arranged as to give them accommodation by the bedside of the sick: or hospitals proper must be altogether replaced by hospital camps, in which huts will be set apart for families with sick members. The free access of private practitioners to their patients can be provided for either by making over particular hospitals altogether to them, as was done by Captain Heard, I. M. S., in the case of the hakíms of Garhshankar, or by allowing them to visit the hospital camps where these have replaced hospitals. The danger of the carrying of infection by practitioners who do not observe the same precautionary rules as officers trained in the European manner is no doubt a serious one; but it will have to be faced. The whole subject is of such supreme importance with a view to the diminution of the grounds for discontent which are created by plague measures, and it involves such far-reaching issues,

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45. In connection with the subject of hospital management and sanitary precautions generally Sir Mackworth Young notices on page 106 of Captain James' report a remark to the effect that in the Hoshiárpur District plague corpses (of course only those of Muhammadans) were buried in quick-lime. It is added that this was not done in the Jullundur District, as sufficient lime (four to eight maunds per person) could not be procured. The burial of bodies in quick-lime in all cases in which any person interested raises an objection was prohibited by Government in orders published with Circular No. 1025, dated 19th June 1897, and republished at the commencement of the Punjab epidemic with Circular No. 1342, dated 8th November 1897. It is not certain that the process is necessary or efficacious, and it is one which is likely to give offence.

VI.—Prophylactic inoculation.

46. Inoculation with M. Haffkine's anti-plague prophylactic medium was performed on 2,408 persons in Jullundur and 1,510 in Hoshiárpur. Eight hundred and eighty out of this total were females. The great majority of those inoculated in the former district were Hindús, mostly Játs, Khatrís and Brahmins, only 181 in all being Muhammadans; but in Hoshiárpur the Muhammadans were in excess, being 699, against 475 Hindús, while the balance consisted apparently of Chamárs, Chuhrás and other inferior castes. Submission to the process was of course voluntary; no inducements were authorized by Government, and it is believed that none were held out; but there seems to have been in some quarters marked willingness, not to say eagerness, to obtain protection, and possibly if the Medical Staff had had more leisure the number of operations might have been considerably increased. It may here be noted that the question of the concessions and exemptions which might properly be allowed to inoculated persons was still undecided when the epidemic in the Punjab was at its height. It has since been determined by the Government of India that "inoculated persons should be exempted—

(1) from segregation, unless they are actually attacked by plague. They will, however, remain liable to evacuate infected houses;" and, it must be added, to evacuate any other houses which it may be necessary to disinfect, at all events to such extent and for such period as may be necessary to allow of adequate disinfection:

"(2) from observation and detention when travelling, subject to disinfection of clothes.

In each case the exemption is subject to the process of inoculation having been performed not more than six months before. The period of the efficacy of inoculation requires further investigation, and it may in the future become possible to extend the six months period."

47. Out of a total of 3,918 people inoculated, 3,119 belonged to villages in which outbreaks of plague occurred. Eight attacks of plague took place among the inoculated, all in the Jullundur District; and of these 1 was fatal, the case being that of a woman who received a dose of only half the minimum strength recommended by M. Haffkine for adults, and who showed none of the

signs of the reaction which usually follow a successful insertion of the prophylactic. In Banga, where inoculations began on the day that the first case of plague was discovered, 865 residents of the town were inoculated, making 17·4 per cent. of the population as determined at the roll-call census which was taken at that time. In the town as a whole 2·09 per cent. of the population was attacked and the percentage of deaths was 63. Among the inoculated the percentages were ·693 and 0 respectively. The results of the operations were thus highly promising.

VII.—Inspection, detention and disinfection.

48. The arrangements on the line of Railway for the protection of uninfected areas against importation of disease by travellers by rail were as follows. Eight stations from Jullundur City to Ludhiána inclusive were treated as suspected on account of the facility with which they could be reached from the area under suspicion. All tickets sold at these stations were marked with a special punch mark, and special 3rd class carriages were added to the trains for the accommodation of 3rd class passengers from these stations.* Inspection posts under the Regulations published with Punjab Government Notification No. 1345, dated 10th November 1897, were established at the stations of Beas, on the northern or Amritsar side of the river of that name, and at Ludhiána, five miles to the south of the Sutlej at Phillour. Up trains were inspected at the former and down trains at the latter post, and passengers from the suspected stations were prohibited when travelling up, from leaving the railway limits between the Kartárpur and Beas stations, and, when travelling down, from leaving them between the Phillour and Ludhiana stations, arrangements being made by the North-Western Railway Administration to reconvey to their destinations without extra charge those passengers who were carried past them in compliance with this regulation. A small patrolling force of police travelled with the trains to see that these orders were obeyed, the object being to lessen the facilities for alighting before the inspection posts were reached and working past them by road. There was no prohibition against crossing the Beas, by fords or otherwise, as that river is situated at a considerable distance from the suspected area; but the crossing of the Sutlej between Rúpar and Phillour was prohibited, and the down ferry trains across the Phillour bridge were run on to Ludhiána instead of stopping as usual at the intermediate station of Ladhowál. Both at Beas and at Ludhiána detention camps were established, Lieutenant Frizelle, an Assistant Commissioner, being put in charge of the former, and a Náib Tahsíldár being stationed at the latter to manage the camp (situated at district head-quarters) under the control of the Deputy Commissioner. The orders were to detain all suspicious persons as defined in paragraph 11 of Government of India, Home Department, Resolution No. 227—240, dated 3rd February 1898, the period (except for those who were suspicious by reason of their symptoms) being fixed first at a period of seven to ten days, but afterwards reduced to 24 hours. Apparatus for the steaming of the clothes and bedding of detenus was provided by the North-Western Railway Administration at both camps, in order to provide against the danger of the exportation of infection in such susceptible articles. As already noted, the carrying of clothes and bedding from the suspected stations otherwise than as the personal luggage of travellers was prohibited altogether.

49. The camps were constructed on the system proved suitable by the experience gained at Khánpur between Mooltan and the Sind border in the spring and summer of 1897, except that the huts were made of sirkís and not of sleepers. It was ordered that families should not be separated, except in the event of plague, and that in that event friends or relatives in reasonable number should be allowed to remain with the sufferer; but as a matter of fact no cases of the disease were discovered or occurred. A small force of police was employed at each, but there was no difficulty in maintaining order, as the detenus were well behaved and contented, and only a few escapes took place, mostly on the part of beggars or vagrants who could not be subsequently traced. Complete figures of

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48. The arrangements on the line of Railway for the protection of uninfected areas against importation of disease by travellers by rail were as follows. Eight stations from Jullundur City to Ludhiána inclusive were treated as suspected on account of the facility with which they could be reached from the area under suspicion. All tickets sold at these stations were marked with a special punch mark, and special 3rd class carriages were added to the trains for the accommodation of 3rd class passengers from these stations.* Inspection posts under the Regulations published with Punjab Government Notification No. 1345, dated 10th November 1897, were established at the stations of Beas, on the northern or Amritsar side of the river of that name, and at Ludhiána, five miles to the south of the Sutlej at Phillour. Up trains were inspected at the former and down trains at the latter post, and passengers from the suspected stations were prohibited when travelling up, from leaving the railway limits between the Kartárpur and Beas stations, and, when travelling down, from leaving them between the Phillour and Ludhiana stations, arrangements being made by the North-Western Railway Administration to reconvey to their destinations without extra charge those passengers who were carried past them in compliance with this regulation. A small patrolling force of police travelled with the trains to see that these orders were obeyed, the object being to lessen the facilities for alighting before the inspection posts were reached and working past them by road. There was no prohibition against crossing the Beas, by fords or otherwise, as that river is situated at a considerable distance from the suspected area; but the crossing of the Sutlej between Rúpar and Phillour was prohibited, and the down ferry trains across the Phillour bridge were run on to Ludhiána instead of stopping as usual at the intermediate station of Ladhowál. Both at Beas and at Ludhiána detention camps were established, Lieutenant Frizelle, an Assistant Commissioner, being put in charge of the former, and a Náib Tahsíldár being stationed at the latter to manage the camp (situated at district head-quarters) under the control of the Deputy Commissioner. The orders were to detain all suspicious persons as defined in paragraph 11 of Government of India, Home Department, Resolution No. 227—240, dated 3rd February 1898, the period (except for those who were suspicious by reason of their symptoms) being fixed first at a period of seven to ten days, but afterwards reduced to 24 hours. Apparatus for the steaming of the clothes and bedding of detenus was provided by the North-Western Railway Administration at both camps, in order to provide against the danger of the exportation of infection in such susceptible articles. As already noted, the carrying of clothes and bedding from the suspected stations otherwise than as the personal luggage of travellers was prohibited altogether.

49. The camps were constructed on the system proved suitable by the experience gained at Khánpur between Mooltan and the Sind border in the spring and summer of 1897, except that the huts were made of sirkís and not of sleepers. It was ordered that families should not be separated, except in the event of plague, and that in that event friends or relatives in reasonable number should be allowed to remain with the sufferer; but as a matter of fact no cases of the disease were discovered or occurred. A small force of police was employed at each, but there was no difficulty in maintaining order, as the detenus were well behaved and contented, and only a few escapes took place, mostly on the part of beggars or vagrants who could not be subsequently traced. Complete figures of

* Passengers from Ludhiána by down trains were not required to travel in the special carriage.

both administrative and medical, that the Lieutenant-Governor will be glad to receive practical proposals from the Inspector-General of Civil Hospitals after consultation with the Commissioner of Jullundur and with any of the officers, civil and medical, employed in the late operations, whose opinions would be likely to be serviceable. It has been suggested in the report submitted by Mr. Butler, Assistant Commissioner that something is to be gained by allowing outsiders to see the hospitals if they wish to do so, with a view to checking rumours of maltreatment and actual poisoning. If the friends and relatives are allowed free access, the advantages of the admission of outsiders would seem to be counterbalanced by the risk of spreading infection by their means. But this also is a point on which the Lieutenant-Governor will be glad to have opinions, from the point of view of general administrative expediency as well as from that of purely medical considerations.

45. In connection with the subject of hospital management and sanitary precautions generally Sir Mackworth Young notices on page 106 of Captain James' report a remark to the effect that in the Hoshiárpur District plague corpses (of course only those of Muhammadans) were buried in quick-lime. It is added that this was not done in the Jullundur District, as sufficient lime (four to eight maunds per person) could not be procured. The burial of bodies in quick-lime in all cases in which any person interested raises an objection was prohibited by Government in orders published with Circular No. 1025, dated 19th June 1897, and republished at the commencement of the Punjab epidemic with Circular No. 1342, dated 8th November 1897. It is not certain that the process is necessary or efficacious, and it is one which is likely to give offence.

VI.—Prophylactic inoculation.

46. Inoculation with M. Haffkine's anti-plague prophylactic medium was performed on 2,408 persons in Jullundur and 1,510 in Hoshiárpur. Eight hundred and eighty out of this total were females. The great majority of those inoculated in the former district were Hindús, mostly Játs, Khatrís and Brahmins, only 181 in all being Muhammadans; but in Hoshiárpur the Muhammadans were in excess, being 699, against 475 Hindús, while the balance consisted apparently of Chamárs, Chuhrás and other inferior castes. Submission to the process was of course voluntary; no inducements were authorized by Government, and it is believed that none were held out; but there seems to have been in some quarters marked willingness, not to say eagerness, to obtain protection, and possibly if the Medical Staff had had more leisure the number of operations might have been considerably increased. It may here be noted that the question of the concessions and exemptions which might properly be allowed to inoculated persons was still undecided when the epidemic in the Punjab was at its height. It has since been determined by the Government of India that "inoculated persons should be exempted—

(1) from segregation, unless they are actually attacked by plague. They will, however, remain liable to evacuate infected houses;" and, it must be added, to evacuate any other houses which it may be necessary to disinfect, at all events to such extent and for such period as may be necessary to allow of adequate disinfection:

"(2) from observation and detention when travelling, subject to disinfection of clothes.

In each case the exemption is subject to the process of inoculation having been performed not more than six months before. The period of the efficacy of inoculation requires further investigation, and it may in the future become possible to extend the six months period."

47. Out of a total of 3,918 people inoculated, 3,119 belonged to villages in which outbreaks of plague occurred. Eight attacks of plague took place among the inoculated, all in the Jullundur District; and of these 1 was fatal, the case being that of a woman who received a dose of only half the minimum strength recommended by M. Haffkine for adults, and who showed none of the

signs of the reaction which usually follow a successful insertion of the prophylactic. In Banga, where inoculations began on the day that the first case of plague was discovered, 865 residents of the town were inoculated, making 17·4 per cent. of the population as determined at the roll-call census which was taken at that time. In the town as a whole 2·09 per cent. of the population was attacked and the percentage of deaths was 63. Among the inoculated the percentages were ·693 and 0 respectively. The results of the operations were thus highly promising.

VII.—Inspection, detention and disinfection.

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the numbers detained have not been furnished, but during May and June 1,331 persons were detained at Beas out of 20,735 who booked from suspected stations; and from May 19th to the end of June 951 persons were detained at Ludhiána. Out of these numbers suspicious symptoms were the grounds of detention in 51 cases only. Clothes which were so filthy and useless as not to justify disinfection were burned, compensation either in money or kind being awarded to the owner. A large number of detenus were fed at the public expense at the time when the period of detention was seven to ten days; and it is understood that this continued at Ludhiána even after the period had been reduced; but the total expenditure under this head was small, and it is of course unquestionably necessary. Persons furnished with certificates showing that they had not come from the suspected area, or that they had undergone a period of observation in one of the Quarantine Camps there, and later on also persons provided with certificates showing that they had undergone within six months inoculation with Haffkine's prophylactic, were never treated as suspicious for the purposes of detention and disinfection, unless suffering from suspicious symptoms.

Attitude of the people.

50. In the villages which actually suffered from plague the Lieutenant-Governor believes that it is now generally recognized that the measures taken for the eradication of the disease were for the best, and during his recent tour through the Garhshankar Tahsíl he has been greatly impressed by the readiness with which this was admitted; but it is possible that false or exaggerated rumours have obtained credence elsewhere, and certain that nothing could be done to secure complete and universal co-operation in the event of a second outbreak. The key to success lies, however, in obtaining co-operation, as nearly complete and as nearly universal as possible, and Sir Mackworth Young thinks that experience indicates some improvements of method and policy which are likely to tend in this direction. The strongest and most disconcerting of all the prejudices with which the Plague Staff had to deal was probably the terror of the hospital and of European medicines, partly based upon and certainly strengthened by the natural aversion to separation from sick friends. Stress has been laid on the paramount importance of freedom to receive or reject treatment, and free access by friends and relatives to the sufferers. The matter is one in which medical must be entirely subordinated to political and administrative considerations. Next in order no doubt comes the dislike to the disturbance of privacy, business and comfort, and the possible danger to property, which is involved in the move into camp. Encouragement and help in the construction of shelters by individuals in accordance with their own tastes and requirements, and reduction of the detention in camp by acceleration of disinfection, are the principal remedies here indicated. When each family is dealt with as a united whole, as it is the intention of Government that they should be, and the largest possible use is made of female practitioners in dealing with women, as was the case in this epidemic, few grievances are likely to arise on the score of intrusion upon domestic privacy. That the Plague Staff could have done more than it did to facilitate the agricultural operations and other business of the cordoned villagers, the Lieutenant-Governor sees no reason to suppose; but the point is mentioned because of its bearing upon that enlistment of sympathy which is essential to success. Injury to property arises or may be apprehended from two directions. It may suffer in the process of disinfection, and it may be exposed to danger of theft when left behind in the evacuated village. In the first instance the remedy is prompt compensation in money or kind, though the principles laid down in Government of India, Home Department, Resolution No. $\frac{10\ \text{Sanitary}}{1044-1057}$, * dated 23rd March 1897, must not be lost sight of in this connection. The risk of theft is a subject which has not been dealt with in the reports, but the recorded correspondence shows that some cases of burglary, and, later on, one or two of deliberate mischief, did occur in evacuated villages, and close attention must be directed to the question of preventive measures if it should unfortunately become necessary to cope with a second outbreak.

* Republished as an annexure to Punjab Government Circular No. 1342, dated 8th November 1897.

Notice of Officers and Staff.

51. Where the general standard of zeal and work was so high it is not easy to select individuals for special mention, and Sir Mackworth Young desires to express his cordial acknowledgments alike to all departments and to all grades which took part in these peculiarly trying and delicate duties. It was no doubt the case that the subordinates of the Medical and Police Departments were frequently selected as the objects of complaint. That these departments, like others, contain men who abuse their opportunities goes, of course, without saying; but the Lieutenant-Governor is persuaded that an instinctive sense of the nature of the complaints which would be most likely to find credence dictated the direction in which charges should be levelled, and that the natural feeling of annoyance at restrictive measures found a vent in attempts to discredit those subordinate agencies without which no measures of any sort could possibly be carried out. Without the police constable there would have been no isolation of the infected villages; without medical subordinates the Commissioned Medical Staff would have been powerless in hospital management and in the execution of sanitary measures. The men who actually carry out unpopular orders are naturally the butt of hostile criticism, and when (as must always be the case) some of them misbehave, and most of them are sufficiently ill-paid for bribe-taking to be a plausible charge, general accusations against the class are the ready recourse of malcontents. Vigilance to minimise the opportunities and temptations of the lower grades must always be the duty of the superior staff, but imputations upon medical and police subordinates in general were, considering all the circumstances, perhaps never less justifiable than in connection with the recent operations against plague.

52. The following officers merit the special thanks of the Lieutenant-Governor:—

Civil.

Lieutenant-Colonel Massy, I. S. C., Commissioner of Jullundur.

Mr. J. G. Silcock, I. C. S., Officiating Commissioner of Jullundur.

Major Inglis, I. S. C., Deputy Commissioner of Hoshiárpur, and thereafter on special duty in control of plague operations.

Mr. L. Jones, Assistant Commissioner.

Medical.

Captain James, I. M. S.

Dr. Datta, U. M. S.

Police.

Mr. Turnbull, District Superintendent of Police.

The names of the other officers who have been specially mentioned in Major Inglis' report will be brought to the notice of the departmental heads concerned. The Lieutenant-Governor approves of the proposal that the non-officials who gave noteworthy assistance in the operations should receive Sanads and Khillats. When at Hoshiárpur on his recent tour through that district he presented in public Darbár these tokens of the approbation of Government to eight gentlemen whose efforts to bring the people to adopt a reasonable attitude towards the Plague Administration had marked them out as specially deserving. As operations are still in progress in Jullundur a similar evidence of appreciation [illegible] the numerous helpers of Government in that district is deferred for the [illegible]ent.

53. In conclusion, Sir Mackworth Young records with much regret the names of the following who died of plague contracted in the discharge of their duties :—

Mr. Goulburne, Sanitary Inspector.

Third Class Hospital Assistant Ali Bakhsh.

Foot Constables Muhammad Waláyat Shah, Alladád Shah, Ghulám Farid, Hame Shah, Idu, Mam Ráj, Hákim Shah and Hákim Beg.

Report by Major E. Inglis, Deputy Commissioner, On Special Duty, and enclosures.
From Commissioner and Superintendent, Jullundur Division, No. 2311½ A / XVII–43, dated 25th July 1898.
Report by Captain C. H. James, I. M. S.

ORDER :—Ordered that the foregoing remarks be published in the *Punjab Government Gazette*. Also that a copy with copies of the letter and Report noted in the margin be forwarded to—

(1) The Government of India, Home Department.

(2) All Local Governments and Administrations.

(3) All Commissioners and Deputy Commissioners in the Punjab.

(4) Inspector-General of Civil Hospitals, Punjab.

(5) Sanitary Commissioner, Punjab.

(6) All Civil Surgeons in the Punjab.

(7) Inspector-General of Police, Punjab.

(8) To the officers honourably mentioned in paragraph 52 of the Review.

By order of the Hon'ble the Lieutenant-Governor,

H. J. MAYNARD,

Junior Secretary to Government, Punjab.

Punjab Government Press, Lahore—20-12-98—230.

APPENDIX.

JULLUNDUR DISTRICT.

Village.	Number of days which elapsed between: Outbreak and report.	Report and cordoning	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return.	End of disinfection and return.
Khatkar Kalan ...	? 180	Nil.	11	Began before evacuation.	64	59	23	Returned before end of disinfection.
Jhander Khurd ...	30	Nil.	2	2	35	69	32	32
Khán Khanán ...	39	Nil.	13	1	88	90	38	2
Khatkar Khurd ...	5	Nil	1	5	28	45	33	12
Shikohpur ...	? 60	Nil.	1	4	51	68	35	11
Sirhál Qázián ...	9	Nil.	10	2	52	71	17	17
Mallupota ...	15	Nil.	9	7	51	71	40	13
Gunachaur ...	11	Nil.	16	3	89	82	54	Returned before end of disinfection.
Sahlon	? 30	Nil.	9	4	49	54	29	3
Mahal Gohla ...	1	Nil.	22	6	57	79	32	15
Kúmam ...	6	Nil.	8	13	42	59	31	4
Jagatpur ...	6	Nil.	11	?	?	67	33	6
Katheron ...	? 30	Nil.	9	21	42	69	32	6
Karnána ...	2	Nil.	36	35	29	65	39	1
Balon ...	6	Nil.	2	4	43	51	22	4
Lakhpur ...	4	Nil.	9	2	49	52	40	1
Núrpur ...	9	Nil.	4	?	?	55	18	?
Lodhipur ...	21	Nil.	3	21	39	65	31	5
Salh Kalán ...	12	Nil.	7	5	31	43	32	7
Moh ámpur ...	2	Nil.	5	36	30	68	21	2
Naura ...	5	Nil.	Not evacuated.	Not evacuated.	...	...	...	...
Masáni ...	14	Nil.	19	Began before evacuation.	79	65	27	1
Banga ...	4	Nil.	50	Ditto.	109	60	9	1
Katt ...	16	Nil.	4	10	51	68	28	7
Hapowal ...	Nil.	Nil.	17	23	29	60	24	8
Chak Bilga ...	3	Nil.	2	39	36	77	47	2
Dahan ...	6	Nil.	2	19	30	53	35	4
Tahírpur ...	10	Nil.	6	12	34	71	55	25
Mazra Nauabad ...	1	Nil.	7	4	33	42	43	5
Mahmúdpur ...	18	Nil.	2	28	38	67	47	1
Satran ...	6	Nil.	Nil.	22	25	65	28	18
Músapur ...	7	Nil.	Nil.	25	38	64	19	1
Sodián ...	3	Nil.	Nil.	22	41	64	38	1
Sidhar Kalán ...	4	Nil.	Nil.	22	29	54	24	3

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Jhander Khurd ...	30	Nil.	2	2	35	69	32	32
Khán Khanán ...	39	Nil.	13	1	88	90	38	2
Khatkar Khurd ...	5	Nil.	1	5	28	45	33	12
Shirohpur ...	? 60	Nil.	1	4	51	68	35	11
Sirhál Qázián ...	9	Nil.	10	2	52	71	17	17
Mallupota ...	15	Nil.	9	7	51	71	40	13
Gunachaur ...	11	Nil.	16	3	89	82	54	Returned before end of disinfection.
Sablon	? 30	Nil.	9	4	49	54	29	3
Mahal Gohla ...	1	Nil.	22	6	57	79	32	15
Kúmam ...	6	Nil.	8	13	42	59	31	4
Jagatpur ...	6	Nil.	11	?	?	67	33	6
Katheron ...	? 30	Nil.	9	21	42	69	32	6
Karnána ...	2	Nil.	36	35	29	65	39	1
Balon ...	6	Nil.	2	4	43	51	22	4
Lakhpur ...	4	Nil.	9	2	49	52	40	1
Núrpur ...	9	Nil.	4	?	?	55	18	?
Lodhipur ...	21	Nil.	3	21	39	65	31	5
Salh Kalán ...	12	Nil.	7	5	31	43	32	7
Moh ámpur ...	2	Nil.	5	36	30	68	21	2
Naura ...	5	Nil.	Not evacuated.	Not evacuated.	...	...	...	...
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Katt ...	16	Nil.	4	10	51	68	28	7
Hapowal ...	Nil.	Nil.	17	23	29	60	24	8
Chak Bilga ...	3	Nil.	2	39	36	77	47	2
Dahan ...	6	Nil.	2	19	30	53	35	4
Tahírpur ...	10	Nil.	6	12	34	71	55	25
Mazra Nauabad ...	1	Nil.	7	4	33	42	43	5
Mahmúdpur ...	18	Nil.	2	28	38	67	47	1
Satran ...	6	Nil.	Nil.	22	25	65	20	18
Músapur ...	7	Nil.	Nil.	25	38	64	19	1
Sodián ...	3	Nil.	Nil.	22	41	64	38	1
Sidhar Kalán ...	4	Nil.	Nil.	22	29	54	24	3

JULLUNDUR DISTRICT—*concluded.*

Village	Number of days which elapsed between: Outbreak and report.	Report and cordoning.	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return	End of disinfection and return.
Khánpur ...	30	Nil.	2	11	30	51	26	10
Barwál ...	9	Nil.	1	21	14	61	37	26
Mazári ...	1	Nil.	1	20	31	55	48	4
Salh Khurd ...	5	Nil.	3	Began before evacuation.	31	31	27	2
Heon ...	4	Nil.	1	6	48	20	21	Returned before end of disinfection.
Langeri ...	3	Nil.	1	15	48	63	34	Nil.
Lálpur ...	3	Nil.	Nil.	13	13	43	25	17
Chahlan ...	6	Nil.	Nil.	29	27	57	32	1
Bisla ...	5	Nil.	Nil.	20	26	61	17	17
Aur* ...	2	Nil.	Not evacuated.	Not disinfected.	...	...	...	...
Malpur ...	?	Nil.	Nil.	20	23	44	36	1
Bika ...	1	Nil.	Nil.	10	20	62	25	3
Hansron ...	30	Nil.	Nil.	21	20	42	34	1
Sirhái Mandi ...	? 1	Nil	23	8	18	30	22	4
Dhandua ...	4	Nil.	1	19	22	55	2	14
Mokandpur ...	5	2	26	15	10	34	34	Nil.
Gobindpur ...	38	Nil.	10	Nil.	40	43	25	3
Lail ...	5	Nil	1	22	16	43	18	5
Chak Kalál ...	Nil	Nil.	18	3	23	30	38	4
Punián ...	4	Nil.	6	4	34	53	43	15
Kariha ...	15	Nil.	14	24	19	46	15	3
Parágpur ...	?	Nil.	10	17	25	44	34	27
Rasúlpur ...	12	Nil.	7	18	21	40	32	1
Rahpa ...	6	Nil	1	15	22	40	24	3
Goslan ...	1	Nil.	3	12	20	46	36	5
Bhangal ...	14	Nil.	3	19	26	46	35	1
Bajon ...	6	Nil.	3	18	19	38	30	1
Malah ...	5	Nil	Nil	11	37	49	45	6
Aujla ...	6	Nil.	16	No disinfection.	...	25	6	...
Chhokrán ...	24	Nil.	Nil.	23	12	35	21	1
Laroya ...	27	Nil	Nil	18	14	36	20	4
Pharála ...	?	Nil.	1	11	27	43	13	5
Ladhana Jika ...	10	Nil.	1	10	15	26	24	1
Bhaura ...	24	Nil.	1	4	17	24	23	3
Turan ...	20	Nil	Nil.	8	10	21	19	3
Jhingán ...	28	Nil.	Nil.	10	16	35	27	9

* The particulars given in regard to this village refer to the first outbreak there only.

HOSHIARPUR DISTRICT.

Names.	Number of days which elapsed between: Outbreak and report.	Report and cordoning.	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return.	End of disinfection and return.
Birámpur ...	36	Nil.	15	52	24	79	37	3
Parkhowál ...	7	Nil.	Nil.	12	46	58	23	Nil.
Rámpur Bilron ...	6	Nil.	*89	10	38	67	25	19
Simmalmazia ...	12	Nil.	24	9	35	45	18	1
Deron ...	23	Nil.	1	22	5	27	29	Nil.
Bhajjal ...	15	Nil.	3	18	24	49	15	7
Sadhowál ...	?	Nil.	Nil.	32	8	42	21	2
Hájipur ...	3	Nil.	24	18	12*	26	1	Returned before end of disinfection.
Parowál ...	6	Nil.	Nil.	27	12	32	4 days after return.	Ditto.
Garhshankar ...	7	Nil.	33	6	48	68	16	14
Sanwáli ...	?	Nil.	1	22	6	29	24	1
Garhi ...	?	Nil.	10	10	29	42	20	3
Kullewál ...	?	Nil.	15	7	36	45	12	2
Chankoha ...	2	Nil	8	6	31	47	10	10
Bhagwain ...	7	Nil.	1	12	20	34	26	2
Palewál ...	?	Nil.	10	2	27	33	34	4

* This village was not evacuated, except by the Chamárs among whom the disease first appeared, until after a second outbreak which occurred on April 12th.

Punjab Government Press, Lahore—20 12-97—230.

JULLUNDUR DISTRICT—*concluded.*

Village	Number of days which elapsed between: Outbreak and report.	Report and cordoning.	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return	End of disinfection and return.
Khánpur ...	30	Nil.	2	11	30	51	26	10
Barwál ...	9	Nil.	1	21	14	61	37	26
Mazári ...	1	Nil.	1	20	31	55	48	4
Sath Khurd ...	5	Nil.	3	Began before evacuation.	31	31	27	2
Heon ...	4	Nil.	1	6	48	20	21	Returned before end of disinfection.
Langeri ...	3	Nil.	1	15	48	63	34	Nil.
Lálpur ...	3	Nil.	Nil.	13	13	43	25	17
Chahlan ...	6	Nil.	Nil.	29	27	57	32	1
Pisla ...	5	Nil.	Nil.	20	26	61	17	17
Aur* ...	2	Nil.	Not evacuated.	Not disinfected.	...	...	...	...
Malpur ...	?	Nil.	Nil.	20	23	44	36	1
Bika ...	1	Nil.	Nil.	10	20	62	25	3
Hansron ...	30	Nil.	Nil.	21	20	62	34	1
Sirhái Mandi ...	? 1	Nil	23	8	18	30	22	4
Dhandua ...	4	Nil.	1	19	22	55	2	14
Mokandpur ...	5	2	26	15	10	34	34	Nil.
Gobindpur ...	38	Nil.	10	Nil.	40	43	25	3
Lail ...	5	Nil	1	22	16	43	18	5
Chak Kalál ...	Nil	Nil.	18	3	23	30	38	4
Punián ...	4	Nil.	6	4	34	53	43	15
Kariha ...	15	Nil.	14	24	19	46	15	3
Parággpur ...	?	Nil.	10	17	25	44	34	27
Rasúlpur ...	12	Nil.	7	18	21	40	32	1
Rahpa ...	6	Nil	1	15	22	40	24	3
Goslan ...	1	Nil.	3	12	20	46	36	5
Bhangal ...	14	Nil.	3	19	26	46	35	1
Bajon ...	6	Nil.	3	18	19	38	30	1
Malah ...	5	Nil	Nil	11	37	49	45	6
Aujla ...	6	Nil.	16	No disinfection.		25	6	...
Chhokrán ...	24	Nil.	Nil.	23	12	35	21	1
Laroya ...	27	Nil	Nil	18	14	36	20	4
Pharála ...	?	Nil.	1	11	27	43	13	5
Ladhana Jika ...	10	Nil.	1	10	15	26	24	1
Bhaurí ...	24	Nil.	1	4	17	24	23	3
Turan ...	20	Nil	Nil.	8	10	21	19	3
Jhingán ...	28	Nil.	Nil.	10	16	35	27	9

* The particulars given in regard to this village refer to the first outbreak there only.

HOSHIARPUR DISTRICT.

Names.	Number of days which elapsed between: Outbreak and report.	Report and cordoning.	Report and evacuation.	Evacuation and beginning of disinfection.	Beginning and end of disinfection.	Evacuation and return.	Last case and return.	End of disinfection and return.
Birámpur ...	36	Nil.	15	52	24	79	37	3
Parkhowál ...	7	Nil.	Nil.	12	46	58	23	Nil.
Rámpur Bilron ...	6	Nil.	*89	10	38	67	25	19
Simmalmazra ...	12	Nil.	24	9	35	45	18	1
Deron ...	23	Nil.	1	22	5	27	29	Nil.
Bhajjal ...	15	Nil.	3	18	24	49	15	7
Sadhowál ...	?	Nil.	Nil.	32	8	42	21	2
Hájipur ...	3	Nil.	24	18	12	26	1	Returned before end of disinfection.
Parowál ...	6	Nil.	Nil.	27	12	32	4 days after return.	Ditto.
Garhshankar ...	7	Nil.	33	6	48	68	16	14
Sanwáli ...	?	Nil.	1	22	6	29	24	1
Garhi ...	?	Nil.	10	10	29	42	20	3
Kullewál ...	?	Nil.	15	7	36	45	12	2
Chankoha ...	2	Nil	8	6	31	47	10	10
Bhagwain ...	7	Nil.	1	12	20	34	26	2
Palewál ...	?	Nil.	10	2	27	33	34	4

* This village was not evacuated, except by the Chamárs among whom the disease first appeared, until after a second outbreak which occurred on April 12th.

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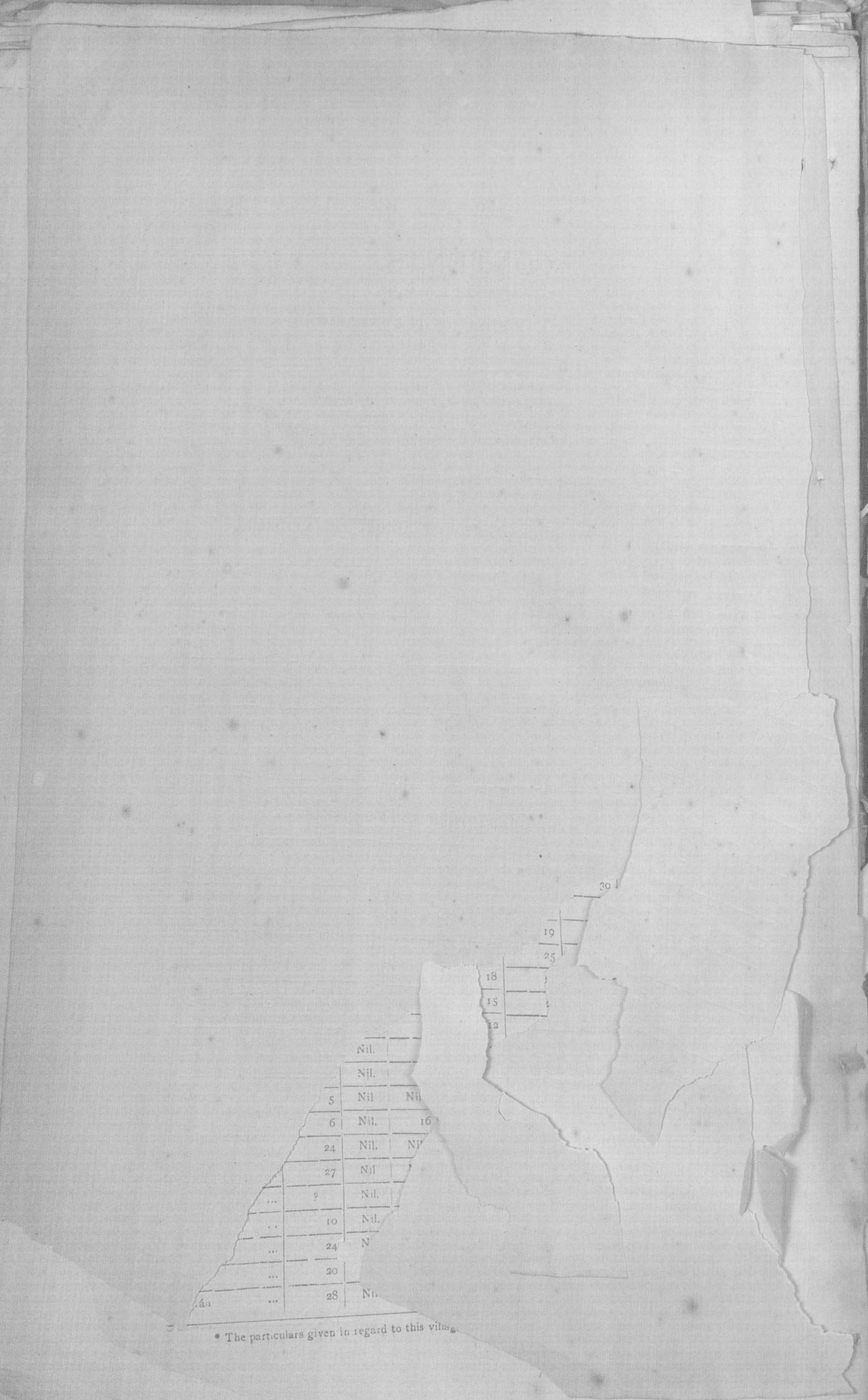

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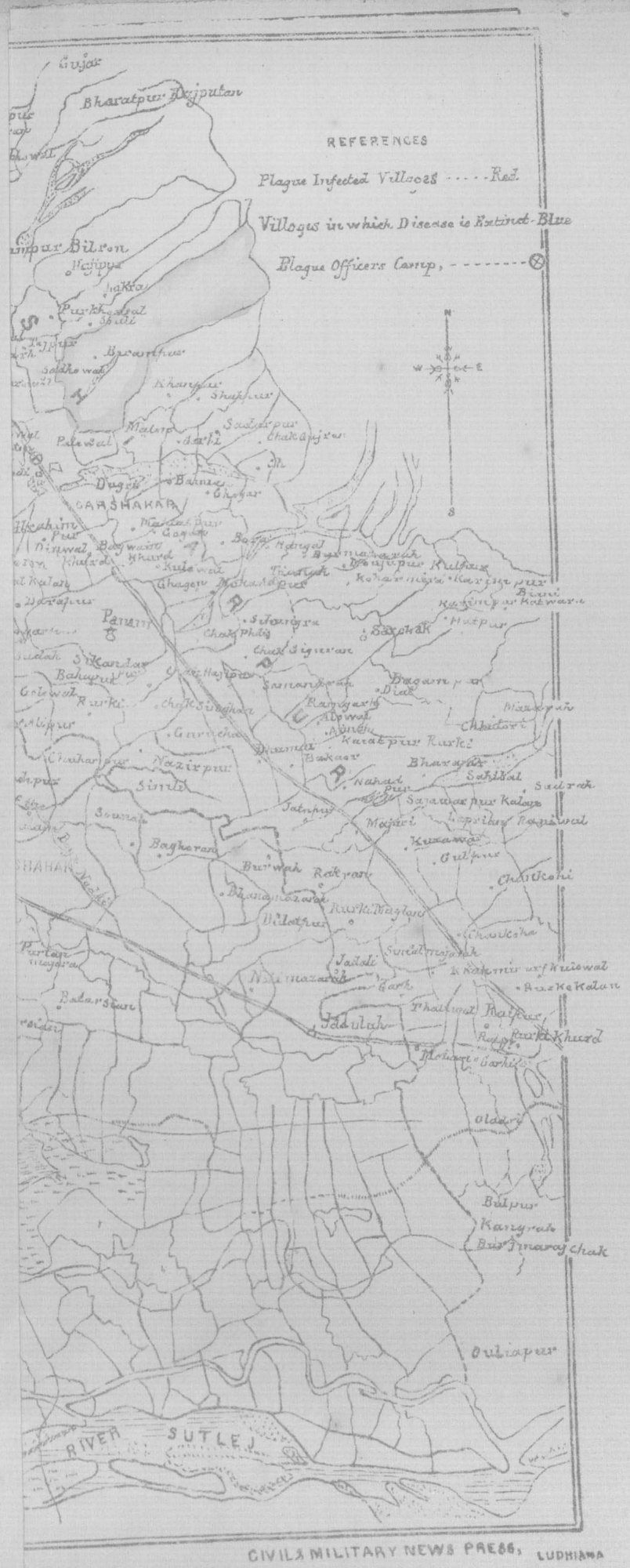

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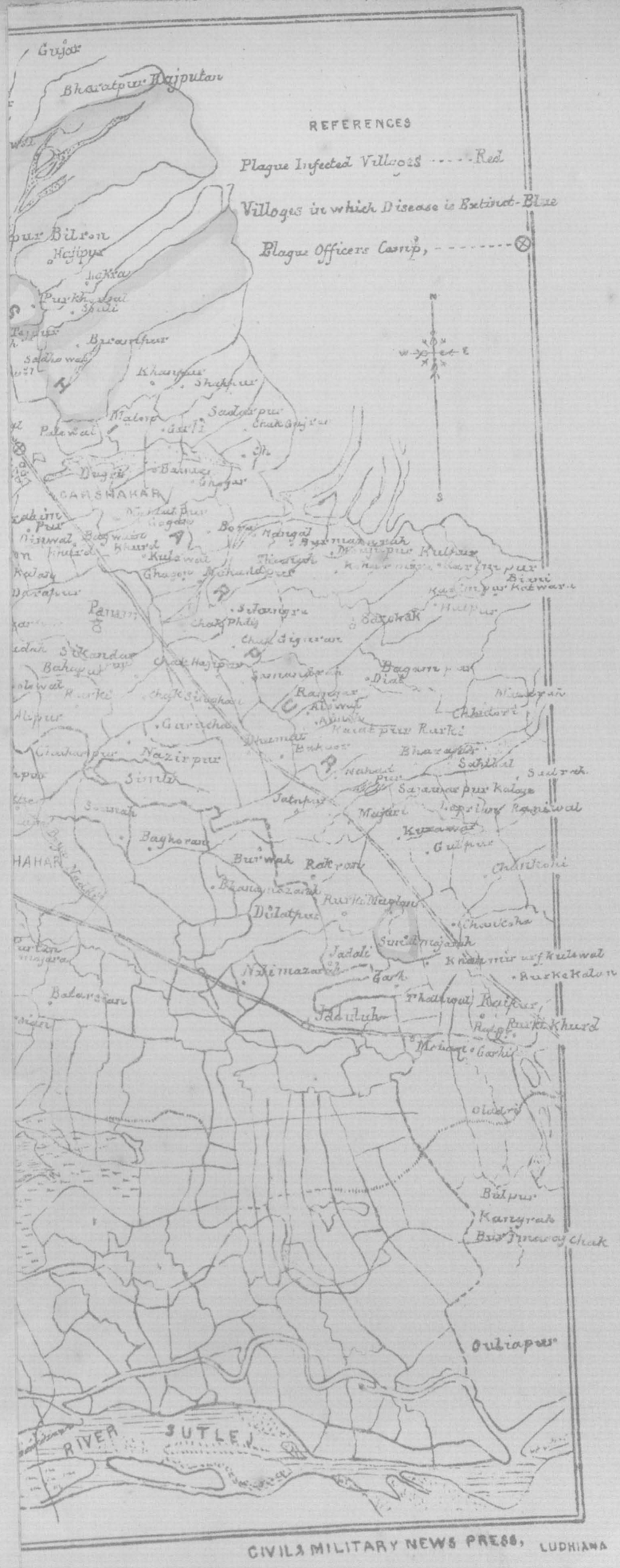

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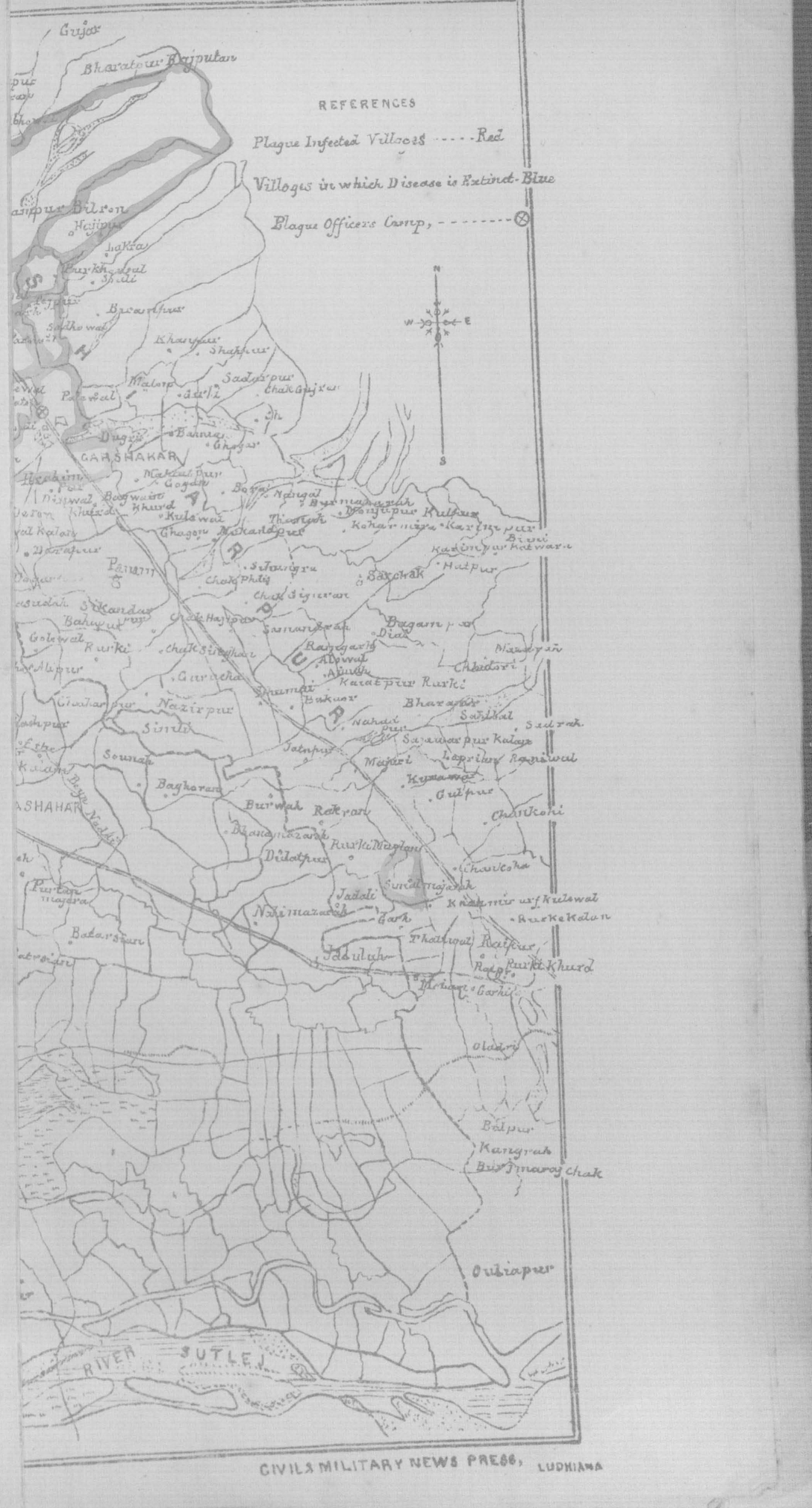
REFERENCES
Plague Infected Villages ----- Red
Villages in which Disease is Extinct - Blue
Plague Officers Camp, ⊗
N
W
E
S
Gujar
Bharatpur Rajputan
Bilron
Hajipur
Shahpur
Khanpur
Sadhpur
Chak Gujran
Palwal
Dugri
Banna
Ghagon
GARHSHAHAR
Makhsudpur
Gogdu
Nangal
Khurd
Kulawal
Thatgaon
Ghagon
Mahandpur
Kakar mara
Karimpur
Kadimpur Ratwara
Hatpur
Sakrak
Chak Sigiwan
Bagarnpur
Dhan
Nazirpur
Chhidari
Karatpur Rurki
Bharapur
Sadkal
Sadrak
Nahari Pur
Sarawar pur Kalan
Kapriby Ranawal
Mujari
Kumawar
Gulpur
Chandkohi
Sirsali
Soumak
Baghrara
Burwak
Rakrari
Bhandarzak
Purki Mughlani
Chandcha
Jadali
Surajak
Kakamir urf Kalawal
Burke Kalan
Nahimarzak
Garh
Thathgaon
Raipur
Purki Khurd
Jadulah
Mirjan
Garhi
Oladri
Balpur
Kangrah
Bir Jmaroj chak
Oubiapur
RIVER SUTLEJ
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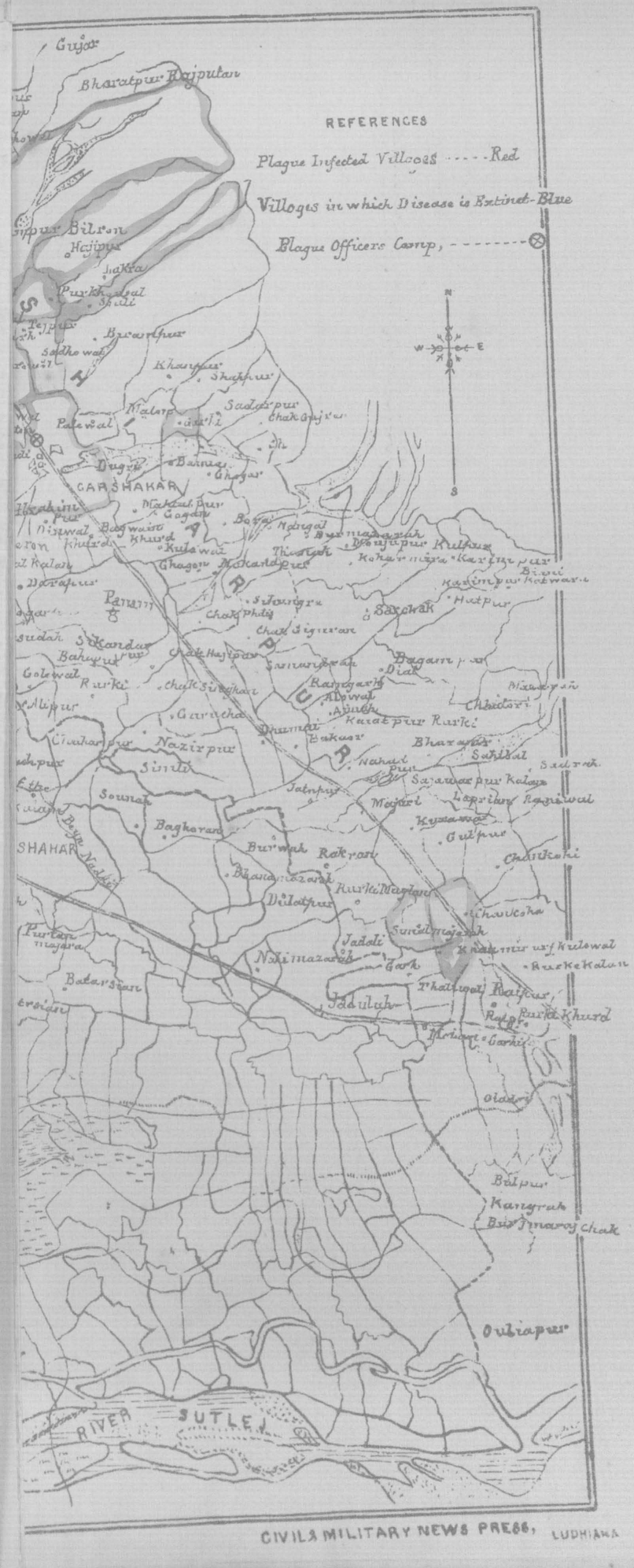
REFERENCES
Plague Infected Villages ----- Red
Villages in which Disease is Extinct-Blue
Plague Officers Camp, --------
Gujar
Bharatpur Rajputan
Bilron
Hajipur
Jakka
Purkhawal
Tejpur
Bharatpur
Sadhowala
Kharpur
Shekhpur
Nalera
Sadatpur
Chak Gujran
Palewal
Aurkh
Dugar
Barnai
Ghagar
CARSHAKAR
Makhal Pur
Gagan
Bajar
Nangal
Bhaupur Kulpur
Kaharpura
Kartar pur
Kasimpur Ratwara
Bisni
Hatpur
Barwak
Thirgarh
Ghagar
Makandpur
Jhingra
Chak Phalia
Chak Sigrian
Sudah
Khandur
Bahupur
Chak Hajipur
Samarpran
Dagarnpur
Dial
Colewal
Rurki
Chak Sikhan
Rangarh
Alowal
Ajnoh
Karatpur Rurki
Chandari
Alipur
Garucha
Dhumai
Bakaur
Bharapur
Sukhal
Chuharpur
Nazirpur
Sirali
Nahal Pur
Sadrah
Sowrah
Jatnpur
Majari
Sajanpur Kalan
Kyamgar
Gulpur
Bagharan
Burmah
Rakrari
Chandkohi
SHAHAR
Bhana Mazara
Rurki Marjan
Dilatpur
Chaucha
Purtan Mazara
Jadali
Nakimazara
Garh
Batarsian
Jadaluh
Rurki Khurd
Mohari
Garhi
Oldara
Bulpur
Kangrah
Bir Jinarajchak
Outrapur
RIVER SUTLEJ
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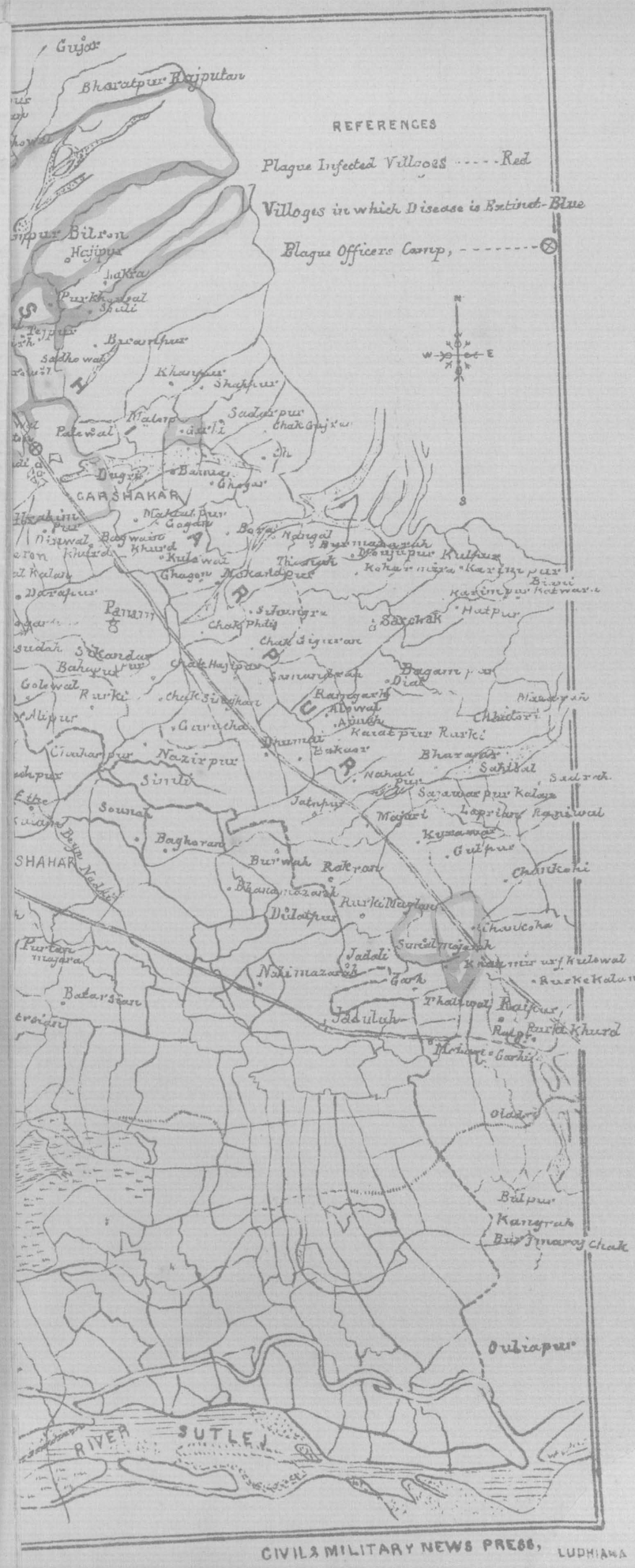

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REFERENCES
Plague Infected Villages ----- Red
Villages in which Disease is Extinct - Blue
Plague Officers Camp, -------
Gujar
Bharatpur Rajputan
Rajpur Bilran
Hajipur
Purkh Lal
Bazarpur
Kharpur
Shahpur
Sadatpur
Chak Rajpur
Patawal
Dugar
Bainsa
Chagar
CANTONMENT
Nizwal
Kulawal
Ghagar
Karatpur
Kalanaur
Hajipur
Chak Phalia
Chak Sigrian
Basudah
Sikandar
Bahupur
Golwal
Rurki
Chak Sikandar
Garacha
Alipur
Nazirpur
Sirali
Kashpur
Jatnpur
Sajanarpur Kalan
Bagheran
Burwal
Rakran
Kurki Mughlan
Dilalpur
Jadali
Nalimazra
Bark
Thalipur
Batargari
Jadulubi
Garhi
Oldsri
Balpur
Kanyrah
Bir Jmaraj Chak
Dubiapur
RIVER SUTLEJ
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the symptoms were put down to this disease. While Ralla was still ill, one of the two Brahmin children belonging to Puran Chand, who lived on the south aspect of the village in a house facing the large village tank, was attacked with severe fever. The elder, Jai Kaur, aged 12 years, was ill about ten days and died before Ralla (August 30th); the younger, Rakhu, aged 4 years, became ill later, and his disease was rapidly fatal. This death is not recorded in the thana register.

The history of the Rawal who came from Poona.

Up to this time the deaths in the village, excepting the *dhobi* above mentioned and several very young infants, had been entirely among the Brahmins. The only other person besides Ram Saran who had left the village for any distant place outside the province was a Rawal named Bannah. The Rawals are great eye-doctors and travel great distances in pursuit of their profession. There were several men in this village who had visited Europe and America in their travels. In February of 1897 a company of them started for Australia. Bannah, who was a man of delicate health, accompanied his fellow-castemen as far as Poona, where his health gave way and he returned to his village in March. He seems to have suffered from phthisis, and after his return he was more or less bedridden, and in September, six months after his return, he gradually sank and died. There does not seem to be any reason to believe that this man ever suffered from plague, and as none of his relatives, or, indeed, any of the Rawals, were affected before the village was evacuated, his case may be dismissed as not directly concerning the points at present under discussion. His history is only alluded to here as being the only other source of which we have any knowledge, and which could possibly have started the epidemic.

The rats began to die in August.

At the beginning of August the rats in the village were noticed to be dying out in the open. This seems to have been first noticed in Hari Ram's cattle-shed near Malan's house.

The disease began to take on an epidemic form in September.

In September some Jats living near Malan's house got infected. Jhandu's daughter, aged 10 years, died after an illness lasting two days; but the exact date of her death is not known; and some Chamars also became ill. The Chamars' quarters lie immediately behind Malan's house, and though there is no direct communication, the houses of some of the infected Jats actually join those belonging to the Chamars. There can be no doubt that the disease from which the people were suffering in September was true bubonic plague. But the villagers at the time were ignorant of the fact, and it was not till the weather became cooler, and the disease took a more virulent form, and larger numbers began to be attacked, that they realized the danger in their midst. Two deaths took place on October 9th, one on the 13th, another on the 14th, and no less than four on the 15th of the same month. It appears that the day on which so many deaths occurred the people became thoroughly roused to their danger and

The occurrence of a fatal form of fever reported at the Banga thana on October 15th.

reported at the thana at Banga, a couple of miles away, that they were being devastated by some fatal form of fever, the exact nature of which they were ignorant. The Banga Hospital Assistant came immediately to the place and found many sick, and reported to the Civil Surgeon, Jullundur, that he thought that the disease was plague. The Civil Surgeon came out, and in turn reported to the Deputy Commissioner and the Commissioner. The Sanitary Commissioner and the Deputy Commissioner arrived on October 21st, and

Plague officially announced October 21st.

after a careful examination of the village officially announced the presence of plague.

The question whether Ram Saran introduced the disease is discussed.

It was not till this date that any attempt was made to try and find out how the disease got into the village, and by this time Ram Saran had been dead nearly six months. All native reports have to be carefully sifted before one can accept them as true, and in this particular case we have the additional uncertainty which lapse of time brings and the fact that there was no one present who could be trusted to observe accurately the man's symptoms. It is, therefore, with great caution that we can accept the statement that it was the Brahmin Ram Saran who introduced the disease and that he was the first to succumb. There are several points in the history of this case which require clearing up. If Ram Saran was first attacked in Rahon and remained there for several days afterwards, why is it that the epidemic did not start there instead of Khatkar, where the man only lived one night? Up to the present the town has remained quite free. Many "plague inspections" have revealed no suspicion of the disease, and an inspecting officer has had his head-quarters in the town. Then, again, what became of the ekka driver who brought in the sick man? He does not seem to have contracted the disease—at any rate, we have no evidence of it. But the most curious part of the story is that the village should have remained free so long after this man's death, and that so few cases should have occurred during the hot weather, and that it should have taken so long to develop the epidemic. Finally, we have no statement to show that the man had enlarged glands. None of these arguments, however, are sufficiently conclusive to preclude the existence of the disease. We have other instances where plague patients have stopped a short time at a place and not communicated the disease to others. This is more likely to happen in the hot weather than the cold. Our experience had shown that during the summer months the disease has very little tendency to spread, and it is extremely common for a long period to elapse between the arrival of the imported case and the onset of the first indigenous case. There is something in the hot weather in the Punjab which seems to be inimical to the spread of the disease. This may be the heat of the sun, or it may be due to some other cause indirectly connected with the sun. This experience of ours during the last three months of this year has helped us to understand why the epidemic did not make more progress during the last hot weather in Khatkar.

Very similar occurrences have this year taken place at Garhi, in the Hoshiarpur, and Aur and other villages in the Jullundur district as appear to have happened in Khatkar last year. There have been a few dropping cases of a mild type, which, had no doctor been present, would certainly have escaped detection and have kept up the infection till the cold weather. As few of these are fatal, there may even be no record to show that any illness at all has been present. In the case of Aur Dr. Wilkinson found four mild cases of plague in July. The last previous case of which we have any record in this village was on April 7th. This seems almost a parallel case to Ram Saran and Malan, who were attacked in April and August, respectively, last year.

It is, therefore, not unreasonable to suppose that the disease may have existed in Khatkar the whole hot weather in a mild form, and the record of deaths was no indication of the amount of illness present. The question as to whether Ram Saran had enlarged glands or not is not of very great importance. Had he had glands, the diagnosis would not have left much room for doubt. But there is no record of this. Many plague patients die without enlarged glands, and, as the man died so soon after his arrival and was more or less unconscious when he arrived, and as the friends were not alive to the importance of buboes, they may very easily have been overlooked even if they were present.

On the other hand, we have some indirect evidence which tends to show that this was really a case of plague.

The symptoms given, though few in number, are characteristic. The very fact that the friends could get a reliable history out of the man, although he was delirious and semi-unconscious, is very like what happens in plague.

There seems to be no doubt in the minds of villagers that this man brought plague into their midst, and the impression is strengthened when we remember that there was plague at the time at Hardwar, where the man had been. The disease at first was confined to the Brahmins, to which caste he belonged, and there seems to have been a regular sequence of cases from Ram Saran to the Chamars who were found with the disease sh on them when we arrived. Further evidence was found when the people evacuated the village between October 24th and 26th.

ill abc Up to this time none of the Rawals had been attacked. They lived in enlarg separate "patti" or section of the village, cut off from the rest, and had

quite a different entrance to the Brahmins. But after they got out a woman named Barkat, wife of Nabbu, was attacked and died. As it was impossible for the infection to have arisen in the new healthy camp, the inference was that she became infected from the village. On going to her house, which lay at the very end of a long *cul-de-sac*, we were surprised to find that it adjoined, back-to-back, Ram Saran's house. In fact, the two houses were under the same roof. The Rawal family had no connection whatever with the Brahmins. This infection of houses adjoining others in which plague has occurred is so common that towards the end of the epidemic in the Banga district we made special arrangements for the disinfection of all houses surrounding and especially those back-to-back to "infected houses." The agency of communication, as we shall presently try and show, is probably rats. But whatever the agency may be, the fact remains that houses touching infected houses, although, as in this case, having their entrances in different streets and occupied by people totally different in caste and habits, are especially liable to infection. This leads us to believe that Ram Saran's house was not only infected, but probably remained so till our arrival. At any rate some infection seems to have spread and remained in Nabbu's house, and the general disturbance of all the property lying in the rooms which moving into camp entailed probably brought the woman in contact with the contagion. There were no other infected houses near from which she could have got the disease.

Then, again, Hari Ram and some of Bhag's family were almost simultaneously attacked with plague when they moved out of their houses. They may have contracted the disease in several different ways; but when we remember that these two men inherited Ram Saran's property, which probably lay untouched till they prepared to go into camp, one is inclined to the belief that they may have been infected from this property, and thus the deceased Brahmin may have been the indirect cause of their being attacked. In short, all Ram Saran's surroundings seem to have been ultimately attacked. The village of Khatkar is fifteen or sixteen miles away from the railway, and there is not much likelihood of many people coming from or going to long distances without it being generally known in the village. Moreover, we had the complete confidence of the people, who helped us in every way in their power, and were ready to give us any information we wanted. This being the case, and there being a total absence of evidence of any other sources of infection, one is almost forced to the conclusion that Ram Saran brought plague to Khatkar Kalan and was the direct means by which the terrible epidemic which has given us so much anxiety during the last nine months was born and bred.

We have discussed this case at some length, as the conclusions are extremely important. If our deductions are true,—and we believe they are true,—then it shows that plague can exist in a mild form in our villages during the hot weather unsuspected, and therefore unheeded, only to break forth with renewed vigour when the winter commences, and to carry death and desolation far and wide. We cannot, therefore, trust to the hot weather alone to stamp out the pest, but must be on the alert and ready to use all the other means which we have at hand.

The effects of the hot weather alone are not sufficient to stamp out the disease.

Plague is no ordinary illness. It is far more infectious than any other disease of which we have any knowledge, and more deadly than most. It consequently calls for severer and more thorough measures to check its spread. It was determined from the commencement not to tinker with it, but to deal with it in the most wholesale manner possible, and arrangements were at once put on foot for completely evacuating the entire village and all its outlying buildings. Of course, every one was quite unprepared to meet the epidemic, and arrangements were more slowly carried out then than they were later on, when the establishment was in better working order, for other villages. But in spite of this the Chamars and sweepers, who were at that time the worst sufferers, were got out by the 24th, and the whole village of 1,355 people was out in camp by the 29th of the month.

Immediate measures were taken to evacuate Khatkar Kalan.

The effect on the disease was most marked. From the time the executive officers arrived on the scene on 21st to the 29th, when the whole village was empty, we had cases as follows:—

The effect of the evacuation on the epidemic.

21st	...	...	...	6	cases.	25th	...	...	...	7	cases.
22nd	...	...	...	7	,,	26th	...	...	...	3	,,
23rd	...	...	..	0	,,	27th	...	...	...	0	,,
24th	...	...	...	3	,,	28th	...	...	...	4	,,

and 29th 2 new cases.

After the evacuation there were 2 cases on the 30th, 3 cases on November 1st, 1 on the 5th, 1 on the 6th, 1 on the 17th, and last dropping case on December 3rd. In fact there were 32 new cases in the nine days previous to and during evacuation and only 9 afterwards. This drop in the cases when the people got out into camp has been most marked throughout the operations in all the villages with which we have had to deal, and will be referred to again in greater detail in another section of this report.

There were altogether 72 cases and 39 deaths during the month of October.

The disinfection of the village was completed at the end of November: a few days were spent in making a final inspection of all the houses. The Bharais,—a caste of Muhammadan beggars,—who had not been attacked by plague, were allowed to return to their houses on November 30th; the Rawals followed on December 6th; and then the various camps followed, till everybody had returned on December 26th. The village was, however, still kept cordoned in order to observe whether any "infection" had remained in the houses and whether any fresh cases would occur after the return of the people. No recrudescence took place. The medical officer had a final roll-call on January 6th, and declared the village free of infection, and after this the police were removed and the people were free to come and go as they pleased.

Disinfection of the village, and return of the inhabitants.

So far the arrangements made seem to have been successful. The disease was decidedly on the increase when we arrived; it practically stopped after the village was evacuated and the last case occurred thirty-five days after evacuation. The infection, which had been several months lurking about the village, was completely eradicated after disinfection, and the place has now (July) remained free for seven months.

The measures adopted were successful in stamping out the disease in Khatkar Kalan; but other villages became affected.

These are, of course, most encouraging results, and as similar results have been obtained in practically every village which has been dealt with, it proves that our methods, if not perfect, are certainly effectual.

But we did not stop the disease from spreading to many other villages. For several weeks, after most careful search by two most able medical officers, one in the Jullundur district and another in the Hoshiarpur district, nothing suspicious was obtained, and we almost felt that the disease had been checked. But it had already passed beyond our police cordon: secretly and surely the seeds of destruction were ripening.

On November 9th, plague was discovered at Jhandher Khurd, a village seven miles away from our first village, a little north of the Phagwara-Banga main road, and about 4½ miles east of the latter town. No satisfactory explanation as to how the disease reached this village was ever obtained, but as the Chamars were first affected, and as some of them were related to the Khatkar Chamars, the probable solution lies in the fact that some one brought the infection from our former village. Six suspicious deaths had occurred quite lately before our arrival. The first of these was Rajji, wife of Fattu and sister of Jawahar. She died about October 25th, after an illness of ten days. Her brother, Jawahar, was attacked with plague on November 19th, after our arrival, and died on the 28th. There is little doubt that disease existed in this village about the 15th October and therefore before the authorities had realized the existence of the malady in Khatkar Kalan, our first village.

Jhandher Khurd attacked.

Mode of infection unknown.

Khankhanan attacked.

Khankhanan, a large village of 2,500 people, was discovered on November 20th, though rumours had reached us some days previously and visits had been made by an Hospital Assistant. It was found to be badly infected, and no less than 115 cases of plague occurred in it before all the people were evacuated on December 6th. The means of infection in this case was also obscure.

Theories as to the mode of its infection.

It appears that a sort of shrine called "Jhandeji," situated about a quarter of a mile east of Khatker Kalan is considered a place of pilgrimage and a fair takes place in it every Sunday. Among the people who visited the fair very regularly,—in fact they constantly sold articles of diet, such as *ata*, *ghi*, sugar, &c.—were a Brahmin named Tulsi and a Khatri named Bhagwana. The first case of which we were able to obtain any definite information was the man, Tulsi, whose case presented difficulties in that he had for many years suffered from lupus of the face, and was in a very debilitated state of health. However, three deaths from plague took place in Bhagwana's house early in November. It is supposed that either Tulsi or Bhagwana, or both, got some of their property infected at Jhandeji, and this property being carried to Khankhanan, afterwards started the disease in their houses. This, however, is chiefly conjecture, as there are not a sufficient number of facts forthcoming to make this story absolutely reliable.

Another supposition is that at the time Khatkar Kalan was being cordoned and evacuated, some clothes were sent from Khatkar to Khankhanan, to avoid their being spoiled by disinfection. In one case we know this was done, but on investigation the clothes were found to have come from a "healthy" family, and none of the recipients ever contracted the disease. But there may have been other cases of which we have no information where infected clothes may have been thus smuggled into this village: on the whole, we must confess that we have no certain knowledge as to how the disease was actually introduced. But the fact remains that the disease spread rapidly from Bhagwana's house all over the quarter of the village known as Dalel Singh's *patti*.

Disease discovered on November 21st. A plague corpse attacked by rats.

The medical officer visited the village on November 21st, but was unable to decide whether the case he saw—an old woman with high fever—was really plague or not, as the typical symptoms had not then developed. He came again the following morning, to find that the old woman had died a few hours before his arrival. However, the corpse had been locked up in the room where the woman had lived and had been kept for his inspection. But when the body was inspected, to the horror of all, it was found that the nose and part of one cheek had been gnawed away—presumably by rats. The investigation proved that the old woman ha[d] died of plague, and the body was burned as soon as possible. But during th[e] next few days every house in the block of buildings in which the corpse w[as] found was affected. Brahmins, Jats and Telis were attacked. When th[e] houses were afterwards disinfected, a number of dead rats were found in them.

The evacuation of Khankhanan.

At first the people of Khankhanan showed a great disinclination to come out into camp, though they had every desire to [have] their sick treated. Much persuasion and tact had to be shown. In fact it was not till they saw the terrible inroads the disease was making in their numbers that they changed their minds, and at length permission was given them they literally ran out of their dwellings, and in a few days six good camps were formed. These camps were afterwards increased to ten in number, by forming fresh segregation camps and also splitting up a large health camp situated at the south of the village. There were 96 cases and 39 deaths during the month of November in the infected villages of the Jullundur district.

Monthly total of cases and deaths.

While we had been treating these three villages the disease had already found a new resting-place in a village in the Hoshiarpur district. This village was Birampur, which is about ten miles from Khankhanan. The history of its infection was as follows:—About the 18th to 20th October, and before a regular cordon had been formed round Khatkar, a sweeper woman, the sister of one Labhu who had plague at the time, and in

The outbreaks in the Hoshiarpur district—Birampur. Disease taken by a Chamar woman from Khatkar Kalan.

whose house she lived, ran away to Birampur with her child. She got ill a few days later and died. But it was not till December 11th that the disease was discovered and took on an epidemic character. Birampur being in the Hoshiarpur district, was at first worked by a separate establishment under the Deputy Commissioner of that district.

Khatkar Khurd attacked.

Khatkar Khurd was found to be infected on December 28th. But as the first cases were found early, and the whole village was immediately evacuated, it escaped with only 10 seizures.

Position of affairs at the end of the year 1897. European establishment.

Up to the end of the year there had been four villages attacked in the Jullundur district and one in the Hoshiarpur district. An Assistant Commissioner, a medical officer and a police officer were the Europeans attached to each of the—two circles. One other medical officer devoted his whole time to the inspection of villages in order to detect plague as early as possible, and two other Assistant Commissioners came to learn the work during the last month. The headquarters of the executive staff of the Jullundur district was at first at Khatkar Kalan, but was moved on November 23rd to Khankhanan. The plague officers in the Hoshiarpur district had their camp at Garhshankar.

Cases and mortality during December.

There were 28 cases and 20 deaths during the month of December in Birampur in the Hoshiarpur district, and 106 cases and 77 deaths in the infected villages of Jullundur district.

No new villages infected during January.

During January no new villages were discovered, and again our hopes were raised to believing that we had got to the end of the epidemic. Map 1 shows the situation of the five villages which had been attacked up to this time; Map 2 the villages being treated on February 1st.

Cases and mortality during January.

There were 19 cases and 11 deaths during the month of January in the infected villages of the Jullundur district, and 17 cases and 12 deaths at Birampur in the Hoshiarpur district.

Villages declared free during January.

The following villages were declared free of plague during the month of January in the Jullundur district:—

(1). Khatkar Kalan, January 6th.
(2). Jhandher Khurd, „ 29th.

Great increase of plague during February.

With the onset of February our real troubles began. The following villages were discovered to be infected on the dates specified:—

JULLUNDUR DISTRICT.

Shikohpur,	February 1st.	Sahlon,	February 20th
Sirhal Qazian,	„ 3rd.	Mehl Gahla,	„ 23rd
Mallupota,	„ 12th.	Kumam,	„ 26th
Gunachour,	„ 13th.	Jagatpur,	„ 27th
Jhandher Khurd,	„ 19th (re-infected).	Khatkar Khurd,	„ 28th (re-infected).

HOSHIARPUR DISTRICT.

Purkhowal,	February 3rd.	Deron,	February 19th.
Bilron,	„ 7th.	Bhajjal.	„ 21st.
Simmal Mazara,	„ 9th.		

Villages declared free during February.

The only village declared free of plague during the month of February was Khatkar Khurd (February 19th) in the Jullundur district.

The formation of the Nawashahr plague circle.

Shikohpur was 6½ miles from the plague officers' camp, and after it had been evacuated on February 2nd a fresh officers' camp was near it. This afterwards became the head-quarters of a separate circle, called the Nawashahr circle. When the hot weather came on, the officer here moved into a bungalow in Nawashahr itself. Other villages in the vicinity of Shikohpur, such as Sohlon, Kumam, &c., soon became affected, and there were eventually 21 villages infected in this circle. The details of these have been collected by Dr. Smith, and are given on page 67 *et seq.* of this report.

The circle was in a way subordinate to the previously formed circle, which was now called the "Banga circle," for the transmission of stores, huts and the various returns, but it had a separate establishment and for all other practical purposes was independent of the former circle.

There were 211 cases and 121 deaths during the month of February in the infected villages of the Jullundur district and 72 cases and 31 deaths in the infected villages of the Hoshiarpur district.

Cases and mortality during February.

Further spread of the disease during March.

In March the epidemic spread to 23 more villages in the Jullundur district and 4 more in the Garhshankar tahsil as follows :—

Villages discovered during the month.

JULLUNDUR DISTRICT.

Banga Circle.

Balon,	March 2nd.	Haphowal,	March 12th.
Lakhpur,	,, 5th.	Chak Bilga,	,, 13th.
Nurpur,	,, 7th.	Dhahan,	,, 13th.
Salh Kalan,	,, 8th.	Tahirpur,	,, 18th.
Naura,	,, 10th.	Mazara Nawabad,	,, 21st.
Masani,	,, 10th.	Sotran,	,, 24th.
Banga,	,, 11th.	Lidhar Kalan,	,, 29th.
Katt,	,, 15th.	Khanpur,	,, 30th.

Nawashahr Circle.

Ghotaran,	March 1st.	Mahmudpur,	March 22nd.
Karnana,	,, 2nd.	Musapur,	,, 25th.
Lodhipur,	,, 7th.	Sodhian,	,, 29th.
Mehrampur,	,, 9th.		

HOSHIARPUR DISTRICT.

Sadhowal,	March 6th.	Parowal,	March 24th.
Hajipur,	,, 9th.	Garhshankar,	,, 30th.

Villages declared free after termination of plague operations in them.

The following villages were declared free of plague during the same month :—

JULLUNDUR DISTRICT.

Khankhanan,	March 17th.	Karnana,	March 29th.
Jhandher Khurd,	,, 7th.		

HOSHIARPUR DISTRICT.

Birampur,	March 26th.	Dheron,	March 30th.

In this month it will be noticed that besides the numerous villages affected two important towns became infected, *viz.*, Garhshankar and Banga. The former is the tahsil head-quarters for the most infected area of Hoshiarpur, and Banga the tahsil head-quarters and post office for the similarly affected part of the Banga circle. It was on both these towns that the plague officials depended for many of their supplies. About this time, more civil and medical officers began to arrive as well as a large number of police, and arrangements had now to be made on a larger scale. Instead of having only two medical officers on inspection duty to discover fresh cases of plague, each of the plague infected areas in the two districts were divided into circles, each had a European officer at its head with a Tahsildar or Naib-Tahsildar, a Hospital Assistant and Kanungos. Extra nurses and dhais were entertained, who were ready for emergencies.

Increase in the establishment on plague duty.

Improved system of observation instituted.

The circles were as follows :—

JULLUNDUR DISTRICT.

Banga. | Phagwara.
Nawashahr. | Aur.
Rahon.

HOSHIARPUR DISTRICT.

Garhshankar. | Mahlpur.
Saibi. | Balachaur.

A system of rewards for early information regarding newly attacked villages which had been initiated in the previous month now came fully into force, and had probably better results than any other system. Several lambardars were also heavily punished during the month for concealing the existence of the disease in their villages. The salutary effect of these convictions is difficult to over-estimate. There is much to criticise in our system of inspections. But it must be admitted that, on the whole, it was highly successful, and the early information of fresh outbreaks put us in a better position to deal with the epidemic.

Rewards for early intimation of plague.

Lambardars punished by imprisonment for hiding cases of plague.

There were 869 cases and 564 deaths during the month of March in the infected villages of Jullundur district, and 132 cases and 90 deaths in the infected villages of Hoshiarpur.

Cases and mortality during March.

During April we had no less than 34 new villages attacked and the epidemic was certainly at its height.

The epidemic most severe during April.

JULLUNDUR DISTRICT.

Banga Circle.

Bahrwal,	April 1st.	Mukandpur,	April 15th.
Mazari,	,, 2nd.	Gobindpur,	,, 15th.
Salh Khurd,	,, 3rd.	Lehal,	,, 17th.
Heon,	,, 3rd.	Chak Kalal,	,, 17th.
Langeri,	,, 4th.	Poonian,	,, 18th.
Lalpur,	,, 5th.	Rahpa,	,, 22nd.
Bisla,	,, 6th.	Gosal,	,, 22nd.
Bika,	,, 10th.	Mallah.	,, 25th.
Sirhal Mandi,	,, 14th.	Aujla,	,, 27th.
Dhandhua,	,, 14th.		

Nawashahr Circle.

Chahlan,	April 6th.	Kariha,	April 20th.
Karnana,	,, 6th.	Piragpur,	,, 21st.
Aur,	,, 7th.	Rasulpur,	,, 21st.
Malpur,	,, 9th.	Bhangal,	,, 24th.
Hansaron,	,, 12th.	Bajon,	,, 26th.

HOSHIARPUR DISTRICT.

Samvali,	April 4th.	Garhi,	,, 20th.
Bilron,	,, 12th (re-infected).	Chinkoa,	,, 23rd.
Kulewal,	,, 15th.		

The following villages were declared free of plague in the Jullundur and Hoshiarpur districts during the month of April :—

Villages declared free during April.

JULLUNDUR DISTRICT.

Shikohpur,	April 19th.	Naura,	April 3rd.
Khatkar Khurd,	,, 7th.	Aur,	,, 19th.

HOSHIARPUR DISTRICT.

Bhajjal,	April 14th.	Sadhowal,	April 19th.
Purkhowal,	,, 18th.		

The Jullundur and Hoshiarpur infected area, which had previously been kept more or less separate, were now brought under the supervision of one Plague Deputy Commissioner, Major Inglis.

The whole plague area put under the orders of Major Inglis, Special Plague Deputy Commissioner.

This month was an important one in the history of the epidemic, not only because the largest number of new villages were discovered to be infected about this time, but also because of fresh troubles in the way of the discontent and resistance to the measures being carried out. The people began to get an idea into their heads that Government had no intention of compelling them to leave their villages unless they themselves wished to come out. It is difficult to trace how this idea originated, but the practical result was very serious. Garhshankar was the first to openly defy authority, and refused to come out into camp. Their example was quickly followed by other villages in the Nawashahr circle. Kariha, Bhangal and Piragpur became defiant. By the time the Commissioner, Mr. Silcock, came down on April 25th, the aspect of affairs had become critical. Colonel Rennick, the Deputy Commissioner, induced the people of Kariha to conform to orders without the use of force. But it was not till the beginning of May, and then not till the people had seen for themselves the terrible effect of remaining in the villages, that they were induced to come out. In the case of Garhshankar recourse to arms had to be taken. The police were opposed when trying to enter the town and firing took place. Nine men were killed and 35 wounded in the affray. But the incident, regrettable though it was, had a marvelously salutary effect. On hearing that Garhshankar had been evacuated, Kariha, Bhangal and Piragpur came out into camp immediately, and after this we never had any more difficulty in evacuating villages. Though the casualties at the Garhshankar riots were very heavy, they are small compared to what the mortality from plague would have been had these severe measures never been taken. It must be remembered that several villages took their cue from Garhshankar, and on the result of this place hung the fate of many places—one may say the fate of all the villages in the district. It was the great turning point in the plague operations. The weather now began to be very hot, but the epidemic at first showed no signs of abating

Some places became discontented and resisted authority.

Kariha, Bangal and Paragpur refuse to come out into camp.

The Garhshankar riots.

There were 861 cases and 491 deaths during the month of April in the infected villages of the Jullundur district and 203 cases and 119 deaths in the infected villages of Hoshiarpur district. During May the following villages were attacked :—

Cases and mortality during April. New infected villages during May.

JULLUNDUR DISTRICT.

Banga Circle.

Chhokran,	May 10th.	Bhaura,	May 25th.
Pharala,	„ 19th.	Turan,	„ 25th.
Ladhana Jhika,	„ 21st.		

Nawashehr Circle.

Laroya,	May 18th	Jhingar,	May 26th.

HOSHIARPUR DISTRICT.

Bhagwain, May 19th.

A large number of villages declared free after the termination of the operations during the month.

The following villages were declared free :—

JULLUNDUR DISTRICT.

Sirhal Qazian,	May 5th.	Salh Kalan,	May 5th.
Mallupota,	„ 13th.	Dhahan,	„ 17th.
Sahlon,	„ 9th.	Lehal,	„ 31st.
Kamam	„ 14th.	Mazara Nawabad,	„ 19th.
Jagatpur,	„ 26th.	Salh Khurd,	„ 17th.
Ghataron,	„ 28th.	Mehrampur,	„ 31st.
Balon,	„ 4th.	Heon,	„ 12th.
Lakhpur,	„ 14th.	Lalpur,	„ 28th.
Nurpur,	„ 13th.	Ganachaur,	„ 31st.
Lodhipur,	„ 24th.		

HOSHIARPUR DISTRICT.

Simbal Mazara,	May 2nd.	Parowal,	May 7th.
Sanwali,	„ 5th.	Hajipur,	„ 8th.

The work now began to diminish. On account of the great distances the Banga circle a new sub-division was formed having head-quarters at Upra, a village nearly 10 miles south-we of Banga. A small bungalow was built, and an Assista Commissioner, a doctor and a police officer stationed the for the supervision of the following villages :—Lehal, Sarhal, Mandi, Tahirpu Aujla, Masani, Chhokran, Rahpa, Turan and Mukandpur.

The epidemic began to diminish.

Upra made the head-quarters of a fourth circle.

The disinfection of several of these villages was almost complete before circle was formed. But having people so much nearer the seat of operat materially helped in getting the work quickly and satisfactorily completed.

During the month of May there were 452 cases and 355 deaths in th infected villages of the Jullundur district, and 235 case and 126 deaths in the infected villages of the Hoshiarpur district.

Cases and mortality during May.

In June the village Palewal was found infected and Bahrwal re-infected. With regard to the latter case only one person, a barber's son, was attacked with plague. He and the family were segregated and no further spread took place. But during this season two or three curious isolated cases of what we believe to be a mild form of plague occurred in some of the other villages. Such cases were seen at Bika, Kariha and Laroya. They were all treated as cases of plague, and in no instance was the patient very ill, nor did infection spread to other members.

Villages infected during June.

The case at Bahrwal.

Very mild cases occurred in certain villages.

We mention the fact as probably indicating that the disease had taken on the mild form which has been noticed by others at the beginning or at end of epidemics. We believe these cases require special observation, as, if not promptly recognized and treated, they may be the means of keeping plague extant in a district from one cold weather to the next.

There were 15 cases and 10 deaths during the month of June in the inf ed villages of the Jullundur district, and 16 cases and 8 deaths in the infe villages of the Hoshiarpur district.

Villages declared free.

The following villages were declared free of plague during the month :—

JULLUNDUR DISTRICT.

Mehl Gabla,	June 14th.	Hansaron,	June 4th.
Masani,	„ 12th.	Sirhal Mandi,	„ 16th.
Katt,	„ 2nd.	Dhandhua,	„ 20th.
Haphowal,	„ 7th.	Mukandpur,	„ 23rd.
Chak Bilga,	„ 9th.	Gobindpur,	„ 18th.
Tahirpur,	„ 13th.	Chak Kalal,	„ 14th.
Mahmudpur,	„ 9th.	Punian,	„ 27th.
Sotran,	„ 7th.	Piragpur,	„ 25th.
Musapur,	„ 8th.	Rasulpur,	„ 18th.
Sodhian,	„ 11th.	Rahpa,	„ 12th.
Lidar Kalan,	„ 1st.	Gosal,	„ 20th.
Khanpur,		Bhangal,	„ 22nd.
Bahrwal,	„ 2nd.	Bajan,	„ 26th.
Mazari,		Mallah,	„ 24th.
Langeri,	„ 17th.	Aujla,	„ 17th.
Chahlan,	„ 12th.	Chhokran,	„ 25th.
Karnana,	„ 22nd.	Ladhana Jhika,	„ 27th.
Bisla,	„ 18th.	Bhaura,	„ 29th.
Malpur,	„ 2nd.	Turan,	„ 25th.
Bika,	„ 21st.		

HOSHIARPUR DISTRICT.

Garhi,	June 18th.	Chinkoa,	June 22nd.
Kulewal,	„ 20th.	Bhagwain,	„ 28th.

In the beginning of July the plague establishment began to be diminished, nd a further reduction took place on the 15th. At this time there were only few villages remaining under treatment, *viz.*, Banga, Kariha, Laroya, Pharala, hirngar, Bahrwal in the Jullundur district, and Rampur Bilron, Garhshankar nd Palewal in the Hoshiarpur district (see Map No. 6). All these villages ere declared free during July, and Aur was the only new village.

At the time of writing these notes (August) only one village, Aur, remains n the list. This place was declared infected on July 23rd, when three mild ases of the disease were discovered; a fourth case was found on the 24th.

Kariha and Bahrwal were declared free on July 12th, Laroya on 30th, nd Pharala on the 31st of the month.

We shall now take the villages *seriatim* and describe as far as possible the ode of infection in each village. We are indebted to Surgeon-Captain Clark r the notes of the Hoshiarpur villages, to Surgeon-Captain Smith for those the Nawashahr circle, and Surgeon-Captain Wilkinson for 19 of the 50 villages the Banga and Upra circles.

It would serve no good purpose to describe in detail the disinfecting operations carried out in each village, as there were in most cases only a repetition of the work done in previous villages. It is, therefore, proposed to refer in this section only to the details in which the arrangements deviated from the usual methods adopted, and to describe these methods more fully in Section III of the Report. This will ensure brevity, with greater clearness of description.

The accompanying chart gives the daily cases and deaths throughout the outbreak, and shows in a graphic form the gradual rise of the epidemic during February, its height in March and April, and its sudden subsidence during the second week in May.

The numbers opposite the names of the following villages indicate their serial order in the accompanying tables, and are given for purposes of ready reference :—

CHART No. I.

Showing the daily cases and deaths from Plague from Oct. 1897 to July 189

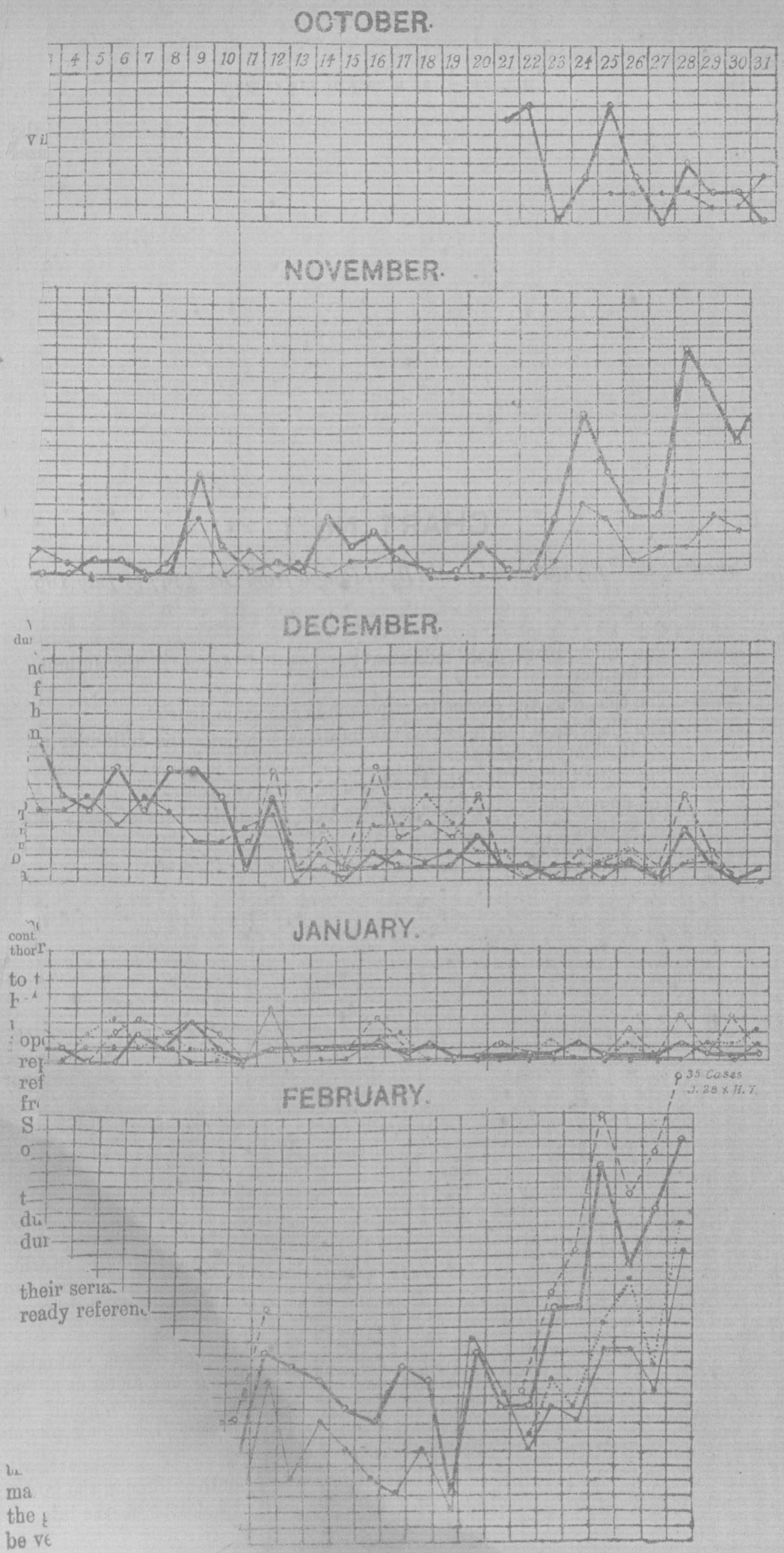
——— The thick black line indicates the cases of plague in the Jullun district.

——— The thin line, the deaths from plague in the same district.

- - - - - The black dash line indicates the total cases in both the Jullundur a Hoshiarpur districts.

..... The dotted black line, the total deaths in the two districts.

The figures on the left hand indicate the actual numbers of cases a deaths.



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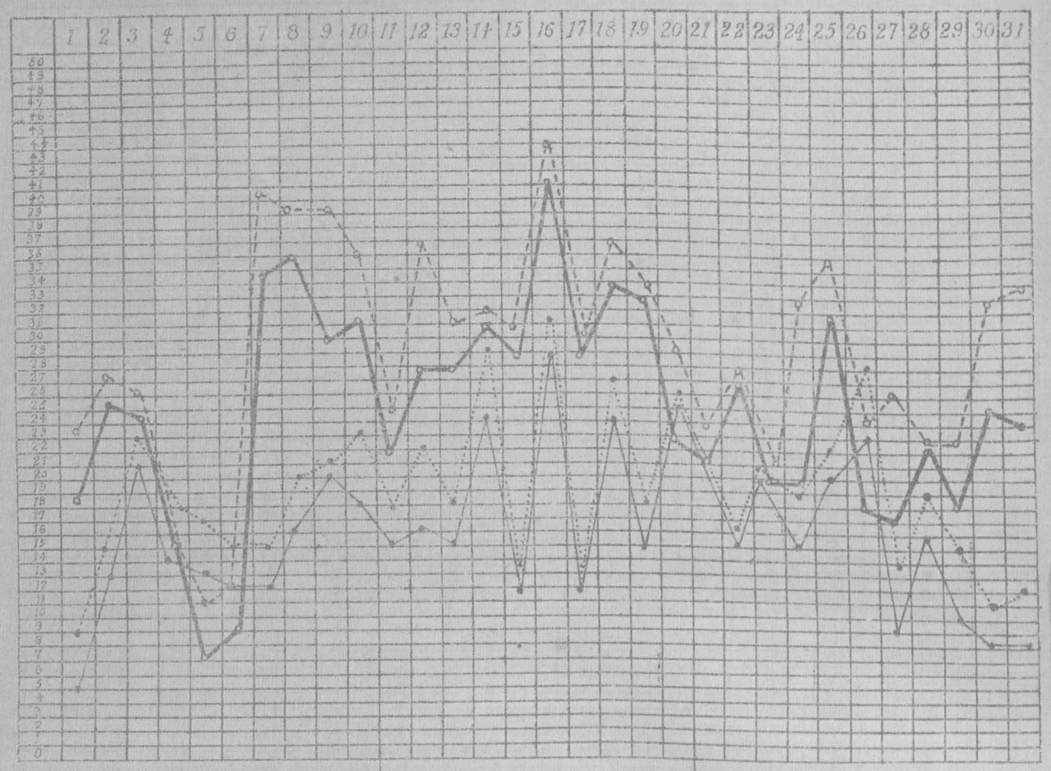

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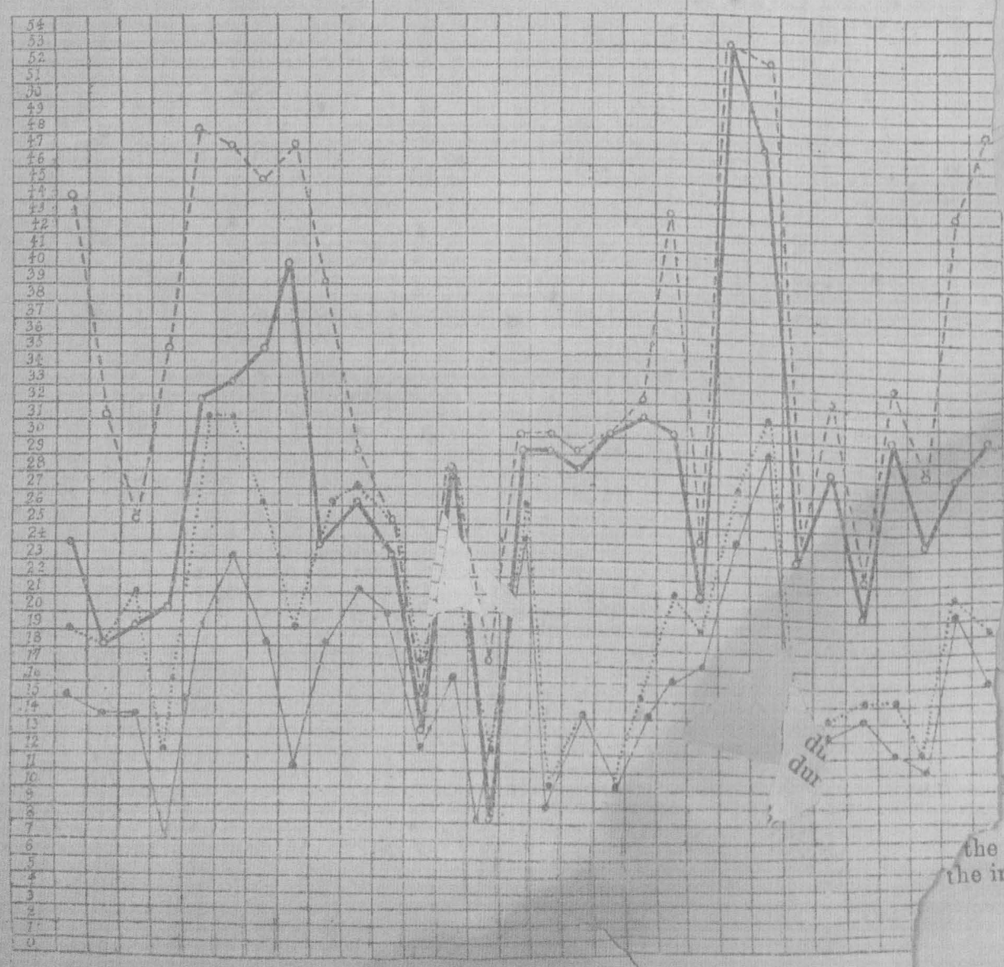

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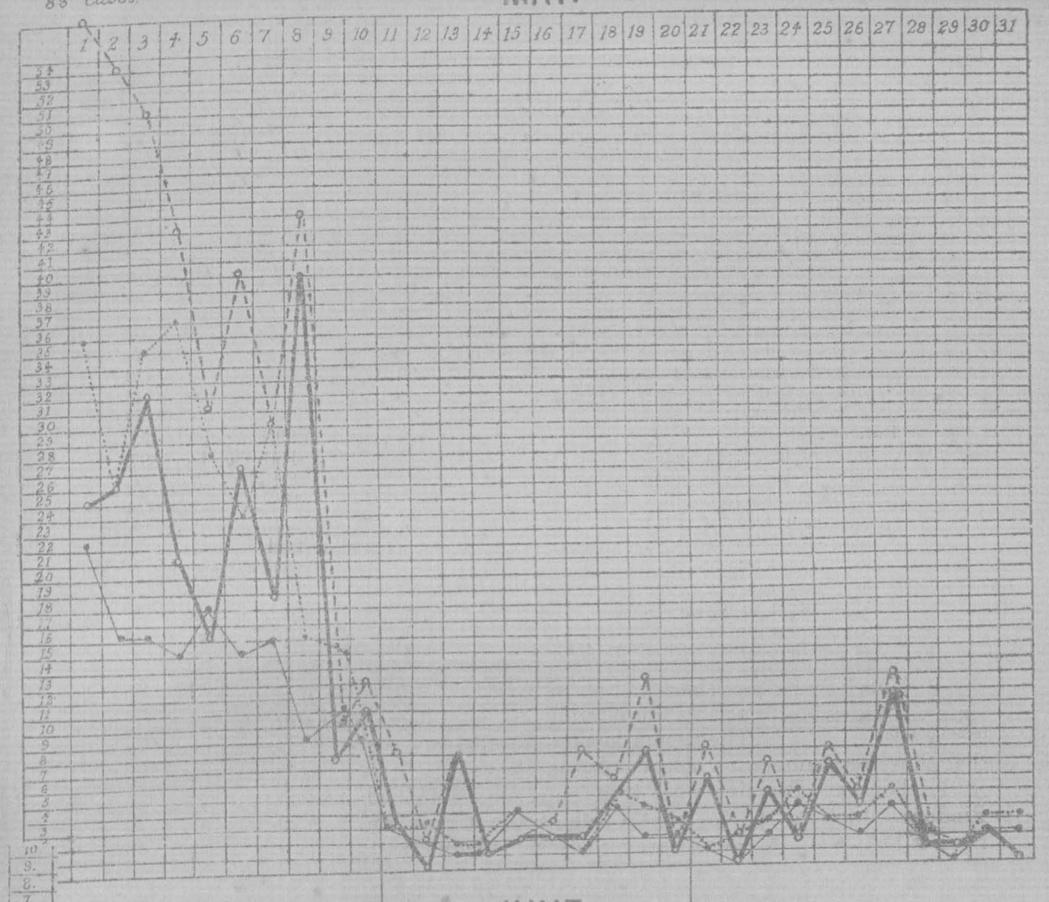

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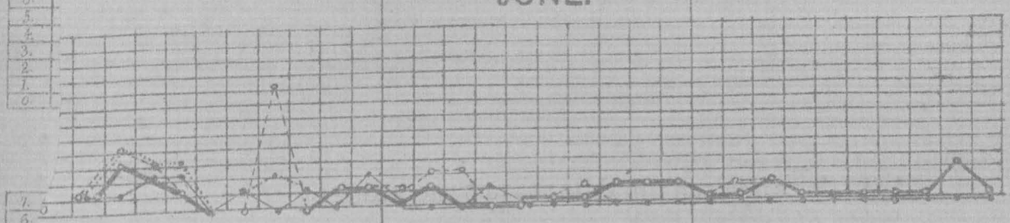

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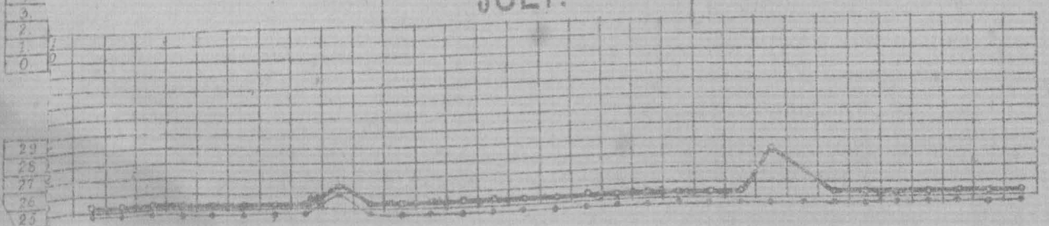

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A.—Banga Circle.

(1) *Khatkar Kalan.*

Census Population (1891)		1,400
Roll-call		1,352
Muhammadans (Rawals)		244
Hindus (all classes)		968
Chamars		129
Sweepers		11
Ramdasi		...
Number of houses		300
Do. do. infected		71
Do. plague cases returned		79
Do. deaths		45
Do. recoveries		34
Date of first case	29th April	1897.
Do. do. returned	17th October	1897.
Do. declaration of plague	17th do.	
Do. cordoning of village	17th do.	
Do. evacuation of village	28th do.	
Do. commencement of disinfection	25th do.	
Do. completion of do.	28th December	1897.
Do. last case	3rd do.	
Do. return to village	26th do.	
Do. removal of cordon	6th January	189
Do. village declared free of plague	6th do.	

This village has already been referred to. It only remains to add

Rats only found in re-infected quarter.

no rats were found in the village itself during disinfect They seem to have all left previously. The villagers sta that they were numerous before plague started. There was plenty of grai in the houses. But live rats were found in a detached outlying portion:—th Pindora which lay on the south side of the village and which was separate from it by a pond. There were no cases of plague in this quarter.

The following is a list of the various camps showing the dates of their formation and the cases which occurred in each. The effect of the evacuation of the quarters was most marked in the Chamars quarters and the sweepers. These were suffering severely the week previously. The disease stopped suddenly on their going into camp.

List of Camps in Khatkar Kalan giving dates of fresh cases of Plague after the inhabitants left the village.

A.—Eleven sweepers went into huts on October 23rd.

They previously had 8 cases of plague, with 6 deaths; one case was attacked afterwards on November 5th. She was a little girl who was in attendance on her mother, who was at the time suffering from plague in a separate hut.

B.—One hundred and thirty-three Chamars went into huts on October 24th.

They previously had 19 attacked with plague. None attacked since.

C.—Six hundred Hindus went into camp on October 26th to 28th.

They had previously not been attacked

There were 2 cases on October 29th.

There was 1 case do. 30th.

Do. 1 do. November 1st.

Do. 1 do. do. 6th.

D.—Two hundred and fifty-seven Rawals (Muhammadans) went into camp on October 26th to 28th.

They had previously no cases of plague.

One case on November 1st.

E.—One hundred and thirty-five Bahrais (Muhammadans) went into camp October 28th.

These had no cases, either before or after evacuation.

F.—One hundred and ninety-two people—the families of 40 persons who had been attacked by plague of various castes—were put into segregation camp on October 28th. Their number was increased by receiving the families of persons attacked in other camps up to November 6th.

One case, October 30th.

One case, November 1st.

(2) *and* (9) *Jhandher Khurd.*

Census population (1891)		800
Roll-call		493
Muhammadans		10
Hindus (all classes)		336
Chamars		120
Other castes		27
Number of houses		72
Do. do. infected		12
Do. plague cases returned		29
Do. deaths do.		19
Do. recoveries do.		10
Date of first case	10th October	1897.
Do. do. returned	9th November	1897.
Do. declaration of plague	9th do.	
Do. cordoning of village	9th do.	
Do. evacuation of village	11th do.	
Do. commencement of disinfection	13th do.	
Do. completion of do.	18th December	1897.
Do. last case	18th do.	
Do. return to village	19th January	1898.
Do. removal of cordon	29th do.	
Do. village declared free of plague	29th do.	

This village has been referred to on page 5.

There is no history of rats in this instance. The people showed little

Some people refused hospital treatment.

inclination to help in the operations, and many of them refused to take hospital treatment. This was not insisted upon, and it was afterwards found that out of 10 persons who took no medicine 9 died, while out of the remaining 19 only 10 died. It is not presumed by this statement to infer that it was entirely due to the treatment that so many recovered. It was probably partly due to treatment, but mostly due to accident.

Re-infection of the village in February.

The village was re-infected by a Sikh carpenter who ran away from Mullupota when that village was discovered to be infected on February 12th. But when the Mullupota village census was scrutinised, his absence was discovered, and he was traced to Jhandher Khurd, where he was found suffering from plague. As the whole village had recently been thoroughly disinfected, it was thought sufficient to turn out only the household with whom he lived. They were segregated under a police cordon for three weeks; the house disinfected; and when the patient recovered all were thoroughly washed with phenyle lotion and allowed to return to their home. No further spread took place. The village was finally declared free on March 7th.

(3). KHANKHANAN.

Census population (1891)		2,300
Roll-call		2,115
Muhammadans		324
Hindus all classes		1,382
Chamars and Ramdasis		386
Sweepers		23
Number of houses		504
Do. do. infected		120
Do. plague cases returned		175
Do. deaths		96
Do. recoveries		79
Date of first case	15th October	1897.
Do. do. returned	23rd November	1897.
Do. declaration of plague	23rd do.	
Do. cordoning of village	23rd do.	
Do. evacuation of village	6th December	1897.
Do. commencement of disinfection	7th do.	
Do. completion of do.	5th March	1898.
Do. last case	28th January	1898.
Do. return to village	7th March	1898.
Do. removal of cordon	17th do.	
Do. village declared free of plague	17th do.	

The mode of infection of this village has been discussed on page 6.

The plague camps.

The people were placed in camps round the village in the following manner. A large camp was formed at the south, called Dewa Singh's camp, from the Zaildar's name who nominally the headman in it. It contained 847 people and remained free disease for over a month. But when the people were allowed to come into village to disinfect their houses some Tarkhans got infec

Infection of people living in camp when they returned to the village to disinfect their houses.

It is pretty evident that they got the infection from village, as though their huts were dotted about the ca it was found that they all lived in a single lane in village and their houses were adjacent to each other. This is one of the num ous instances we had of people who when they left the village had their quarte free from disease, but when they returned for disinfection they found the virulently infectious. In consequence of this infection the camp had to be sp up into smaller camps. Three so-called healthy camps were formed on the e of the village, and were called Naurang Singh's camp, containing 109 peop Khazan Singh's camp, 314 people; and Dalel Singh's camp, with 112 people.

On the north of the village next to the infected quarters, but separate by half a mile, were the four segregation camps and the hospital.

The Chamars and sweepers (376 in number) had their camp situated to the north-east.

The disease showed some obstinacy, and was finally eradicated by dis infecting nearly all the camps as well as the village. Numerous instance were given by the people of rats dying of plague in houses preparatory to th

Notes about rats.

people living in them becoming attacked. When th village disinfection was completed no rats could be fou anywhere, but in the course of a month they returned. The people say the animals went into the fields, during the disinfecting operations.

Table No. I.

Showing the Section or Patti of Khankhanan village from which plague cases we re admitted to hospital for the fortnight before the people went into camp.

Patti.	Popula-tion.	November.								December.						
		23	24	25	26	27	28	29	30	1	2	3	4	5	6	Total.
Dalel Singh's Patti ...	443	1	9	6	4	3	15	11	8	8	12	8	5	4	5	99
Khazan Singh's Patti ..	314	...	1	...	...	...	...	...	1	...	...	...	1	...	2	5
Naurang Singh's Patti...	109	...	1	1	...	...	1	1	...	3	...	...	...	1	1	9
Dewa Singh's Patti ...	824	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1
Exact Patti unknown ...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1
Total	...	1	11	7	4	3	16	12	9	11	13	9	6	5	8	115

It will be seen that Dalel Singh's quarter was badly infected, and that the disease was spreading to the other portions of the village. The effect of evacuation is seen in the following

Table showing the camps round Khankhanan from which cases of Plague were admitted to Hospital.

Serial No.	Name of camps.	Population.	No. of cases in village.	Date of going in-to camp.	JANUARY 1898. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	DECEMBER 1897. 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	Remarks.
1	Segregation camp No. I	82	...	6-12-97	...	...	
2	,, No. II	*248	...	...	...	3 ... 2 3 ... 1 1 ... 1 ...	*This camp was formed from infected families removed from Dewa Singh's camp.
3	,, No. II	144	...	...	...	... 1 ...	
4	New segregation camp ...	38	...	13-1-98	...	...	
5	Chamars' camp	270	...	6-12-97	...	2 1 ... 1 ... 1 ...	
6	Dalel Singh's camp ...	104	90	...	1 ...	1 ... 2 ...	
7	Khazan Singh's ,, ...	314	5	...	2 1 ...	2 1 5 ... 3 ...	
8	Naurangh Singh's ,, ...	109	9	...	...	... 4 ...	
9	Dewa Singh's ,, ...	824	1	...	...	...	Camp infected from the village.
10	Hospital	...	...	...	...	... 1 ...	
11	Quarters of village unknown.	...	1	...	...	...	
	Total	2,129	115	...	5 8 8 6 1 6 1 ... 2 1 ... 1 3 ...	5 8 8 6 1 6 1 ... 2 1 ... 1 3 ...	

Dalel Singh's Patti contained 443 persons, of which 104 went to Dalel Singh's camp and the rest to the segregation camp. All the cases occurring in the segregation camp were among people from Dalel Singh's Patti except one case on 26th December, which came from Naurang Singh's Patti.

(4.) KHATKAR KHURD.

Census population (1891)		377
Roll-call		346
Muhammadans		21
Hindus (all classes)		182
Chamars and Rahtia Sikhs		143
Number of houses		77
Do. infected		4
Number of plague cases returned		10
Do. deaths		6
Do. recoveries		4
Date of first case	23rd December	1897.
Do. cases returned	28th do.	
Do. declaration of plague	28th do.	
Do. cordoning of village	28th do.	
Do. evacuation of village	29th do.	
Do. commencement of disinfection	3rd January	1898.
Do. completion	31st do.	
Do. last case	10th do.	
Do. return to village	12th February	1898.
Do. removal of cordon	19th do.	
Do. village declared free of plague	19th do.	

This small village has already been mentioned (page 7). The mode of infection is unknown. We got information concerning the presence of the disease very early, and the village was completely evacuated thirty hours afterwards. There were only 10 attacks, of which 6 proved fatal.

There was a re-infection of the village on February 27th (see No. 14, page 24).

(6.) SIRHAL QAZIAN.

Census population (1891)		2,026
Roll-call		1,812
Muhammadan, chiefly Arains and Qazis		677
Hindu Jats		212
Other Hindus		439
Chamars		357
Sweepers		55
Ramdasis		72
Number of houses		625
Do. do. infected		54
Do. plague cases returned		82
Do. deaths		63
Do. recoveries		19
Date of first case	25th January	1898.
Do. returned	3rd February	1898.
Do. declaration of plague	3rd do.	
Do. cordoning of village	3rd do.	
Do. evacuation of village	13th do.	
Do. commencement of disinfection	15th do.	
Do. completion of do.	8th April	1898.
Do. last case	do.	
Do. return to village	25th do.	
Do. removal of cordon	5th May	1898.
Do. village declared free of plague	5th do.	

Mode of infection.

Two cases of plague were discovered in the village by Dr. Davidson on February 3rd. The following day 8 more cases were discovered. Attri, the wife of Sonah, a Khatri, seems to have been the first of these cases attacked. The statement given was that she became ill on January 25th. The disease was almost certainly brought from Khankhanan. Many of the inhabitants of the two villages were either related or had close business connections. But we are still ignorant as to who the person was who actually conveyed the infection. One story is that a Jat, named Puran, son of Ram Singh, had relatives in Khankhanan and often went to see them when they were in camp. But Puran Singh was not attacked till February 19th, which was long after the disease had established itself in his village. Another story is that Labhu, a Tarkhan, who died at Sirhal Qazian on February 4th, brought the disease from Khankhanan. This seems likely from the fact that he did the same kind of woodwork for which the Khankhanan carpenters are so famous, and these latter suffered severely in the epidemic.

The cases discovered by us were all in the northern portion of the town and consisted of Khatris 2, Arains 3, Suniars 3, 1 Lalari and 1 Tarkhan. Arrangements were at once commenced for the total evacuation of the village.

The infected houses were immediately emptied and their inhabitants placed in a segregation camp. The large Chappar hospital from Khankhanan was taken down and brought over to Sirhal Qazian. The patients who had been accommodated in small huts were admitted into the hospital on February 8th. There was some delay in getting out the rest of the village, consisting of 1,812 persons, on account of the material for building huts having run short. But in spite of this the village was evacuated by the 13th of the month. Up to this time 25 patients had been attacked, all of whom, except 1 from the segregation camp, came from the village.

After the people came out very heavy rain fell, and they consequently suffered a good deal of discomfort. There was a very determined attempt to hide cases even after the villagers went out into camp. This was evinced by the fact that no less than 12 cases were picked out dead from the various camps.

The disease at first was very obstinate, and the improvement from evacuation small; but it quickly disappeared when the weather again became fine.

The following is a list of the cases from the various camps:—Segregation camp 15 cases; Dewa Singh's camp 14; Chamars 9; Ram Singh's, where the disease started, 8; Arains 6; Qazians 2; and 2 sweepers. There were also two policemen attacked. The means by which these latter were infected was not discovered.

The last case occurred on March 8th, and the disinfecting was completed on April 8th. The people returned to their homes on the 25th, having been two months and ten days in camp. The mortality among those attacked was very high, being 63 deaths out of 82 cases, or a death-rate of 76·8 per cent. The type of disease in this place was very virulent. In one case a man died a few hours (18) after being attacked.

(7). MALLUPOTA.

Census population (1891)		1,399
Roll-call		1,174
Muhammadans, chiefly Arains		318
Hindus, chiefly Jats		659
Chamars		178
Sweepers		19
Number of houses		304
Do. do. infected		70
Do. plague cases returned		91
Do. deaths returned		60
Do. recoveries returned		31
Date of first case	January 28th.	
Do. do. returned	12th February	1898.
Do. declaration of plague	12th do.	
Do. cordoning of village	12th do.	
Do. evacuation of village	21st do.	
Do. commencement of disinfection	28th do.	
Do. completion of do.	20th April	1898.
Do. last case	24th March	1898.
Do. return to village	3rd May	1898.
Do. removal of cordon	13th do.	
Do. village declared free of plague	13th do.	

Mode of infection.

This large village, consisting of 1,174 people, is situated about two miles north of Khankhanan, and the fields of the two villages adjoin one another along the intervening boundary. The disease was discovered here by Dr. Davidson on February 12th, when no less than 9 cases were found by the medical officers on the same day. The mode of infection of this village is interesting. It apparently did not take place from any of the adjoining infected villages, but from one situated eight miles away. About 15 days before our visit, one of the lambardars, named Hamera, went to Nawashahr in order to make some arrangements about the land tax. His daughter-in-law, Nihali, went with him. On their return journey they went a little out of the way to visit some of Nihali's relatives at Shikohpur. This must have been just before this latter village was cordoned by us on January 29th. The two travellers seemed to have stopped the night and then proceeded on their homeward journey. On arriving at a village named Dosanjh, five miles distant, Hamera suddenly became ill and had to be carried the rest of the way to Mallupota. On arriving at his home he took to his bed and died a few days later. After arriving at the house, Nihali

became ill and died the same day as her father-in-law. On our arrival at the village Phatu, one of Hamera's sons, was down with plague. The family denied that Hamera and Nihali ever went to Shikohpur, but the story was afterwards confirmed by other relatives, and besides it is difficult to see what Hamera was doing at Dosanjh, which is not on the direct road to Nawashahr, while it is on the direct line to Shikohpur, and also what was Nihali's object in going with her father-in law if it was not to see her relatives at Shikohpur. The result of this visit was most disastrous, as not only was the disease introduced to Mallupota on account of it, but this family was the cause of spreading the disease to another village Mehlgahla (*vide infra*). It appears that when Nihali was very ill her daughter Shib Dai, who had married Uttam Singh's son at Mehlgahla, came to see her, and eventually got ill at the latter place.

On our arrival the village, now under consideration, was found badly infected. As previously stated, nine cases were found on that day, and five cases on each of the three following days. It was impossible to get out the people into camp quickly, as there were heavy winter rains at the time and Mallupota, being situated on low-lying ground, was almost surrounded by a lake. In fact, on the 14th the segregation camp was half under water. In consequence of this, it took nine days to evacuate the village, and by that time 43 cases had occurred, giving an average of nearly 5 cases a day. The beneficial result of the evacuation was not apparent for some days (see Table No. IV, page 118), there being 5 cases on the 23rd, 4 on the 24th, and 8 on the 25th, and again 4 on the 26th: after this the disease showed signs of abating. On March 2nd (nine days after evacuation) there were only 2 cases. The number of cases after evacuation was 48 as against 43 before evacuation, giving averages of 4·0 and 3·6, respectively. The comparison is not a fair one, as most of the cases occurring after evacuation must have been infected in the village, but only showed symptoms when in camp. The disease then seemed to have stopped. But unfortunately some Chamars got infected when on disinfection work in the village, and spread the disease in their camp. This was promptly taken in hand by Dr. Fatteh Chand, who disinfected the camp and moved it to a fresh site. After this the disease stopped. The practical ending of the epidemic was March 18th, but the usual last "dropping case" took place on March 24th, thirty-one days after total evacuation of the village.

The disinfection was completed on April 20th, and the people returned to the village on the 3rd May, having been one month and ten days in camp. They had 91 cases, with 30 deaths, being an average of 7·75 per cent. of the population attacked, of which 33 per cent. died.

The lambardars of this village were tried for having knowingly hidden the occurrence of the disease, and were each sentenced to three months' imprisonment.

(11). MEHLGAHLA.

Census population (1891)	2,548
Roll-call	2,488
Muhammadans	192
Hindus, chiefly Jats	1,914
Chamars and Ramdasis	307
Sweepers	75
Number of houses	926
Do. do. infected	60
Do. plague cases returned	101
Do. deaths returned	57
Do. recoveries returned	44
Date of first case	22nd February 1898.
Do. do. returned	23rd do.
Do. declaration of plague	23rd do.
Do. cordoning of village	23rd do.
Do. evacuation of village	17th March 1898.
Do. commencement of disinfection	23rd do.
Do. completion of do.	20th May 1898.
Do. last case	3rd do.
Do. return to village	4th June 1898.
Do. removal of cordon	10th do.
Do. village declared free of plague	14th do.

Mehlgahla is one of the most instructive villages with which we have had to deal. There seems little doubt that we obtained very early information

about it, and although energetic measures were immediately taken the inhabitants suffered severely.

Mode of infection.

Among the people who were found to have left Mallupota when that village was found infected was a girl named Shiv Dai daughter of Nathu, and grand-daughter of Hamera, the lambardar who was first attacked at Mallupota. The statement of several people is that when Nathu's wife Nihali died at Mallupota, Shiv Dai, her daughter, who was married to a youth named Jawala at Mehlgahla came over to see her mother and remained three days at Mallupota. She left just previous to the village being cordoned on February 12th and remained well till February 22nd. We were able to trace her to her destination, and Dr. Davidson, who was then inspecting officer, paid several visits to Mehlgahla to satisfy himself that she was quite well. On the date named above, Shiv Dai complained of fever and pain and swelling in the groin. Her father-in-law, Uttam Singh, in whose house she was now living, immediately gave information to Dr. Davidson, who after seeing the girl informed the executive staff.

Partial evacuation.

The following day, February 23rd, Uttam Singh and the whole of his family including the patient were put out into a suitable camp some distance from the village and remained there till March 17th, when they went into a newly formed health camp. A few days after Shiv Dai's attack, Uttam Singh's house was thoroughly disinfected and whitewashed by a trained gang from Khankhanan, it being considered inadvisable to employ any of the Chamars belonging to the village itself.

Between February 22nd and March 15th (twenty-one days) no new cases occurred, and it seemed as if the disease had been nipped in the bud. Shiv Dai made a rapid and uneventful recovery and the whole family with all their personal property were washed in phenyle solution preparatory to allowing them to return to the village.

Spread of the disease in the village.

On the latter date, however, our hopes were dashed to the ground. One of the lambardars arrived late at night at our camp and reported that several of the Chamars and sweepers in the Chamars' quarters had been attacked, the first attacked being the *kamin* or servant of Uttam Singh.

The following day the evacuation of the whole village, of 2,488 persons, was commenced, the Chamars being given a separate camp from the others. A brisk epidemic broke out among the latter, 25 of whom were attacked, mostly from the segregation camp.

Complete evacuation.

The evacuation was completed on March 17th, and the disease stopped on the 24th, seven days later. Up to this time only Chamars had suffered, excluding the girl who introduced the disease.

Disinfection of the village.

On March 23rd the systematic disinfection of the village was commenced. The "infected" houses in the Chamars' and sweepers' quarters were first done, and it is important to note that none of the persons employed on the disinfection of these houses was attacked with plague.

The work was completed on the 28th. The cleaning of the "healthy" houses was then commenced.

On April 2nd more cases began to occur among the disinfecting gang, and on the 4th a Muhammadan bhisti from the "healthy camp" was attacked.

At this time it was almost impossible to obtain coolie hire, as the crops were ripe and it was of importance to the zamindars that their grain should be gathered with the utmost speed. They, therefore, employed every available workman in the village. We were consequently obliged to allow house-owners to do their own disinfecting and whitewashing under the supervision of a European sanitary inspector. Large numbers of rats were found dead all over the village, and people working at the disinfection were frequently attacked.

Spread of the disease in the healthy camp.

The disease got into the large so-called "healthy camp," and although disinfection of all the clothes and personal property and giving a phenyle bath to every person was started immediately, it was found that, on account of the large size of the camp, this took some time to accomplish. In fact, we did not wait for the work to finish, but broke up the large camp into four smaller ones.

This was completed on April 23rd.

On April 22nd, on account of the large number of casualties among the people on disinfection work, we suspended the work altogether. The day previously, Mr. Goulbourne, the European sanitary inspector, was attacked with plague. He died three days later. Nine persons were attacked on April 22nd and 13 on the 23rd. There were then two or three cases daily till the 27th (five days after stopping the disinfection). The disease then stopped, with the exception of one dropping case on May 3rd.

Workers on disinfection attacked.

The *patti* where most people were attacked among the disinfectors was one which was at the extreme north-east corner of the village, while the Chamars' quarters, where the cases of plague had occurred before evacuation, was situated at the south-west corner. *The infection had, therefore, travelled the whole breadth of this large village after all the people had left it.* No dead rats were seen before evacuation; they were found all over the village after the place had been emptied, and in one room alone 15 dead rats were found. They could not have died of starvation, as a large quantity of grain was left in the village and was easily accessible.

The infection continued to spread in the village after complete evacuation.

In May we completed the disinfection with a properly constituted gang of coolies supervised by two well-trained Hospital Assistants. As we were not satisfied with the previous disinfecting, and also bearing in mind what a very strong focus of infection the village had been, we had the entire village re-disinfected. No casualities occurred during the second disinfection, and no rats, dead or alive, were found.

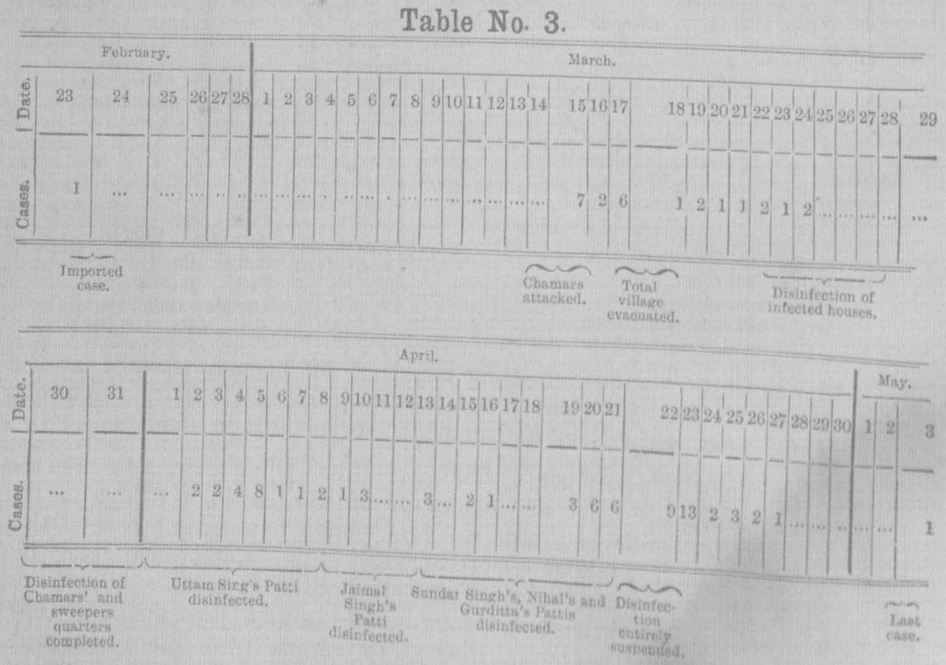
The village disinfected a second time.

The people began to return to their homes on June 4th, having been two months and eighteen days in camp.

They had 101 cases of plague, with 57 deaths, being a percentage of 4·05 cases to population and 56·43 deaths to attacks.

The following is a table of the "daily state," from the beginning to the end of the epedimic in Mehlgahla :—

Table No. 3.



(14). KHATKAR KHURD. *(Second infection).*

Census population (1891)	377
Roll-call	346
Muhammadans...	21
Hindus, chiefly Jats	182
Chamars and Rahtia Sikhs	143
Number of houses	77
Do. do. infected	1
Do. plague cases returned	3
Do. deaths returned	2
Do. recoveries returned	1

Date of first case	27th February 1898.
Do. do. returned	28th do.
Do. declaration of plague	28th do.
Do. cordoning of village	28th do.
Do. evacuation of village	28th do.
Do. last case	19th March 1898.
Do. return to village	7th April 1898.
Do. removal of cordon	17th do.
Do. village declared free of plague	17th do.

(*See also No. 4, page 7*).

This little village, which had been evacuated and disinfected on account of plague in December and January, and had been declared free of the disease on the 22nd February, gave another case on the 27th. No case had occurred since January 10th, and the people had been living in their houses fifteen days when this case occurred. It will be remembered that they had only 10 cases, but 6 of these had died. All those attacked had been Jat Sikhs.

On February 27th, a Chamar woman named Dharmua, wife of Deala, was attacked in the Chamars' quarters at the opposite end of the village and died early on the morning of the 28th. This woman's husband earned his living by cutting grass and selling it in Banga bazaar. His wife usually accompanied him. It is, therefore, extremely likely that this woman got the disease elsewhere and not from the village itself. However, the two families occupying the same court-yard were placed in camp.

Two others were attacked, one being the other wife of Deala.

Two out of the 3 cases proved fatal.

The evacuated quarters only were disinfected and whitewashed.

The people in camp returned to their homes on April 7th.

(17). BALON.

Census population (1891)	282
Roll-call	189
Muhammadans, chiefly Gujars	161
Chamars	28
Number of houses	48
Do. do. infected	16
Number of plague cases returned	28
Do. deaths returned	11
Do. recoveries returned	17
Date of first case	24th February 1898.
Do. do. returned	2nd March 1898.
Do. declaration of plague	2nd do.
Do. cordoning of village	2nd do.
Do. evacuation of village	4th do.
Do. commencement of disinfection	8th do.
Do. completion of do.	20th April 1898.
Do. last case	2nd do.
Do. return to village	24th do.
Do. removal of cordon	4th May 1898.
Do. village declared free of plague	4th do.

This is a little village consisting of about 50 houses, situated at the northern limit of the Banga circle and bordering on the Hoshiarpur district; it is inhabited almost entirely by Muhammadan Gujars, 161 in number.

The mode of infection was as follows :—Umer Din's wife, who was the first person attacked, had been an inhabitant of Purkhowal, a village in the Hoshiarpur district. She had been to this village to see her brother Dalel, son of Sakru, and returned on or about February 16th. Eight days later she became ill with high fever and delirium and died three days later, that is on February 24th. As it is the custom among natives to give presents of clothes, &c., to the daughters of the house when they return from their husband's houses to visit their homes, the people of Balon seem to have no doubt that Umer Din's wife conformed with custom and brought clothes from her home. But we were never able to find these, and the family stoutly denied that she had ever brought them.

It appears that another girl named Hafiz, daughter of Bassan, also went to Purkhowal and was attacked with plague on her return, about February 27th. But as this was subsequent to the last case, it can only be looked on as a second possible source of infection.

The village was discovered on February 28th, and entirely evacuated on March 4th. There were only 4 infected houses before the people went out, and these were at once disinfected, ventilated and limewashed. Twenty-eight people in all were attacked, only 11 of whom succumbed. The houses of people attacked in camp were, however, looked on as infected.

Among those attacked were 2 of the disinfecting gang who were infected while working in the village. As usual, it was not from the so-called "infected" houses that they got their disease, but from houses supposed to be free from all taint. The last case occurred on 2nd April, twenty-nine days after evacuation.

The people returned to their village on the 24th April, after having spent one month and twenty days in camp.

(18). LAKHPUR.

Census population (1891)	445
Roll-call	417
Muhammadans	*Nil*
Hindus (all classes)	324
Chamars and sweepers	71
Sahnsis	22
Number of houses	85
Do. do. infected	18
Do. plague cases returned	31
Do. deaths returned	23
Do. recoveries returned	8
Date of 1st case	1st March 1898.
Do. do. returned	5th do.
Do. declaration of plague	5th do.
Do. cordoning of village	5th do.
Do. evacuation of village	14th do.
Do. commencement of disinfection	16th do.
Do. completion of do.	4th May 1898.
Do. last case	26th March 1898.
Do. returned to village	5th May 1898.
Do. removal of cordon	15th do.
Do. village declared free of plague	15th do.

Lakhpur is a small Jat village situated on the north-west boundary of Khankhanan. The first case of plague seen was Maji, the son of Gaura. The boy had been ill four days when seen and died on the day of our visit (March 5th). The only history of the introduction of the disease which we could obtain was that Bhola, the boy's uncle, with whom he lived, had been in the habit of going to Khankhanan when the cordon was on that village to *salaam* to the zaildar. It seems probable that, somehow or other, he introduced the disease.

At first only Bhola's family was put out into camp. But on March 12th more cases were found in the village. In consequence of this the whole village was evacuated. This was completed on March 14th.

Thirty-one people in all were attacked in a village of 417 persons, and 23 died, giving a mortality of 74·2 per cent., which is higher than the average.

The sick from this place were treated in the Mullupota hospital, situated only about a mile and a half away. The last case occurred on 26th March, 12 days after evacuation, and the villagers returned to their homes on May 5th, having been fifty-two days in camp.

(19). NURPUR.

Census population (1891)	443
Roll-call	483
Muhammadans, chiefly Gujars	68
Other Hindus,	90
Sikhs	252
Chamars	73
Sweepers	...
Ramdasis	20
Number of houses	106
Do. do. infected	6
Number of plague cases returned	19
Do. deaths returned	11
Do. recoveries returned	8

Date of first case	26th February 1898.
Do. do. returned	7th March 1898.
Do. declaration of plague	7th do.
Do. cordoning of village	7th do.
Do. evacuation of village	9th do.
Do. last case	15th April 1898.
Do. return to village	3rd May 1898.
Do. removal of cordon	13th do.
Do. village declared free of plague	13th do.

Two sources of infection.

Nurpur is situated a short distance—not half a mile—from Sirhal Qazian, and when the latter village got infected it seemed probable that this one would also, sooner or later become attacked. This took place about the end of February, and the disease was discovered on the 7th of the next month. There seems to have been a double source of infection from two separate villages, as has happened in several other plague-infected villages. The first person to be attacked was Harnam Singh, son of Uttam Singh, a Jat, aged 18 years. He became ill on February 28th and died on the 7th. Harnam Singh's sister had married an obstructive old man named Sunder Singh, who was well known to us and who died of plague at Khankhanan on December 5th. It appears that after this both Harnam Singh and his father, Uttam Singh, often visited Khankhanan, and even took articles of food, &c., with them from Sirhal Qazian, the village next to their own. The villagers believe that these men brought the infection from Khankhanan. If this is the case, it is difficult to understand how there could be such a long interval between getting the infection and the attack of Harnam Singh. The last case in the segregation camp, where Sunder Singh's wife lived, was January 9th, while the last case at Khankhanan was the 28th of the same month, and Harnam Singh was not attacked till February 28th. It is impossible to suppose that the incubation of this disease was 30 days. The only plausible suppositions are that either Harnam Singh did not get his infection from Khankhanan, or if he did, it must have been through the medium of some sort of formites such as clothes, &c., which under favouring circumstances can keep the germs of the disease alive for an indefinite period. Without having any proof of this transference of clothes, we rather incline to the belief that this was the probable mode of infection.

The second source of infection, though a little later in date, is much more definite. When Sirhal Qazian, the adjacent village, was evacuated on account of plague on February 13th, coolies were employed in putting up the huts which the plague authorities had provided for the people. Among these were several Chamars belonging to the village now under consideration. Biru, son of Rahru, was one of these, and it is definitely known that he helped in the putting up of the Arains' camp, where, as we have already shown, 6 cases of plague occurred. Several Arains were attacked in the village, and on the 16th and 17th, Arains dead of plague were found in the camp. So there is little doubt that Biru mixed with plague-infected people. He was also related, as were many of the Chamars of Nurpur, with Chamars of Sirhal Qazian, and it was these relatives who got them to come in and help in the work. The plague officers believing that all the Chamars on work at the various camps were people of the village, did not use any means to keep them separate. The Chamars worked in the camps even after the people came out. Biru went home to Nurpur, got ill on the 2nd or 3rd March, and gave the disease to three members of his family and thus started the epedimic in the Chamars quarters; another Chamar named Ralla was known to have worked in the Sirhal Qazian camp up to March 2nd. In Nurpur 19 people were ultimately attacked, of whom 14 were Chamars.

There were 11 deaths, giving a percentage of 3·93 of the population attacked, with a mortality of 58·8.

The village was evacuated on March 9th; the last case occurred on the 15th and the people returned on May 3rd, so that they were not in camp more than fifty-five days.

(21). SAHL KALAN.

Census population (1891)	356
Roll-call	236
Muhammadans, chiefly Arains	191
Hindus	14

The village was discovered on February 28th, and entirely evacuated on March 4th. There were only 4 infected houses before the people went out, and these were at once disinfected, ventilated and limewashed. Twenty-eight people in all were attacked, only 11 of whom succumbed. The houses of people attacked in camp were, however, looked on as infected.

Among those attacked were 2 of the disinfecting gang who were infected while working in the village. As usual, it was not from the so-called "infected" houses that they got their disease, but from houses supposed to be free from all taint. The last case occurred on 2nd April, twenty-nine days after evacuation.

The people returned to their village on the 24th April, after having spent one month and twenty days in camp.

(18). LAKHPUR.

Census population (1891)	
Roll-call	445
Muhammadans	417
Hindus (all classes)	*Nil*
Chamars and sweepers	324
Sahnsis	71
Number of houses	22
Do. do. infected	85
Do. plague cases returned	18
Do. deaths returned	31
Do. recoveries returned	23
Date of 1st case	8
Do. do. returned	1st March 1898.
Do. declaration of plague	5th do.
Do. cordoning of village	5th do.
Do. evacuation of village	5th do.
Do. commencement of disinfection	14th do.
Do. completion of do.	16th do.
Do. last case	4th May 1898.
Do. returned to village	26th March 1898.
Do. removal of cordon	5th May 1898.
Do. village declared free of plague	15th do.
	15th do.

Lakhpur is a small Jat village situated on the north-west boundary of Khankhanan. The first case of plague seen was Maji, the son of Gaura. The boy had been ill four days when seen and died on the day of our visit (March 5th). The only history of the introduction of the disease which we could obtain was that Bhola, the boy's uncle, with whom he lived, had been in the habit of going to Khankhanan when the cordon was on that village to *salaam* to the zaildar. It seems probable that, somehow or other, he introduced the disease.

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Thirty-one people in all were attacked in a village of 417 persons, and 23 died, giving a mortality of 74·2 per cent., which is higher than the average.

The sick from this place were treated in the Mullupota hospital, situated only about a mile and a half away. The last case occurred on 26th March, 12 days after evacuation, and the villagers returned to their homes on May 5th, having been fifty-two days in camp.

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Roll-call	443
Muhammadans, chiefly Gujars	483
Other Hindus,	68
Sikhs	90
Chamars	252
Sweepers	73
Ramdasis	...
Number of houses	20
Do. do. infected	106
Number of plague cases returned	6
Do. deaths returned	19
Do. recoveries returned	11
	8

Date of first case	26th February 1898.
Do. do. returned	7th March 1898.
Do. declaration of plague	7th do.
Do. cordoning of village	7th do.
Do. evacuation of village	9th do.
Do. last case	15th April 1898.
Do. return to village	3rd May 1898.
Do. removal of cordon	13th do.
Do. village declared free of plague	13th do.

Nurpur is situated a short distance—not half a mile—from Sirhal Qazian, and when the latter village got infected it seemed probable that this one would also, sooner or later become attacked. This took place about the end of February, and the disease was discovered on the 7th of the next month. There seems to have been a double source of infection from two separate villages, as has happened in several other plague-infected villages. The first person to be attacked was Harnam Singh, son of Uttam Singh, a Jat, aged 18 years. He became ill on February 28th and died on the 7th. Harnam Singh's sister had married an obstructive old man named Sunder Singh, who was well known to us and who died of plague at Khankhanan on December 5th. It appears that after this both Harnam Singh and his father, Uttam Singh, often visited Khankhanan, and even took articles of food, &c., with them from Sirhal Qazian, the village next to their own. The villagers believe that these men brought the infection from Khankhanan. If this is the case, it is difficult to understand how there could be such a long interval between getting the infection and the attack of Harnam Singh. The last case in the segregation camp, where Sunder Singh's wife lived, was January 9th, while the last case at Khankhanan was the 28th of the same month, and Harnam Singh was not attacked till February 28th. It is impossible to suppose that the incubation of this disease was 30 days. The only plausible suppositions are that either Harnam Singh did not get his infection from Khankhanan, or if he did, it must have been through the medium of some sort of formites such as clothes, &c., which under favouring circumstances can keep the germs of the disease alive for an indefinite period. Without having any proof of this transference of clothes, we rather incline to the belief that this was the probable mode of infection.

Two sources of infection.

The second source of infection, though a little later in date, is much more definite. When Sirhal Qazian, the adjacent village, was evacuated on account of plague on February 13th, coolies were employed in putting up the huts which the plague authorities had provided for the people. Among these were several Chamars belonging to the village now under consideration. Biru, son of Rahru, was one of these, and it is definitely known that he helped in the putting up of the Arains' camp, where, as we have already shown, 6 cases of plague occurred. Several Arains were attacked in the village, and on the 16th and 17th, Arains dead of plague were found in the camp. So there is little doubt that Biru mixed with plague-infected people. He was also related, as were many of the Chamars of Nurpur, with Chamars of Sirhal Qazian, and it was these relatives who got them to come in and help in the work. The plague officers believing that all the Chamars on work at the various camps were people of the village, did not use any means to keep them separate. The Chamars worked in the camps even after the people came out. Biru went home to Nurpur, got ill on the 2nd or 3rd March, and gave the disease to three members of his family and thus started the epedimic in the Chamars quarters; another Chamar named Ralla was known to have worked in the Sirhal Qazian camp up to March 2nd. In Nurpur 19 people were ultimately attacked, of whom 14 were Chamars.

There were 11 deaths, giving a percentage of 3·93 of the population attacked, with a mortality of 58·8.

The village was evacuated on March 9th; the last case occurred on the 15th and the people returned on May 3rd, so that they were not in camp more than fifty-five days.

(21). SAHL KALAN.

Census population (1891)	356
Roll-call	236
Muhammadans, chiefly Arains	191
Hindus	14

Chamars	31
Number of houses	52
Do. do. infected	...
Do. plague cases returned	12
Do. deaths returned	10
Do. recoveries returned	2
Date of first case	24th February 1898.
Do. do. returned	8th March 1898.
Do. declaration of plague	8th do.
Do. cordoning of village	8th do.
Do. evacuation of village	15th do.
Do. commencement of disinfection	20th do.
Do. completion of do.	20th April 1898.
Do last case	26th March 1898.
Do. return to village	27th April 1898.
Do. removal of cordon	5th May 1898.
Do. village declared free of plague	5th do.

This small village was infected from Birampur, in the Hoshiarpur district. Two brothers, named Gujar and Munshi, Jhinwars or Hindu water-carriers, were in the habit of going to Birampur to visit their maternal uncles, Ralla and Uttam. On one occasion, on their return to Sahl Kalan, Gujar fell ill, and after an illness of two days, died. This happened some days before we knew that the village was infected. Munshi, who went with his brother to Birampur, brought some clothes back with him, and was attacked later, on March 2nd, or eight days after his return to his home. It was while he was ill that the Jhinwar youth Puran from Gobindpur came to see him, and afterwards spread the disease in his own village. In the meantime his uncle, Jowahir, whom he had been to see, died at Birampur from plague.

The existence of the disease at Sahl Kalan was discovered by Dr. Davidson on March 8th. Munshi died on the 10th. A partial evacuation of the village was at first attempted, with the usual result, that it failed. On the 15th the whole village was emptied.

There were only 12 attacks in this village, not including Gujar, the existence of whose illness and death did not transpire till the village was re-occupied. Ten cases proved fatal, giving a mortality of 83·3 per cent. This is, therefore, one of the villages where we had a very small number of attacks, but the mortality was one of the highest. The people were treated in the Balon hospital, where the percentage of deaths among the other occupants was very low.

The last case occurred on March 26th, ten days after the evacuation. The village was re-occupied on 25th April. None of the disinfecting gang were attacked.

(23). NAURA.

Census population (1891)	1,688
Roll-call	1,567
Muhammadans	270
Hindus, chiefly Sainis	1,065
Chamars	190
Sweepers	42
Number of houses	96
Do do. infected	
Do. plague cases returned	
Do. deaths returned	
Do. recoveries returned	1
Date of first case	1898.
Do. do. returned	do.
Do. declaration of plague	do.
Do. cordoning of village 10th	do.
Do. evacuation of village 28th	do.
Do. commencement of disinfection 29th	do.
Do. completion of do. 10th	do.
Do. last case ... ... 3rd April	1898.
Do. return to village 13th	do.
Do. removal of cordon 13th	do.
Do. village declared free	

Only one case.

Only one case of pla[illegible]d in this village. The case was an old Jhi[illegible]n named Nihali, widow of Nathu, who was [illegible]d to be ill on March 10th. She had a large sup-purating bubo in the [illegible] appeared to be very ill indeed. She stated that

she had been ill only five days, but from the condition of the bubo and the general aspect of the patient the medical officer decided that probably she had been ill a much longer period. She was moved out into camp and ultimately recovered.

Partial evacuation.

The place where she lived was a room leading out of a covered passage into a small court-yard. All the houses in this enclosure were evacuated, and the people, 18 in number, placed in camp.

As no fresh cases occurred the segregated people were disinfected and allowed to return to their houses on April 3rd. The houses themselves had been treated *secundem artem* a fortnight previously.

This is the only village where this succeeded.

This is the only village out of many in our circle in which the experiment of partial evacuation succeeded in checking the disease.

History of mode of infection.

The mode of infection is obscure. The only history we were able to obtain as to the cause of this case being attacked was that the woman is said to have been in the habit of going to the camp where Uttam Singh's family were segregated outside Mehlgahla, the next village, in order to comb out Uttam Singh's wife's hair. It will be remembered that Uttam Singh's daughter-in-law ran away from Mallupota and was taken ill at Mehlgahla, and that at first only this family with the patient were placed in camp. The story of Nihali being infected from these people seemed to us to be a very likely one, especially as Uttam Singh's camp is really nearer to Naura than to Mehlgahla in point of distance, and also the police guard set over it patrolled the Mehlgahla side and not the Naura side, and Uttam Singh's wife had no other woman to help her in her toilet except the sick girl between February 23rd, when she went out into camp, and March 5th, when the old Jhinwari was said to be attacked. However, without further proof the story cannot be accepted, as it was given by one of the lambardars of Mehlgahla, who was always very hostile to Uttam Singh, and, moreover, from numerous inquiries we were unable to get any confirmation to the story.

(25). BANGA.

Census population (1891)	5,010
Roll-call	4,727
Muhammadans	761
Hindus, chiefly Brahmins and Khatris	3,221
Chamars and Ramdasis	569
Sweepers	176
Number of houses	1,600
Do. do. infected	80
Number of plague cases returned	103
Do. deaths returned	65
Do. recoveries returned	38
Date of first case	7th March 1898.
Do. do. returned	11th do.
Do. declaration of plague	11th do.
Do. cordoning of village	11th do.
Do. evacuation of village	30th April 1898.
Do. commencement of disinfection	11th March 1898.
Do. completion of do.	28th June 1898.
Do. last case	20th do.
Do. return to village	29th do.
Do. removal of cordon	5th July 1898.
Do. village declared free of plague	9th do.

Preparations for the epidemic.

It had long been feared that Banga would sooner or later become infected, and to guard against this, measures were taken as early as December last in order to try and keep out the disease. A carefully prepared list of the inhabitants was made, the Hospital Assistant in charge of the local dispensary was warned to be on the alert and to give early information, and the burying and burning grounds were carefully watched. The inhabitants were warned not to allow strangers to stop in the town more than was absolutely necessary. This was a difficult measure to carry out, as Banga is the central market for the surrounding villages. It is here that the cultivators bring their vegetables, &c., for sale, and take back salt, *ghi* and other necessaries for their homes. The bankers and large shop-keepers have their head-quarters and stores in the bazaar. It was also the place from which the police on plague duty drew their supplies.

Banga Plague Committee.

On December 30th a Committee, consisting of Bishen Dass, the President of the Municipal Committee, Sham Singh, Zaildar of Banga, Sekunder Khan, Zaildar of Heon, Muhammad Bakhsh, Thanadar, and Ghulam Rasul, Hospital Assistant, was formed in order to make daily visits throughout the town, report all suspicious cases of illness, see that drains, &c., were kept clean, houses in a dirty state properly remedied, ventilation holes made in any houses which were dark or overcrowded, and to put down phenyle solution wherever they thought it desirable. The Committee worked with energy, and afterwards, with the help of a nurse, did very good inspection work. At the time there was an epidemic of mumps in the town which caused them anxiety several times, as the disease in its early stages sometimes resembles plague.

The first case of plague in Banga.

The first case of the real disease was discovered on March 11th. It was an old woman named Rajji, a Jhinwari, who lived in the *Lalaris'* or Muhammadan cloth-dyers' quarters. She earned her livelihood, such as it was, by begging, and had lately been in other villages; but it was never discovered from which village she brought the disease. She was quite collapsed when first seen; and though she rallied a little when placed in hospital, she was never able to give an account of her movements, and died two days later.

On the occasion of finding this case, the people of Banga turned out in large numbers and almost blocked the road, and put on a very threatening attitude, shouting out at the top of their voices that the case had been imported from another place by one Pir Bakhsh, in order to obtain the reward. It was only after much persuasion, and after they saw that only the *mohalla* in which the woman lived was going to be evacuated and that Pir Bakhsh was going out into camp together with the other *Lalaris*, that they were pacified. There was no foundation for the report that the woman had been brought when sick from another village.

Partial evacuation attempted.

Banga being a town, and containing many people of various trading occupations, we realized that it must be treated on rather different lines to the ordinary villages, where turning the whole population out into camp caused very little hardship except the actual discomfort of people having to leave their homes. In the case of Banga many people would suffer large pecuniary loss by being placed in camp, and many of the traders would lose their occupation altogether.

The people, moreover, were noted for being exceptionally troublesome, and the saying that the "*Banga log bahut binga hain*" was commonly quoted. Therefore, with the sanction of the Commissioner (Colonel Massy), we started at first the *mohalla* system of evacuation—that is, we intended to turn out a large section of the town each time a case was discovered in it.

First mohalla evacuated: 87 people placed in camp on March 11th.

On March 11th, on discovery of the first case, 87 people were placed in camp. The entrance to the *mohalla* was bricked up with an eight-foot wall before any one was allowed to move, and the people thus cut off were removed through an opening in the outer wall of the town. On reference to the accompanying diagram it will be seen that the *mohalla* was situated against the outer wall at the northern part of Banga, and by the means employed was entirely cut off from the rest of the town. The camp was situated about half a mile away, to the north-west, and strongly cordoned. After these people were in camp, 2 of them were attacked, one four days and the other eight days after removal. The *Lalaris* after this remained quite healthy and on April 15th returned to their quarters. On March 28th (seventeen days after the *Lalaris* had been out in camp) 3 more cases were discovered in a *mohalla* called the *Thatharian* or brass-worker's *mohalla*. The cases were found in two houses, one a Khatri's named Devi Dial, who had two children down with the disease, and the other the son of a Brahmin named Billu. On referring to the diagram, it will be seen that the houses are practically situated one on either side of the *Lalaris'* *mohalla*. This *mohalla* had been quite emptied and all the entrance had been blocked by the wall marked A. Moreover, the *Lalaris* were out in camp, and were at the time practically healthy, as the two cases in hospital were now convalescent, and besides the Khatris and Brahmins had no connection whatever w

Second section of the town evacuated, 203 persons placed in camp, March 28th.

them. The question naturally arises, how were these three children attacked?

Supposed manner of the spread of the disease in this case.

Certain facts make it likely that rats may have been the cause. A day or two before this, some of the disinfecting gang saw a rat die in the middle of a room in a *Lalaris'* house in the *mohalla* first infected.

The description given made it seem extremely likely that the rat died of plague. The body of the dead animal was placed in a convenient place for our inspection. When we arrived a short time later it had mysteriously disappeared. At the time, a cat, which had been seen shortly before, was supposed to have snatched away the rat and departed. On the morning that Billu's child had been attacked a very offensive smell was noticed in the room, and on investigation a dead and putrefying rat was found. It is not inferred from this that the rat thus found in Billu's house was the same one that had been removed by some unseen agency from the *Lalari's* house. But, as in the latter case the rat found had died of plague, it is reasonable to suppose that the one found in Billu's house was also a plague rat. At any rate, it is the only hypothesis we have for accounting for the disease spreading from the *Lalaris'* quarters.

Mohalla cut off from the rest of the town by building walls across the streets.

In the case of this second *mohalla*, called the *Thatarian's mohalla*, or Bashambar Das's *mohalla*, from the name of the most influential resident, the four entrances on the town side were blocked up by brick walls (marked C in the map) by Mr. Jones exactly in the same way as the first *mohalla* had been cut off from the rest of the town, and the people were got out into a separate camp in the fields through an opening in the town wall (marked D in the diagram). In this way 203 persons were evacuated, and all the houses surrounding the Lalari *mohalla* and Devi Dial and Billu's houses were entirely emptied. A police guard was placed over the only remaining entrance (at D) to this area, as had been previously done in the case of entrance B in the former *mohalla*. The people in camp were also cordoned and had no communication with either the former camp or with the people in the rest of the town. They had 13 more cases of plague after they left their homes, the last case occurring ten days after being in camp. There were 2 deaths from other causes before they returned to their homes, two months later.

Third section infected on April 7th, and 249 persons placed in camp.

On April 7th, a third section of the town became infected. A little Brahmin girl living in a house situated in a *mohalla* known as Kirpa Ram's was attacked and died. This *mohalla* is in reality only a continuation of the lane which forms the principal street of the previous *mohalla*, and the house in which the case occurred was the next one beyond the temporary wall which had been built to seperate the two *mohallas*. It seems as if after an interval of ten days the disease had spread from the last *mohalla*, just in the same way as it had done from the first to the second *mohalla*, after an interval of twenty-one days. But in this case we have no evidence to give as to the agency by which it spread.

This third *mohalla* was closed by a wall marked E in the diagram, and the people taken out into camp by an opening made in the town wall at F: 249 persons were placed in a large camp situated at the north of the town: among these there were only 4 more cases of plague, the last 2 of which occurred on the 16th, *i.e.*, nine days after being in camp.

Fourth section attacked, and 64 persons evacuated on April 7th.

After this there was another interval before fresh cases occurred, and the *mohalla* next affected was situated some distance from the previous ones. The cases were a man named Hamera and Jawala his son, both Sunars. They were found on April 16th. Hamera had been attacked two days previously, and his son the previous day. They lived in *mohalla* Rorian, which contained 64 people. It was immediately evacuated. It appears that Hamera kept a shop (marked thus * in the map) in which a plague rat, seen coming from the direction of the second infected *mohalla*, had died. A day or two previous to his being attacked the other people standing by advised the owner to leave his shop, but he only laughed and threw the rat thrown away. Among these people placed in camp, 3 were attacked on April 22nd, six days after evacuation.

Fifth section: three separate mohallas infected and 56 people placed in camp. The mohalla system of evacuation showing signs of being a failure.

On April 17th and 18th people in three other *mohallas* in various parts of the town were found attacked, *viz.*, a *Sunár* in Arti *mohalla*, a Brahmin in Sarga *mohalla*, and a sweeper in the sweepers' quarters at the south-east of the town (this last is not shown in the map). It now began to be apparent that the *mohalla system of evacuation, though carried out with* the utmost care and with special advantages,—for our first three *mohallas* had been situated on the outskirts of the town,—had failed, and that we must be prepared for an entire evacuation of the place as soon as possible.

In the meanwhile we continued to move out small *mohallas* whenever affected. On this date we moved out 56 people. Only 3 of these were afterwards attacked, the last case occurring four days after evacuation.

Sixth section: three separate mohallas attacked and 56 people evacuated on April 19th.

On April 19th another Chimba in another Chimba's quarters was attacked, as were also two Kalals, one in the Lutian *mohalla* and the other in Amar Nath's street or Kurian *mohalla*: 56 people were evacuated and 4 more cases occurred among the Kalals, the last six days after evacuation.

A Ramdasi woman committed suicide in a state of delirium.

On April 22nd a Ramdasi woman named Premi, living in the Khojean quarter, became ill with fever, and during the night in a state of delirium threw herself down the Ramdasis' well and was drowned. It is pretty certain that she had plague. The number of people evacuated on this date is not stated. But no more were attacked.

Seventh section: 28 people evacuated on April 23rd.

On April 23rd, Dev Raja, Khatri, a boy, was attacked in the Seranda *mohalla*: 28 people were evacuated and no new cases followed.

Eighth section: 28 people placed in camp on April 25th.

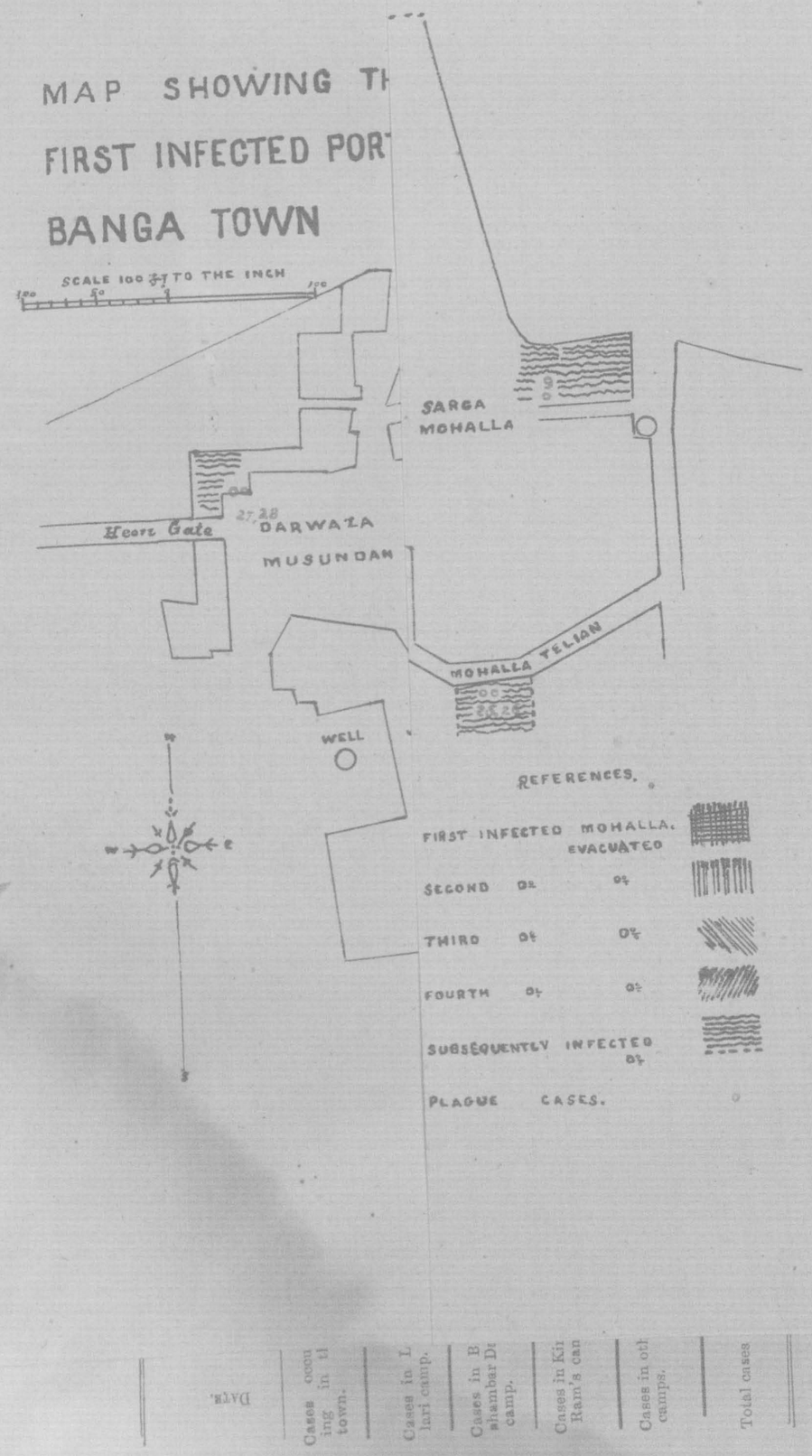
On the 25th, two Brahmins were attacked in the Chabachra quarter, which adjoined Kirpa Ram's *mohalla*. The house infected was separated from the wall barrier, placed to prevent entrance to the old *mohalla*, by another house in which dead rats had occurred. One of these was shown us and was found to have died of plague. Nobody in this house was attacked. This may possibly be due to the fact that they had all been inoculated with Haffkine's serum. No dead rats were found in the infected house. A third Chimba, from a third Chimba quarter, was also admitted on this day: 28 people in all were moved out into camp, of which only 1, Dia Banti, the Chimba's infant child, was attacked on the 28th.

Ninth section: 14 people placed in camp on 26th.

On the 26th, a case was found in the Khojean *mohalla*, opposite to where the Ramdasis lived, and 14 people more were placed in camp.

Great increase of cases. Total evacuation of the town decided on.

On the 27th, things came to a climax, and no less than 16 new cases were reported, of which 15 had occurred in the town. It was now absolutely absurd to continue the partial evacuations. Consequently all the remaining people were given notice to go out into camps, and suitable sites for the various sections and castes were selected near groves of trees. The people began going out early on the morning of the 28th, and the town was completely empty by the evening of the 30th. There were 8 cases reported on the 29th, 3 on the 30th, 6 on the 1st, 2 on the 3rd, 8 on the 4th, 2 on the 6th, 1 on the 13th, 1 on 16th and 17th, when the disease seemed to stop. A case was afterwards discovered in an outlying camp on June 20th, but the man had been ill almost from the day he left the village. A new Hospital Assistant was in charge of this camp and mistook the buboes in the neck for scrofula. The patient made a rapid recovery after getting into hospital, and fortunately no other members of his family were attacked. The accompanying table, Table No. 4, shows the effect of the evacuation in the various camps.



On April 17th and 18th people in three other *mohallas* in various parts of the town were found attacked, *viz.*, a *Sunár* in Arti *mohalla*, at

Table IV.

Showing the effect of placing people in Camp at Banga Town.

Date.	MARCH. 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	APRIL. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	MAY. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Cases occurring in the town.	1 ... ... 2 1	... ... 1 ... ... 2 2 1 2 1 1 ... 1 1 3 .. 15 1 4 2	Town evacuated between April 28th and 30th.
Cases in Lalari camp.	... ... 1 ... ... 1 ... ...

On April 17th and 18th people in three other *mohallas* in various parts of the town were found attacked, *viz.*, a *Sunár* in Arti *mohalla*,

Showing the effect of plag Infec propose Rats *at Banga Town.*

Date.	MARCH. 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	APRIL. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	MAY. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Cases occurring in the town.	1 ... ... 2 1	... ... 1 ... ... 2 2 1 2 1 1 ... 1 1 3 .. 15 1 4 2	Town evacuated between April 28th and 30th.
Cases in Lalari camp.	... ... 1 ... ... 1 ... ...

From the above description it will be seen that the partial evacuation of the town carried out during March and April totally failed to stop the onward march of the disease. Though large sections of the town were emptied, and brick walls were built across the streets leading to the affected quarters, the disease seemed to slip past us and attack fresh portions of the town. In spite of this, it showed a wonderful tendency to die out in the camps situated in the open and composed of the families and neighbours of the affected persons.

There is strong reason for believing that rats were the cause of this spread. We have already shown that dead rates were found in the dwellings of two of the cases (Billu and Hamera). We ourselves saw a plague-stricken rat dragging its feeble and feverish frame along an open street in broad daylight. The street was situated at the south of the town behind the school, a part which up to that time had not been attacked. And yet the microscopical examination of and the culture made from the spleen gave us typical plague bacilli.

On 21st April plague rats were found and examined from the local dispensary, an isolated building about 200 yards to the south-east of the town. The occupants, including the patients, were immediately turned out into a grove, and all escaped the disease.

After all the people had left Banga, dead rats were found lying about in the shops situated on the Phagwara-Nawashahr main road. And there can be little doubt that the people whose houses occupied the south portion of the town were saved by having been placed in camp before the diseased rats had reached their houses.

The disinfection of the houses was started in March, but not complete till June 27th. The work was most difficult, as there were not only 1,600 hou to be done, but many of them contained numerous rooms stored with me dise, which required careful taking out, disinfecting and returning. the old bricked houses were in a dilapidated condition, and in ser unable to make the usual ventilation holes, but had to trust to a plen cation of disinfectants and lime-wash.

The people were told that they might return to their dwellings 28th. But this appears to have been an unauspicious day, and not a so a move till the 29th, when 4,900 people returned to their homes. Duri previous ten days every camp had been disinfected, and every man, woma child had undergone the ordeal of the "phenyle bath." When the time nothing remained but to give the word, and the people loaded up their carts, a in a few hours every camp was deserted. Heavy rain fell on the evening of th 29th. But most of the people had already closed the *mogas*, or large holes mad by us in their roofs to let in the purifying agents—sun and air.

Prophylactic inoculations were done in this town on a large scale, and will be referred to in another section. (See page 132).

There were 103 attacks in all, with 65 deaths, making a percentage of 2·7 attacked, with a mortality of 63·1 per cent.

26. KATT.

Census population (1891)	...
Roll-call	759
Muhammadans	679
Hindus, chiefly Jats	38
Chamars and Ramdasis	527
Number of houses	114
Do. do. infected	148
Do. plague cases returned	17
Do. deaths returned	29
Do. recoveries returned	20
Date of first case	9
Do. returned	24th February 1898.
Do. declaration of plague	12th March 1898.
Do. cordoning of village	12th do.
Do. evacuation of village	12th do.
Do. commencement of disinfection	16th do.
Do. completion of do.	26th do.
Do. last case	16th May 1898.
Do. return to village	25th April 1898.
Do. removal of cordon	23rd May 1898.
Do. village declared free of plague	2nd June 1898.
	2nd do.

Information concerning Katt reached us on March 12th, and the village was entirely evacuated on the 16th.

Mode of infection.

The disease seems to have started in a Khatri's house, which is situated in front of the main entrance to the village. This Khatri, whose name was Nathu, was in the habit of going with his grown up sons to Sirhal Qazian to see his friend, another Khatri. They brought the disease back with them on or about February 24th, and at first only members of this household were attacked. They kept the existence of the disease very secret, and had not Uttam Dai, Nathu's young wife, applied to outsiders for leeches, which were applied to the bubo in the left groin, this family might have gone on some time longer without the disease being discovered.

However, on turning out the village other cases came to light. The disease spread to the Jats, 21 of whom were attacked. It is also interesting to note that 5 Tarkhans were also attacked. It will be remembered that this class suffered severely in Khankhanan: it was probably a Tarkhan who brought the disease from Khankhanan to Sirhal Qazian. In this village again we have a large number of this caste attacked.

There were 29 cases in this village, with 20 deaths. The last case occurred on 25th April, one month and nine days after evacuation. This is one of the latest attacks we have had after evacuation.

(27). HAPHOWAL.

Census population (1891)	...
Roll-call	517
Muhammadans	585
ndus, chiefly Jats	13
mars	472
ber of houses	100
Do. do. infected	106
Do. plague cases returned	4
Do. deaths returned	13
Do. recoveries returned	3
Date of first case	10
Do. do. returned	12th March 1898.
Do. declaration of plague	12th do.
Do. cordoning of village	12th do.
Do. evacuation do.	12th do.
Do. commencement of disinfection	29th do.
Do. completion of do.	21st April 1898.
Do. last case	20th May 1898.
Do. return to village	4th do.
Do. removal of cordon	28th do.
Do. village declared free of plague	7th June 1898.
	7th do.

Mode of infection unknown.

The manner of introduction of the disease into this little village is not quite clear. On March 12th the hospital assistant (Ganpat Rai) on inspection duty shewed us a little child named Jowala, the son of a Jat named Nihal Singh. This child had only been taken ill that morning. But it had a well-marked small acutely tender gland and other symptoms of plague. The only history we could get was that the child's brother, Meemull, had gone a few days previously to Jhandher Khurd to get sugarcane seeds, which he had brought to Haphowal and sown. It is possible to conceive that though Jhandher Khurd was now free from plague and had been so since December, except the imported case on February 19th, the infection may have remained in the seeds, which were gathered when the epidemic was at its height. But I believe this to be extremely unlikely: the child's sister, Dhanni, was married to a boy named Hazara, son of Goll, who still lived at Jhandher Khurd. It is more likely that Meemull brought clothes or infected articles from some of the villages, such as Dalian, by which he would have to pass to get to Jhandher. But we have no proof of this. The whole of the Jat family at Haphowal were placed the same night into camp and their house locked up. It was disinfected a few days later. All went well for a fortnight; no new cases occurred, and none of the Jats in the camp were attacked. The little child recovered. On March 28th the lambardars of the village reported that a Tarkhan family at the opposite side of the village had been attacked. No less than 3 Tarkhans and a Jattiwee

Extension of the disease in the village.

attacked. It is interesting to note that the whole village had been turned out and a roll-call held by the inspecting officers on the same morning and no unusual illness found. This has happened several times in our experience. Villages have been carefully inspected by the inspecting staff and nothing discovered, and a few hours later plague has been found to be present. We do not think any blame is due to the inspecting officers. It only shows how easy it is for the villagers to hide cases in their villages if they wish to do so. This question will be discussed under the section dealing with inspections.

Roll-call of the village failed to detect the disease.

The whole village was evacuated on March 29th.

Evacuation, &c.

The last case occurred on the 4th May, when a Chamar on disinfection work was attacked. But the epidemic really stopped on April 16th, when the last Tarkhan was attacked. Only 13 people in this village were infected, and out of these only 3 died. So that Haphowal gave the best results of any of our villages.

The patients were treated in huts, and no special hospital was built for them.

The people returned to the village on May 28th, having been two months and a day in camp.

On the day of allowing them to return, and when making a preparatc inspection and disinfection of the camp, we found a sr te boy with enlarged glands in both groins. He seemed parently quite well and had no fever, nor had he been ill. He and his were kept out in camp. The boy was well again in a few days and th entirely disappeared. We believe these to be cases of plague in an mild form—the pestis minor or pestis ambulans of some authors.

Pestis minor.

(28). CHAK BILGA.

Census population (1891)	829
Roll-call	831
Muhammadans	131
Hindus, chiefly Jats	511
Chamars and Ramdasis	181
Sweepers...	8
Number of houses	174
Do. do. infected	28
Do. plague cases returned	33
Do. deaths returned	22
Do. recoveries returned	11
Date of first case	10th March 1898.
Do. do. returned	13th do.
Do. declaration of plague	13th do.
Do. cordoning of village	13th do.
Do. evacuation of do.	15th do.
Do. commencement of disinfection	23rd April 1898.
Do. completion of do.	29th May 1898.
Do. last case	14th April 1898.
Do. return to village	31st May 1898.
Do. removal of cordon	9th June 1898.
Do. village declared free of plague	9th do.

Chak Bilga is a small village of 831 people, situated to the east of and less than quarter of a mile from Katt. All accounts agree in stating that Mela Ram, son of Jowhir, a Brahmin, aged 18 years, was the first person attacked. This youth was seen by us on March 14th, when he had been ill only four days.

Infection probably by rats from Katt.

The lambardars on being informed that it was a case of plague, of their own accord and without any hint from the plague officers, asked to be allowed to come out into camp immediately, as they stated that rats had been noticed to be dying for some days in the village and they had heard that when this was the case many people died of plague. Suitable camping grounds were immediately selected, and in less than an hour after the disease had been discovered people started getting out into camp. But the village was not completely evacuated till two days later.

In spite of this promptness, 33 people were attacked and 22 died.

The cause of this village being infected is that either Jowhir brought it from Katt, or the rats did so instead, or thirdly both Jowhir and the rats were infected by some common cause of infection such as infected property brought from the other village. In the absence of any other information we are inclined to believe that the rats were the agents which transmitted the malady. They were certainly the first, as far as our information goes, to be attacked.

(29).—DAHAN.

Census population (1891)	574
Roll call	535
Muhammadans	29
Hindus, chiefly Jats	395
Chamars and Ramdasis	103
Sweepers	8
Number of houses	122
Do. infected	31
Number of plague cases returned	47
Do. deaths returned	35
Do. recoveries returned	12
Date of first case	7th March 1898.
Do. do.	13th do.
Do. declaration of plague	13th do.
Do. cordoning of village	13th do.
Do. evacuation of do.	15th do.
Do. commencement of disinfection	3rd April 1898.
Do. completion of do.	3rd May 1898.
Do. last case	2nd April 1898.
Do. returned to village	7th May 1898.
Do. removal of cordon	17th do.
Do. village declared free of plague	17th do.

Dahan is a small Jat village situated to the north of Mallupota from which there is little doubt that it received its infection. An attempt was made to hide the fact that plague was present, and when on March 13th the disease was discovered, no less than 5 cases and 2 corpses were brought to light in the village, and more cases occurred before anything could be done. The first case appears to have been a *lohar* woman named Ram Kaur, whose dead body was seen by us on our arrival. Ram Kaur's mother, Khemi, wife of Bhana, was subsequently attacked and died. It appears that another *lohar*, named Kahna, had previously brought clothes and property from Mallupota just before that village had been cordoned, and deposited them in Ram Kaur's house. If these were the causes of the epidemic it will be noticed that there was an interval of 23 days between the time the clothes were brought on February 12th and March 7th, when Ram Kaur was attacked. A number of dead rats were subsequently found in this house and in the neighbouring ones when they came to be disinfected. The early infection of rats had the usual result that a large number of persons fell victims to the disease: 47 persons became ill, of whom 35 died, making a percentage to population of 12·3 attacked and a mortality of 74·4 per cent. among those attacked. It should be mentioned that 12 persons were attacked in the village and 28 during the first eight days after evacuation, who probably got infected in the village, and the remaining 7 were afterwards affected. The last case was attacked on April 2nd, eighteen days after evacuation.

Infection brought in property from Mallupota. Rats early affected.

Result of evacuation.

The people returned to the village on May 7th, having been one month and twenty-one days in camp.

There is little doubt that in this instance we came to the village at the moment the disease had burst forth in a virulent and wide-spread manner, and by promptly turning every one out into camp, which we did the following day, we quickly put an end to the epidemic.

attacked. It is interesting to note that the whole village had been turned out and a roll-call held by the inspecting officers on the same morning and no unusual illness found. This has happened several times in our experience. Villages have been carefully inspected by the inspecting staff and nothing discovered, and a few hours later plague has been found to be present. We do not think any blame is due to the inspecting officers. It only shows how easy it is for the villagers to hide cases in their villages if they wish to do so. This question will be discussed under the section dealing with inspections.

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Pestis minor.

(28). CHAK BILGA.

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Muhammadans	131
Hindus, chiefly Jats	511
Chamars and Ramdasis	181
Sweepers	8
Number of houses	174
Do. do. infected	28
Do. plague cases returned	33
Do. deaths returned	22
Do. recoveries returned	11
Date of first case	10th March 1898.
Do. do. returned	13th do.
Do. declaration of plague	13th do.
Do. cordoning of village	13th do.
Do. evacuation of do.	15th do.
Do. commencement of disinfection	23rd April 1898.
Do. completion of do.	29th May 1898.
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The lambardars on being informed that it was a case of plague, of their own accord and without any hint from the plague officers, asked to be allowed to come out into camp immediately, as they stated that rats had been noticed to be dying for some days in the village and they had heard that when this was the case many people died of plague. Suitable camping grounds were immediately selected, and in less than an hour after the disease had been discovered people started getting out into camp. But the village was not completely evacuated till two days later.

In spite of this promptness, 33 people were attacked and 22 died.

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(29).—DAHAN.

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Roll call	535
Muhammadans	29
Hindus, chiefly Jats	395
Chamars and Ramdasis	103
Sweepers	8
Number of houses	122
Do. infected	31
Number of plague cases returned	47
Do. deaths returned	35
Do. recoveries returned	12
Date of first case	7th March 1898.
Do. do.	13th do.
Do. declaration of plague	13th do.
Do. cordoning of village	13th do.
Do. evacuation of do.	15th do.
Do. commencement of disinfection	3rd April 1898.
Do. completion of do.	3rd May 1898.
Do. last case	2nd April 1898.
Do. returned to village	7th May 1898.
Do. removal of cordon	17th do.
Do. village declared free of plague	17th do.

Dahan is a small Jat village situated to the north of Mallupota from which there is little doubt that it received its infection. An attempt was made to hide the fact that plague was present, and when on March 13th the disease was discovered, no less than 5 cases and 2 corpses were brought to light in the village, and more cases occurred before anything could be done. The first case appears to have been a *lohar* woman named Ram Kaur, whose dead body was seen by us on our arrival. Ram Kaur's mother, Khemi, wife of Bhana, was subsequently attacked and died. It appears that another *lohar*, named Kahna, had previously brought clothes and property from Mallupota just before that village had been cordoned, and deposited them in Ram Kaur's house. If these were the causes of the epidemic it will be noticed that there was an interval of 23 days between the time the clothes were brought on February 12th and March 7th, when Ram Kaur was attacked. A number of dead rats were subsequently found in this house and in the neighbouring ones when they came to be disinfected. The early infection of rats had the usual result that a large number of persons fell victims to the disease: 47 persons became ill, of whom 35 died, making a percentage to population of 12·3 attacked and a mortality of 74·4 per cent. among those attacked. It should be mentioned that 12 persons were attacked in the village and 28 during the first eight days after evacuation, who probably got infected in the village, and the remaining 7 were afterwards affected. The last case was attacked on April 2nd, eighteen days after evacuation.

Infection brought in property from Mallupota. Rats early affected.

Result of evacuation.

The people returned to the village on May 7th, having been one month and twenty-one days in camp.

There is little doubt that in this instance we came to the village at the moment the disease had burst forth in a virulent and wide-spread manner, and by promptly turning every one out into camp, which we did the following day, we quickly put an end to the epidemic.

(38).—BAHRWAL.

Census population (1891)	778
Roll call	677
Muhammadans	54
Hindus, chiefly Jats	460
Chamars and Ramdasis	154
Sweepers	9
Number of houses	130
Do. do. infected	9
Do. plague cases returned	22
Do. deaths returned	14
Do. recoveries returned	8
Date of first case	23rd March 1898.
Do. do. returned	1st April 1898.
Do. declaration of plague	1st do.
Do. cordoning of village	1st do.
Do. evacuation of village	2nd do.
Do. commencement of disinfection	23rd do.
Do. completion of do.	7th May 1898.
Do. last case	26th April 1898.
Do. return to village	2nd June 1898.
Do. removal of cordon	12th do.
Do. village declared free of plague	12th do.

Two sources of infection—by property from Mallupota and by human beings from Dahan.

Bahrwal seems to have had two sources of infection, both of which declared themselves at the same time, in two different parts of the village. It appears that Hari Ram, the patwari of Mallupota, finding that there was plague in the village, instead of reporting the matter to the authorities spent all his time and energy in getting his property out of the village. He got two men, Dalel Singh and Uttam Singh, to help him. These men came over to Mallupota with a cart from Bahrwal and took over the property, which they stored in their house. They were afterwards both attacked with plague, and both died.

The other infection was from Dahan. Janu, son of Bura, a *teli*, whose business consisted of carding cotton, ran away with his wife and family on the discovery of plague at Dahan on the 13th March. Umri, his daughter, became ill on or about March 23rd, Mahun, his son, on the 24th, and Jewni, his wife, became ill a little later, and aborted and died on March 31st.

Quick evacuation of the whole village.

The disease was discovered by the authorities on April 1st, and the village totally evacuated by the evening of the following day. There were altogether 22 attacks, with 14 deaths. The last case occurred on the 26th April, twenty-four days after evacuation.

Late cases attacked after revisiting the village.

The cause of the last two cases was traced to the fact that the people attacked had surreptitiously been in the village the day before they were attacked to get out various household articles which they required.

The people were allowed to return to their homes on the 2nd June, after having been exactly two months in camp. The disinfection of the people in camp and their property took two days and was carried out by Dr. Darabseth.

(39).—MAZARI.

Census population (1891)	467
Roll call	432
Muhammadans	7
Hindus, chiefly Jats	277
Chamars	133
Sweepers	15
Number of houses	92
Do. do. infected	3
Do. plague cases returned	8
Do. deaths returned	4
Do. recoveries returned	4
Date of first case	1st April 1898.
Do. do. returned	2nd do.
Do. declaration of plague	2nd do.
Do. cordoning of village	2nd do.
Do. evacuation of do.	3rd do.
Do. commencement of disinfection	23rd do.
Do. completion of do.	24th May 1898.
Do. last case	10th April 1898.
Do. return to village	28th May 1898.
Do. removal of cordon	7th June 1898.
Do. village declared free of plague	7th do.

Mode of infection.

The next village after Barhwal was Mazari, a little Jat village containing 432 inhabitants and situated directly south of the last considered village. Here the only history of infection which we could obtain pointed to the disease having been brought from Khankhanan. Bhana, son of Chajju, a Jhinwar, who was certainly the first person attacked at Mazari, had a paternal aunt named Ralli, wife of Mela, son of Khushal Singh, at Khankhanan whom he often visited, breaking the cordon round the latter place in order to do so. But Khankhanan had been free from disease since the 28th of January, two months previously, and besides no Jhinwar in Khankhanan were ever attacked with plague. We think it much more likely that the disease was brought from Mallupota, the next village,—in fact we have several instances of the cordon having been broken and persons passing through at night from one village to another. For instance, a patwari named Moti Ram is known to have several times come to this village from Mallupota, breaking through the cordon. On one occasion at least he brought clothes and came with his relatives Ganda and Nand Lal. Both Ganda and his wife subsequently died of plague. Several Jhinwars were attacked at Mallupota. Jhinwars are particularly likely to be the first infected, as they not only act as water-carriers, but are sed as domestic servants in many cases and as *kahars*, when women and oods, &c., have to be conveyed from one place to another. With these marks we must pass on to other subjects and be content to leave the estion as to the mode of infection in this village as unsettled for the resent.

Village suffered very slightly.

The village suffered very slightly. There were only 8 patients, of whom 4 died. All the cases, except the one which died in the village, were treated at the Banga plague hospital.

(40).—SALH KHURD.

Census population (1891)	180
Roll call	152
Muhammadans, chiefly Gujars	88
Hindus	10
Chamars	37
Sahnsis	17
Number of houses	42
Do. do. infected	8
Do. plague cases returned	16
Do. deaths returned	8
Do. recoveries returned	8
Date of first case	29th March 1898.
Do. do. returned	3rd April 1898.
Do. declaration of plague	3rd do.
Do. cordoning of village	3rd do.
Do. evacuation of do	6th do.
Do. commencement of disinfection	4th do.
Do. completion of do.	5th May 1898.
Do. last case	10th April 1898.
Do. return to village	7th May 1898.
Do. removal of cordon	17th do.
Do. village declared free of plague	17th do.

Mode of infection.

Salh Khurd is quite a small village composed of about 42 houses, and containing 154 persons. It is situated west of Salh Kalan, and is intimately connected with that village. In fact, the chamars, who live in a separate group of buildings placed between the two villages, work for inhabitants in both villages. Like the people in Salh Kalan, the people in Salh Khurd have relatives in Purkhowal. They are also mostly composed of Gujars. It is, therefore, not surprising that this village, like its larger sister, soon became infected.

The disease was discovered on April 3rd, when an old Gujar woman named Nanki and a Gujar girl, named Lado, were found, as well as 3 chamars in the chamars' isolated set of buildings. The first person attacked was a chamar shoemaker, named Meyer, son of Kurah, who became ill on he 29th March. He probably got his infection from the chamars who

worked for Salh Kalan, and whose house was close to his. He in turn infected other chamars, who infected the Gujar families for whom they worked.

Effects of evacuation.

The village was turned out, but eleven cases occurred in the village before the evacuation was completed. After this there were only 5 cases. In fact, the epidemic stopped on the fourth day after the people went into camp.

The disinfection of the village was carried out in connection with Salh Kalan. The people returned to their houses on 7th May, having been only one month in camp.

(41).—HEON.

Census population (1891)	1,283
Roll call	1,294
Muhammadans, chiefly Arains and Rajputs	860
Hindus	107
Chamars and Ramdasis	295
Sweepers	28
Sahnsies	4
Number of houses	255
Do. do. infected	1
Do. plague cases returned	2
Do. deaths returned	1
Do. recoveries returned	1
Date of 1st case	30th March 1898.
Do. do. returned	3rd April 1898.
Do. declaration of plague	3rd do.
Do. cordoning of village	3rd do.
Do. evacuation of do.	4th do.
Do. commencement of disinfection	10th do.
Do. completion of do.	28th May 1898.
Do. last case	3rd April 1898.
Do. return to village	24th do.
Do. removal of cordon	4th May 1898.
Do. village declared free of plague	4th do.

This is a large Muhammadan Rajput village situated on a hill about a mile and a half north of Banga. The zaildár reported two cases on April 3rd. These were a Sahnsi named Likur and his infant son, Isher, who was only six months old. It appears that the child was first attacked on March 30th and the father two days later. The Sahnsis are a wandering tribe of criminals, who earn their livelihood by stealing. This man with his wife and child were in the habit of wandering about looking for "whatever the gods were pleased to put in their way." The zaildár reported that the Sahnsi had been thieving cattle's food from both Balon and Salh Kalan, both infected villages, a few days before his attack. He took his wife and child with him on these foraging expeditions. It is also known that he spent much of his time nursing his little son, of whom he was very fond. It is an interesting question whether he and the child contracted the disease at the same time. It is possible that this is the case, and the child shewed symptoms first because it had a much smaller body, and therefore less material on which the plague bacilli could work before toxic symptoms would make their appearance. On the other hand, it is possible that the child first contracted the disease and communicated it to its father. If this were the case, it is strange that the mother who nursed the child at the breast never contracted the illness.

The Sahnsi's family, which inhabited a detached hovel, at the south of the village, were put out into camp, and no more cases occurred. The dwelling, which had a thatched roof, was assessed by the civil authorities and set light to and burnt.

The whole village of Heon was evacuated on the following day, and remained in camp till the 24th of the month (20 days). The houses were not disinfected, but fresh lime was given to the lambardars, and under their supervision the people cleaned up their own houses, whitewashed the walls and made suitable openings in their roofs.

(42).—LANGERI.

Census population (1891)	1,331
Roll call	1,254
Muhammadans, chiefly Arains	872
Hindus	169
Chamars	183
Sweepers	12
Sahnsis	18
Number of houses	266
Do. ,, infected	8
Do. plague cases returned	24
Do. deaths returned	18
Do. recoveries returned	6
Date of first case	1st April 1898.
Do. do. returned	4th do.
Do. declaration of plague	4th do.
Do. cordoning of village	4th do.
Do. evacuation of do.	5th do.
Do. commencement of disinfection	20th do.
Do. completion of do.	7th June 1898.
Do. last case	4th May 1898.
Do. return to village	7th June 1898.
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Do. village declared free of plague	17th do.

The lambardars reported the occurrence of the disease.

This is also a Muhammadan village situated on an eminence and adjoins the infected villages of Mallupota and Lakhpur. It was discovered to be infected on April 1st, the lambardars of the village themselves giving the information about the illness. On the arrival of the plague officers 3 Gujars and an Arain (2 women and 2 children) were found to be suffering. The manner of the infection of the village is obscure. A chamar named Nathu was known to have visited his son, Ghudu, and other members of his family at Lakhpur, but neither he nor any of the chamars ever got the disease. In the same way other persons had gone into Mallupota to see relatives, but we were unable to trace any connection between these persons and Basso, wife of Lakka, Arain, and Jevi, wife of Nihala, Gujar, who seem to have been the first persons attacked at Langeri.

Mode of infection uncertain.

The village was evacuated on April 5th into three large camps and a small segregation camp. The patients were treated at Mallupota plague hospital. But when that hospital was dismantled on 1st June, they went to Dhandhua hospital, which was really closer to their own homes. The disinfection of the village took a long time owing to the want of labourers, but was completed on June 7th: 24 persons in all fell victims to the malady, of whom 5 were attacked in the village. The epidemic stopped on the 16th—eleven days after the evacuation. But 2 sporadic cases occurred on the 2nd and 3rd May in the health camp. The cause of these is unknown.

15 Arains,	2 Muhammadan Rajputs,
5 Gujars,	1 other caste,

1 Sheikh.

There were 18 deaths, making a mortality of 74·5 per cent.

The village returned on 7th June, having been two months and two days in camp.

(43).—LALPUR.

Census population (1891)	219
Roll call	249
Muhammadans, chiefly Mughals	223
Chamars	24
Sweepers	2
Number of houses	60
Do. do. infected	10
Do. plague cases returned	29
Do. deaths returned	21
Do. recoveries returned	8

worked for Salh Kalan, and whose house was close to his. He in turn infected other chamars, who infected the Gujar families for whom they worked.

Effects of evacuation.

The village was turned out, but eleven cases occurred in the village before the evacuation was completed. After this there were only 5 cases. In fact, the epidemic stopped on the fourth day after the people went into camp.

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Sweepers	28
Sahnsies	4
Number of houses	255
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Sweepers	2
Number of houses	60
Do. do. infected	10
Do. plague cases returned	29
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Hindus	169
Chamars	183
Sweepers	12
Sahnsis	18
Number of houses	266
Do. ,, infected	8
Do. plague cases returned	24
Do. deaths returned	18
Do. recoveries returned	6
Date of first case	1st April 1898.
Do. do. returned	4th do.
Do. declaration of plague	4th do.
Do. cordoning of village	4th do.
Do. evacuation of do.	5th do.
Do. commencement of disinfection	20th do.
Do. completion of do.	7th June 1898.
Do. last case	4th May 1898.
Do. return to village	7th June 1898.
Do. removal of cordon	17th do.
Do. village declared free of plague	17th do.

The lambardars reported the occurrence of the disease.

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There were 18 deaths, making a mortality of 74·5 per cent.

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(43).—LALPUR.

Census population (1891)	219
Roll call	249
Muhammadans, chiefly Mughals	223
Chamars	24
Sweepers	2
Number of houses	60
Do. do. infected	10
Do. plague cases returned	29
Do. deaths returned	21
Do. recoveries returned	8

Date of first case	... ...	2nd April 1898.
Do. do. returned	... ...	5th do.
Do. declaration of plague	... ...	5th do.
Do. cordoning of village	... ...	5th do.
Do. evacuation of do.	... ...	5th do.
Do. commencement of disinfection	... ...	18th do.
Do. completion of do.	... ...	1st May 1898.
Do. last case	... ...	23rd April 1898.
Do. return to village	... ...	18th May 1898.
Do. removal of cordon	... ...	28th do.
Do. village declared free of plague	... ...	28th do.

This little village, consisting of 60 houses, was discovered to be infected on April 5th, and was immediately evacuated into two camps—one the health camp and the other the segregation camp. On account of this quickness of action, many of the plague patients went into the health camp; in fact, when the first medical officer arrived, he found as many plague patients in one camp as the other. This, however, did little harm, as the disease does not show the same infectiousness and tendency to spread in camps as it does in the dwellings where it breaks out. On the afternoon of the 5th, 8 cases of plague were found. All the cases appear to have been attacked very much at the same time, but Basri, widow of Abdul Rahman, seems to have been about the first. She was attacked three days before the village was discovered But Jiwi an Kaki became ill the same day. The lambardar states that the rats in the v lage began to die some days before anyone was attacked. The village consis of Mughals, and they have no relations in any of the surrounding village The first 8 people attacked were all women, and as these observe strict *pard* they are not likely to have brought the disease from other villages. There i a story to the effect that one Dewa Singh, a *juloha* of Dahan (an infecte village) placed his property in the house of a man named Nawab. The woman Kaki lived in this house as well as Jan Bibi, who was attacked on the following day. But this does not account for Basri's attack earlier in the day. Basri lived in another part of the village. Twenty-nine persons in all were attacked. The effect of the evacuation is well marked in this instance, as the following table shows :—

Village quickly evacuated.

Mode of infection.

Effect of evacuation.

Table No. V.

Before Evacuation.				After Evacuation.																
8 cases.				21 cases.																
April 2	3	4	5	April 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
3	1	2	2	1	2	9	1	3	...	2	...	...	1	...	...	1	...	...	...	...	1	After this no more cases.

The people here all refused treatment. The mortality was 21, on 72 4 per cent of cases.

(46).—BISLA.

Census population (1891)	603
Roll call	500
Muhammadans	14
Hindus, chiefly Jats	377
Chamars	106
Sweepers	3
Number of houses	not stated.
Do. do. infected	10
Do. plague cases returned	28
Do. deaths returned	15
Do. recoveries returned	13
Date of first case	1st April 1898.
Do. do. returned	6th do.
Do. declaration of plague	6th do.
Do. cordoning of village	6th do.
Do. evacuation of do.	6th do.
Do. commencement of disinfection	26th April 1898.
Do. completion of do.	22nd May 1898.
Do. last case	do.
Do. return to village	8th June 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

This village was reported to be infected the same day as Lalpur, *viz.*, April 5th, but as there was some doubt about the case seen being plague, it was left till next day for fuller investigation. The following morning a fresh case had developed, and plague was officially announced, and the village immediately evacuated. The first case attacked was Jawali, a Jat widow, aged 30 years. She had been ill four days when first seen, but the attack was a very mild one. It appears that a few days before she was attacked she went to her father's house at Bahrwal to see her brother, Attar Singh. It is therefore probable that she contracted the illness in this village. Another case was found when the village was being turned out. Twenty-eight cases in all occurred, of which 15 died. As happened in Lalpur, all the first cases were women.

Mode of infection.

There is nothing special to mention about this village, except that the last case attacked was a chamar who had been on disinfection work. He was the only man of this caste attacked in this village.

Chamar on disinfection work attacked.

(52).—DHANDHUA.

Census population (1891)	486
Roll call	492
Muhammadans, chiefly Arains and Gujars	432
Hindus	14
Chamars	46
Number of houses	115
Do. do. infected	17
Do. plague cases returned	23
Do. deaths returned	13
Do. recoveries returned	10
Date of first case	10th April 1898.
Do. do. returned	14th do.
Do. declaration of plague	14th do.
Do. cordoning of village	14th do.
Do. evacuation of do.	15th do.
Do. commencement of disinfection	4th May 1898.
Do. completion of do.	26th do.
Do. last case	7th do.
Do. return to village	9th June 1898.
Do. removal of cordon	20th do.
Do. village declared free of plague	20th do.

A Muhammadan village situated between Lalpur and Dahan on the east, Chak Bilga on the west, and Langeri on the south—all plague-infected villages—was therefore not likely to remain free very long. A case of plague was discovered in it on April 14th—a girl, named Rahman, daughter of Ibrahim, who was attacked three or four days previously. It is not very clear how the disease entered the village: one story is that two Tarkhans, named Ram Ditta and Sahib Ditta, worked in Natha Khan's house at Langeri, and that both their wives contracted the disease at Dhandhua and died of it; another story is that these two men used to get food from their friends in Chak Bilga. A sepoy on the Chak Bilga cordon used to help them in this transaction. It was difficult for obvious reasons to get at the root of the matter. But neither Sahib Ditta nor Ram Ditta's family were affected before Rahman. We are therefore inclined to believe that the infection of the village took place before this time, and possibly other infections occurred later. A village situated as Dhandhua was, within a mile of which were four other infected villages, would get infected with the utmost ease. Nothing has transpired to make us believe that the infection took place by rats or, indeed, anything but by human agency.

Mode of infection.

There were 23 cases, with 13 deaths, the last case occurring on May 6th, twenty-one days after evacuation. On April 30th 4 people were attacked who had gone into the village against orders, showing conclusively that infection still lingered in the houses, though it had practically died out in the camps. The cases which occurred after this date were relatives of these persons who lived in the segregation camp.

Four people who went into the still infected village were attacked fifteen days after evacuation.

(54).—GOBINDPUR.

Census population (1891)	1,158
Roll call	1,140
Muhammadans	14
Hindus, chiefly Sainis	896
Chamars and Ramdasis	230
Number of houses	269
Do. do. infected	11
Do. plague cases returned	24
Do. deaths returned	11
Do. recoveries returned	13
Date of first case	8th March 1898.
Do. do. returned	15th April 1898.
Do. declaration of plague	15th do.
Do. cordoning of village	15th do.
Do. evacuation of do.	25th do.
Do. commencement of disinfection	25th do.
Do. completion of do.	4th June 1898.
Do. last case	13th May 1898.
Do. return to village	7th June 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

The disease seems to have been brought to this village from Salh Kalan. It will be remembered that a youth, named Puran, a Jhinwar, went to see Munshi when he was ill. He came back and had some fever and an enlarged glan in the left groin. But, as he never laid up, he was altogether overlooke for a time. He appears to have infected Gondah, a Sunar, who lived in house close to his, and who died on April 14th. Gondah's wife became ill o the same day.

When the plague officers visited the village on April 15th, they saw Gondah's corpse, and his wife, who was there very ill. As the disease seemed localized to one house (Puran was then not discovered), a partial evacuation of the village was determined on, and the inhabitants, 32 in number, of seven houses were placed in a segregation camp. The next few cases occurred among these people. But on April 25th cases began to occur in the village, and consequently the whole village had to be evacuated. This was carried out on the same day. The healthy people were placed in three large camps, called Sunder Singh's camp, Chamars' camp and Ram Ditta's camp.

During the disinfection of the village, four persons were attacked on the same day: one of these persons included the hospital assistant, Lal Chand. The house they had all been working in was not previously known to be infected, but dead rats were found in it at this time.

Out of the 24 persons attacked, 14 were women. Rather, a large numbe of different castes were also represented, *viz.*—

Sainis	5
Chamars	6
Sunars	2
Jhinwars	2
Mohammedan Jats	8
Brahmin	1
Total	24

The last case occurred nineteen days after the total evacuation of the village.

(65).—MALLAH.

Census population (1891)	443
Roll call	428
Muhammadans	16
Hindus, chiefly Jats	336
Chamars	76
Number of houses	98
Do. do. infected	6
Do. plague cases returned	11
Do. deaths returned	9
Do. recoveries	2

Date of first case	21st April 1898.
Do. do.	26th do.
Do. declaration of plague	26th do.
Do. cordoning of village	26th do.
Do. evacuation of do.	26th do.
Do. commencement of disinfection	7th May 1898.
Do. completion of do.	8th June 1898.
Do. last case	30th April 1898.
Do. return to village	14th June 1898.
Do. removal of cordon	24th do.
Do. village declared free of plague	24th do.

This small village was attacked about April 21st, and the disease dis-
covered on the 26th. The disease is supposed to have
Mode of infection. been brought from Dahan. A man named Sunder Singh brought some property belonging to Hira Singh from Dahan. He got plague himself and died. Kirpa Singh, his son, after his father's death, realized that the property from Dahan had been directly or indirectly the cause of his father's illness and sent the goods back to Dahan. This, however, he did not accomplish till June 22nd, when both villages had been declared free.

It is difficult to determine the date when this property came over to Mallah. But Hira Singh himself was attacked on 20th March and died in the Mallupota hospital on the 26th. It is probable that the clothes and other rticles were conveyed away after his death, as the villagers were then under he impression that the clothes of all persons dying of plague were burnt. We ave no record of when Sunder Singh was attacked, or when he died, as this appened before we came to the village, and on our arrival the villagers, rightly judging that they were about to be turned out of their houses, did not see fit to vouchsafe more information than they were obliged to give. The village was evacuated the same day (26th April).

Four cases which had occurred in the village were found. After the people
The evacuation of the village. got into camp there were 7 more cases, 3 on the second day after evacuation, 1 on the third and 3 more on the fourth day in camp. The disease then stopped. None of the patients would submit to European treatment, and were placed with their families in a separate camp. No less than 9 out of the 11 patients died.

The village was re-occupied on 14th June, having been fifty-one days in camp.

(69).—PHARALA.

Census population (1891)	3,214
Roll call	2,982
Muhammadans	479
Hindus, all classes, chiefly Jats	1,964
Chamars	405
Sweepers	134
Number of houses	931
Do. do. infected	10
Do. plague cases returned	18
Do. deaths do.	7
Do. recoveries do.	11
Date of first case unknown.	
Do. do. returned	19th May 1898.
Do. declaration of plague	19th do.
Do. cordoning of village	19th do.
Do. evacuation of do.	20th do.
Do. commencement of disinfection	31st do.
Do. completion of do.	27th June 1898.
Do. last case	19th do.
Do. return to village	2nd July 1898.
Do. removal of cordon	26th do.
Do. village declared free of plague	31st do.

This large village, containing nearly 3,000 people and situated much nearer Phagwara than the previously infected villages, was found to contain cases of plague on May 19th.

The mode of infection is obscure. The only information which we were able
to obtain was that the first case attacked a woman named
Mode of infection. Basant Kaur, who had lately gone to a wedding at a village called Kaleran. This village had not been infected as far as we know. But

(54).—GOBINDPUR.

Census population (1891)	1,158
Roll call	1,140
Muhammadans	14
Hindus, chiefly Sainis	896
Chamars and Ramdasis	230
Number of houses	269
Do. do. infected	11
Do. plague cases returned	24
Do. deaths returned	11
Do. recoveries returned	13
Date of first case	8th March 1898.
Do. do. returned	15th April 1898.
Do. declaration of plague	15th do.
Do. cordoning of village	15th do.
Do. evacuation of do.	25th do.
Do. commencement of disinfection	25th do.
Do. completion of do.	4th June 1898.
Do. last case	13th May 1898.
Do. return to village	7th June 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

The disease seems to have been brought to this village from Salh Kalan. It will be remembered that a youth, named Puran, a Jhinwar, went to see Munshi when he was ill. He came back and had some fever and an enlarged glan in the left groin. But, as he never laid up, he was altogether overlooke for a time. He appears to have infected Gondah, a Sunar, who lived in house close to his, and who died on April 14th. Gondah's wife became ill o the same day.

When the plague officers visited the village on April 15th, they saw Gondah's corpse, and his wife, who was there very ill. As the disease seemed localized to one house (Puran was then not discovered), a partial evacuation of the village was determined on, and the inhabitants, 32 in number, of seven houses were placed in a segregation camp. The next few cases occurred among these people. But on April 25th cases began to occur in the village, and consequently the whole village had to be evacuated. This was carried out on the same day. The healthy people were placed in three large camps, called Sunder Singh's camp, Chamars' camp and Ram Ditta's camp.

During the disinfection of the village, four persons were attacked on the same day: one of these persons included the hospital assistant, Lal Chand. The house they had all been working in was not previously known to be infected, but dead rats were found in it at this time.

Out of the 24 persons attacked, 14 were women. Rather, a large numbe of different castes were also represented, *viz.*—

Sainis	5
Chamars	6
Sunars	2
Jhinwars	2
Mohammedan Jats	8
Brahmin	1
Total	24

The last case occurred nineteen days after the total evacuation of the village.

(65).—MALLAH.

Census population (1891)	443
Roll call	428
Muhammadans	16
Hindus, chiefly Jats	336
Chamars	76
Number of houses	98
Do. do. infected	6
Do. plague cases returned	11
Do. deaths returned	9
Do. recoveries	2

Date of first case	21st April 1898.
Do. do.	26th do.
Do. declaration of plague	26th do.
Do. cordoning of village	26th do.
Do. evacuation of do.	26th do.
Do. commencement of disinfection	7th May 1898.
Do. completion of do.	8th June 1898.
Do. last case	30th April 1898.
Do. return to village	14th June 1898.
Do. removal of cordon	24th do.
Do. village declared free of plague	24th do.

This small village was attacked about April 21st, and the disease discovered on the 26th. The disease is supposed to have been brought from Dahan. A man named Sunder Singh brought some property belonging to Hira Singh from Dahan. He got plague himself and died. Kirpa Singh, his son, after his father's death, realized that the property from Dahan had been directly or indirectly the cause of his father's illness and sent the goods back to Dahan. This, however, he did not accomplish till June 22nd, when both villages had been declared free.

Mode of infection.

It is difficult to determine the date when this property came over to Mallah. But Hira Singh himself was attacked on 20th March and died in the Mallupota hospital on the 26th. It is probable that the clothes and other articles were conveyed away after his death, as the villagers were then under the impression that the clothes of all persons dying of plague were burnt. We have no record of when Sunder Singh was attacked, or when he died, as this happened before we came to the village, and on our arrival the villagers, rightly judging that they were about to be turned out of their houses, did not see fit to vouchsafe more information than they were obliged to give. The village was evacuated the same day (26th April).

The evacuation of the village.

Four cases which had occurred in the village were found. After the people got into camp there were 7 more cases, 3 on the second day after evacuation, 1 on the third and 3 more on the fourth day in camp. The disease then stopped. None of the patients would submit to European treatment, and were placed with their families in a separate camp. No less than 9 out of the 11 patients died.

The village was re-occupied on 14th June, having been fifty-one days in camp.

(69).—PHARALA.

Census population (1891)	3,214
Roll call	2,982
Muhammadans	479
Hindus, all classes, chiefly Jats	1,964
Chamars	405
Sweepers	134
Number of houses	931
Do. do. infected	10
Do. plague cases returned	18
Do. deaths do.	7
Do. recoveries do.	11
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Do. do. returned	19th May 1898.
Do. declaration of plague	19th do.
Do. cordoning of village	19th do.
Do. evacuation of do.	20th do.
Do. commencement of disinfection	31st do.
Do. completion of do.	27th June 1898.
Do. last case	19th do.
Do. return to village	2nd July 1898.
Do. removal of cordon	26th do.
Do. village declared free of plague	31st do.

This large village, containing nearly 3,000 people and situated much nearer Phagwara than the previously infected villages, was found to contain cases of plague on May 19th.

Mode of infection.

The mode of infection is obscure. The only information which we were able to obtain was that the first case attacked a woman nam Basant Kaur, who had lately gone to a wedding at a vil called Kaleran. This village had not been infected as far as we know.

it was hinted by the people at Pharala that some of the people of Mullah and Bisla had slipped through their respective cordons and attended this wedding. From the nature of the information, it was difficult to get any definite facts as the people seemed afraid that they themselves would get into difficulties.

Evacuation.

The whole village was immediately evacuated, and the people placed in four large camps. Heavy rain fell while they were still out; but the sites chosen being high, and the huts sufficiently water-tight, the people suffered very little discomfort.

There were only 18 attacks with seven deaths. A mild case occurred after the people returned to their houses. But the evacuation of a few people was sufficient to prevent any further spread.

Disinfecting coolies all inoculated.

The 98 coolies who worked on plague had all previously been inoculated with Haffkine's prophylactic. One of them had undoubted plague, which he contracted while on duty. Another man had fever, but it is very doubtful whether the case was actually plague.

(70).—LADHANA JHIKA.

Census population (1891)	1,259
Roll call	1,327
Muhammadans	70
Hindus, chiefly Sainis	1,093
Chamars	145
Sweepers	19
Number of houses	300
Do. do. infected...	4
Do. plague cases returned	9
Do. deaths	5
Do. recoveries...	4
Date of first case	11th May 1898.
Do. do. returned	21st do.
Do. declaration of plague	21st do.
Do. cordoning of village	21st do.
Do. evacuation of do.	22nd do.
Do. commencement of disinfection	1st June 1898.
Do. completion of do.	16th do.
Do. last cases	24th May 1898.
Do. return to village	17th June 1898.
Do. removal of cordon	22nd do.
Do. village declared free of plague	27th do.

Ladhana Jhika was discovered on May 21st, though there is little doubt that the disease had existed in the place for at least ten days previously.

Mode of infection.

It appears to have been imported from Mehlgahla, a large village about a mile-and-a-half away. One of the chaukidars, named Channan, of this large village had his home in Ladhana Jhika. He lived in the same quarters as Meru and Sani, two Muhammadan Pathans. These men often come to see Channan at Mehlgahla. The meeting is supposed to have always taken place at the boundary. But whether this rule was strictly carried out is uncertain. But it is known that men from Ladhana Jhika sometimes brought their wives with them, and there is a suspicion that these took away property with them. However, Sani's wife, Salamat, was the first attacked. She lingered on for some time and died on May 23rd. The next to be attacked were the Muhammadan Rajputs living in the same court-yard. Three persons were attacked.

The spread of the disease.

The disease spread quickly to a Jat family which lived in a house only separated from the Muhammadans by a cattle shed. Narain Singh, the head of this family, had three of his women affected. It is curious that all the first cases in this village, as in so many of our villages, were women.

Evacuation of village.

The people came out into camp on May 22nd, after which there were only 4 new cases, making a total of 9 cases in all, 4 of which were fatal. The weather was now extremely hot and the disease showed very little tendency to spread.

A suspicious case after the people returned to the village.

The people returned to their homes after having been twenty-six days in camp. After their return a suspicious death took place which might have been due to plague. The family in which the death occurred were segregated in camp for twenty-one days. But as no further illness took place, they were allowed to return to their house.

(71).—BHAURA.

Census population (1891)	1,004
Roll call	1,030
Muhammadans, chiefly Rajputs	485
Hindus, chiefly Sainis	328
Chamars	150
Sweepers	37
Sahnsis	30
Number of houses	232
Do. do. infected	3
Do. plague cases returned	4, actual 6
Do. deaths do.	2, do. 3
Do. recoveries do.	2, do. 3
Date of first case	1st May 1898
Do. do. returned	25th do.
Do. declaration of plague	25th do.
Do. cordoning of village	25th do.
Do. evacuation of do.	26th do.
Do. commencement of disinfection	30th do.
Do. completion of do.	16th June 1898.
Do. last case	27th May 1898.
Do. return to village	19th June 1898.
Do. removal of cordon	25th do.
Do. village declared free of plague	29th do.

Mode of infection.

Bhaura is a small Muhammadan Rajput village situated to the east of Mehlgahla, and near the border of the Hoshiarpur district. It has a bad reputation of harbouring thieves and the receivers of stolen property. After Mehlgahla went out into camp, it was found that though the village area was cordoned with police, not enough men were obtainable to place a guard round the village site. In consequence of this, complaints several times reached us that robberies had taken place in some of the vacated houses. The blame was always placed on people from Bhaura.

We were, therefore, not surprised to find on May 25th that there were 3 cases of plague in this village. The first case attacked seems to have been a Rajput named Jewa, son of Banna, who came over to Mehlgahla in April and was attacked at the end of that month. He died on May 1st or 2nd. A Sannsi (criminal tribe) named Gandu is said also to have been attacked, but recovered. It is also affirmed that when the Medical Officer came round to inspect the village, a substitute was shown him in the place of this man. The disease was discovered among the Chamars, and Jhandu, a Chamar, is said to have been in the habit of visiting a Chamar named Wazira, son of Kaku, at Mehlgahla, and to have sold him tobacco. Wazira had a brother also named, curiously enough, Jhandu, who died of plague at Mehlgahla. So the Jhandu of one village was the cause of the disease being taken by another Jhandu to the next village.

Disease shewed very little tendency to spread.

The weather was hot and dry, and the disease shewed very little tendency to spread. There were only 4 cases, which all occurred in the village. No fresh cases occurred after the village was evacuated. The disinfection had to be carried out with the utmost despatch, as the fields all round Bhaura are in the track of an occasional stream called the Bein and are all under water during the rains. Fortunately the whole village was re-occupied and declared free before this took place. There has since been no recrudescence of the disease.

(74).—BÁHRWAL.

Census population (1891)	778
Roll call	677
Muhammadans	54
Hindus, chiefly Jats	460
Chamars and Ramdasis	154
Sweepers	9
Number of houses	225
Do. do. infected	
Do. plague cases returned	1
Do. deaths do.	
Do. recoveries do.	1
Date of first case	22nd June 1898.
Do. do. returned	23rd do.
Do. declaration of plague	23rd do.
Do. cordoning of village	23rd do.
Do. evacuation of village. (Not evacuated, only 19 persons placed in camp.)	
Do. commencement of disinfection	4th July 1898.
Do. completion of do.	5th do.
Do. last case	23rd June 1898.
Do. return to village	10th July 1898.
Do. removal of cordon	12th do
Do. village declared free of plague	12th do.

This was probably a case of re-infection. The village had previousl been infected, evacuated, disinfected, and the people returned to their homes o June 2nd; the last case having occurred on 26th April (see page 39). On June 22n the son of a barber was attacked. He had been in the habit of travelling about in the various infected villages, giving and receiving information of persons who had died. He had also received clothes worn by people who had died of plague. His house was situated in the village wall with its entrance outside the village, and not in a part previously affected by plague. His son, who had an extremely mild attack, made rapid and uninterrupted recovery, and the 19 persons placed in camp were allowed to return to their homes on July 10th. The barber's house, which was a double-storied one, was entirely unroofed during the disinfection.

The information concerning the following nineteen villages has been collected and tabulated by Surgeon-Captain E. Wilkinson. It will be seen that he has also attempted to trace the course of the disease from house to house in each village—a very careful and laborious piece of work. Some of his maps—those which do not give any particular information—are omitted; but all the more important ones are reproduced. These are more in the nature of diagrams, as they have not been drawn to scale, but they illustrate very well the relative positions to each other of the infected houses.

(8).—GUNACHAUR.

Census population (1891)	3,614
Roll call (March 1898)	3,021
Muhammadans, chiefly Arains and Rajputs	1,727
Hindus, all classes	831
Chamars	310
Sweepers	140
Ramdasis	13
Number of houses	1,545
Do. do. infected	81
Do. plague cases returned	147, actual 156
Do. deaths	97 „ 105
Do. recoveries	50 „ 51
Date of first case	2nd February 1898.
Do. do. returned	13th do.
Do. declaration of plague	13th do.
Do. cordoning of village	13th do.
Do. evacuation of do.	1st March 1898.
Do. commencement of disinfection	4th do.
Do. completion of do.	31st May 1898.
Do. last case	28th March 1898.
Do. return to village	21st May 1898.
Do. removal of cordon	31st do.
Do. village declared free of plague	31st do.

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MAP No. 8.

GONA CHAUR.



Reticence of the people.

Owing to the great reticence of the people of Gunachaur, it has been exceedingly difficult to find out which really was the first case of plague which occurred in the village: there can be no doubt that cases occurred at least a fortnight before the disease was discovered, the names of 9 persons other than those recorded, who suffered from plague, have been ascertained and will be mentioned later.

Mode of infection.

The first case about which any exact evidence can be obtained was Khemi, wife of Kishen Singh, *dhobi*. This woman went to Sirhal Qazian, to arrange for the betrothal of her son, on January 25th. She stayed there in the house of Ditta, son of Dhanna Singh, *dhobi*, returning on January 27th. She was taken ill with "fever" on February 2nd and died the next day, having had a bubo in the groin. There was no illness in Ditta's house at Sirhal Qazian, but a person in the next house was ill with plague.

Two other persons of her family, eleven in number, were attacked on February 4th and 15th, respectively. Her house is marked (1) on the accompanying map and that next to it is marked (2). In this house dead rats were seen on February 3rd, and on that day Partabu, son of Lal Singh, *dhobi*, was attacked with plague, the remaining residents of the house being attacked on February 4th, 6th and 8th, respectively; none of these had left Gunachaur recently, nor had they known themselves to have been exposed to any source of infection.

There is a much less definite story about the wife of Iklas, Muhammadan Rajput. She is stated to have gone to Kotgarh a village in the Hoshiarpur District, on or about January 24th, while she returned on January 27th. On January 30th she went to Hadrabad, near Phagwara, returning the same day. She became ill on the way back with "fever," and died on February 3rd. She was driven in a *bail-ghari* by a man called Tapassi, son of Nihala: this man was also taken ill on January 30th and suffered from fever and a large swelling on the right side of the neck: he recovered. His mother, Rupan, was attacked with plague on March 1st; her house is marked (52) on the accompanying map.

Manner of the spread of the disease in the village.

The following numbers refer to the figures on the map, and the notes attached have reference to the method in which infection is thought to have been carried.

(1) *Vide supra.*

(2) Ditto.

(3) Bulla, father of the patient Halima, bought straw from (2) while inmates were suffering from plague.

(7), (8), (9). Dead rats were seen in all these houses four or five days previous to the patient being attacked; (7) is next to the *haweli* of (3).

(11) Jini, wife of Harwa, had attended patients in (1) and (2).

(17) Sahib Din was a beggar and often went into infected houses.

(19) Mahtab, son of Shadi, *teli*, is said to have bought cotton from house No. (6); this house is said to have been infected by straw from (4), but there is no history as to how this last became infected.

(27) The 6 persons attacked in this house are thought to have become infected from the dead body of a son of the first case recorded in it (Nino) which was buried in the house.

(41), (42) Got clothes from houses (2) and (1), respectively.

(49) Budi, wife of Budda, is thought to have contracted plague pneumonia in hospital, but her mother Skina, wife of Atta Khan, died in this house on February 27th, after two days' illness, fever and delirium. Skina was a sister of Nino, house No. (44), who is supposed to have been infected from having attended Barkat in (9). When attacked the residents of (44) fled to (44 a), probably thus infecting (67).

(52) Rupan, wife of Nihala—*vide* statement concerning the wife of Iklas, Muhammadan Rajput, *supra*.

(79) Natha Singh was a chaukidar of Aur, but was sent to Gunachaur on duty: he is said to have taken things from infected houses, and it is stated that he visited Aur while on duty at Gunachaur.

Nothing definite is known about the infection of houses where numbers have not been mentioned above, though from the map it will be seen that many of them adjoin previously infected houses.

(13).—JAGATPUR.

Census population (1891)	1,729
Roll call, February 1898	1,500
Hindús, chiefly Jats	862
„ Khatris and Brahmins	130
Muhammadans, chiefly kamins	212
Chamars	244
Ramdasis	43
Sweepers	9
Number of houses	340
Do. do. infected	40
Do. plague cases	63
Do. deaths	43
Do. recoveries	20
Date of first case	21st February 1898.
Do. declaration of plague	27th do.
Do. cordoning of village	27th do.
Do. evacuation of „	10th March 1898.
Do. commencement of disinfection	12th February 1898.
Do. completion do.	10th May 1898.
Do. last case	13th April 1898.
Do. return to village	16th May 1898.
Do. removal of cordon	22nd do.
Do. village declared free of plague	26th o.

The people of Jagatpur attribute the infection of their village both to Khankhanan and to Gunachaur.

Infection from two sources.

They say that Hira Singh, son of Nagina, Jat, and his son Gurdit Singh went to Khankhanan on or about February 15th, to see one Harnam Singh there, to whom they are related, and in whose family certain persons had been attacked with plague.

They only stayed a day at Khankhanan, when they returned to Jagatpur bringing with them some clothes. Gurdit Singh was attacked with plague on February 21st, and Hira Singh himself was attacked some days later. It is also said that Partapi, wife of a younger son of Hira Singh, was attacked with plague the day after Gurdit Singh was, and died; but her case is not recorded.

This house is marked (1) on the accompanying map. The reputed infection from Gunachaur is attributed to Ram Jas and Kino, sons of Chartu, *lohar*, who are said to have gone to Gunachaur about the middle of February: a few days after their return Gangi, wife of Kisso's son, was attacked with plague and died, and Kisso himself afterwards died of plague. This house is marked (3) on the accompanying map, where it will be seen to be next (2), which is said to have been infected from (1), the residents of these houses being friends.

Spread of the disease in the village.

The houses on the map are numbered according to the sequence of their becoming infected: contiguity with other infected houses will explain the infection of many. The following notes contain such information as has been obtained concerning the spread of the disease, the figures referring to corresponding ones on the map. The only house about which any definite information about rats has been obtained is No. 39, in which a large number of dead rats was found when it was being disinfected; dead rats were also found in other houses, but in which has not been recorded.

(1), (2), (3) *Vide supra.*
(4), (6) Patients were servants in (1).
(7), (8) Relatives of (1).
(10) Adjoins (6).
(11) Relatives of (10).
(18) Patients, servants of (3).
(19) Patients several residents of (1), in segregation camp.
(23) Lehna, *teli*, combed cotton for families of (1) and (2).
(27) Gahia, *chamar*, worked in village in disinfecting gang.
(33), (35), (36) *Chamars* working at disinfection.
38 Patient entered village to get something from his shop. When he became ill he went to houses (38 a), and (38 b), in a garden outside the village, thus infecting Dalipa, who lived in (40).
(39) This man entered the village from the healthy camp to get something from his house on March 30th; he found several dead rats in his house and threw them away: he was attacked with plague on April 6th.

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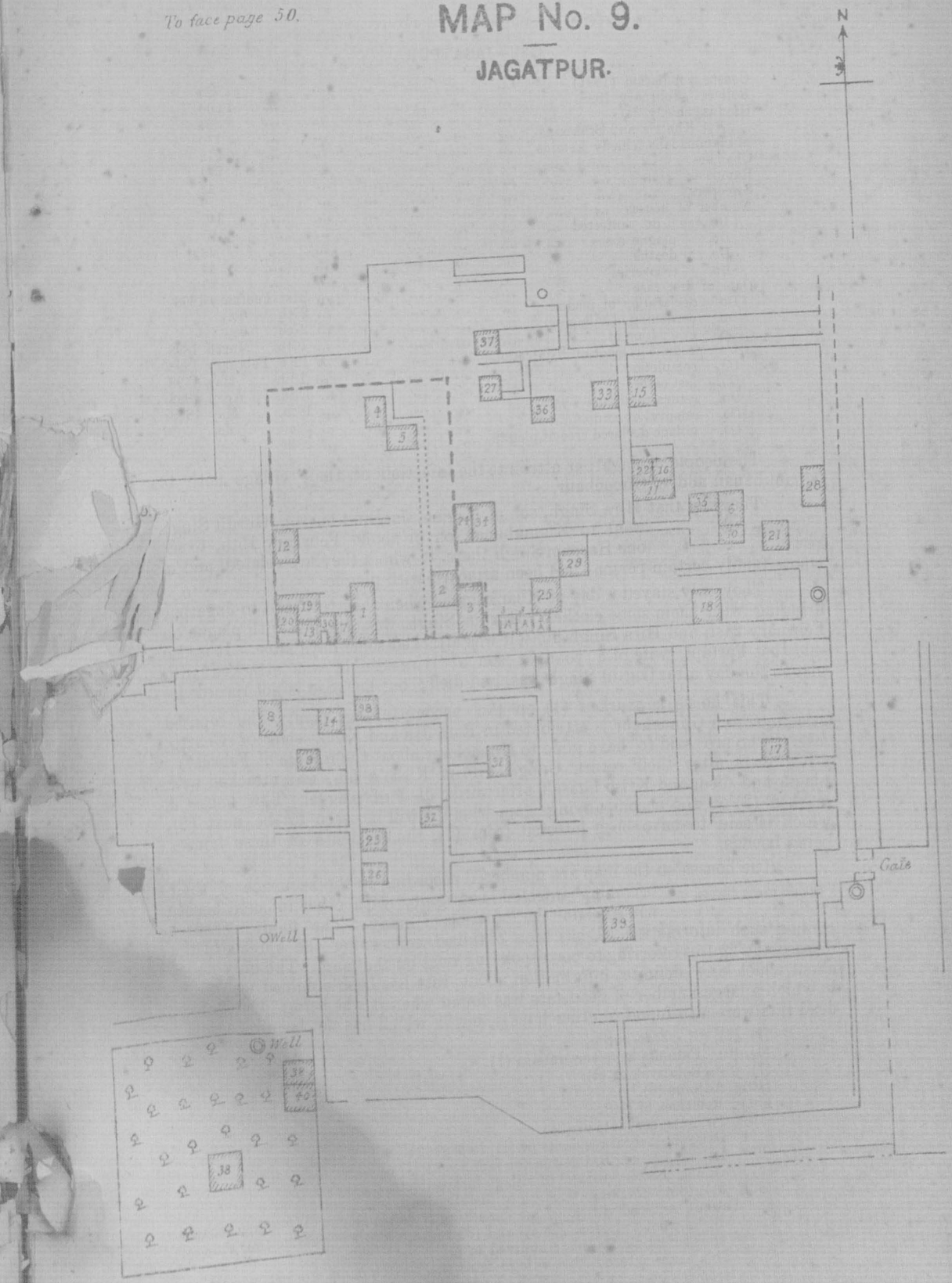
MAP No. 9.

JAGATPUR.



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Census population (1891)	1,729
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„ Khatris and Brahmins	130
Muhammadans, chiefly kamins	212
Chamars	244
Ramdasis	43
Sweepers	9
Number of houses	340
Do. do. infected	40
Do. plague cases	63
Do. deaths	43
Do. recoveries	20
Date of first case	21st February 1898.
Do. declaration of plague	27th do.
Do. cordoning of village	27th do.
Do. evacuation of „	10th March 1898.
Do. commencement of disinfection	12th February 1898.
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Do. last case	13th April 1898.
Do. return to village	16th May 1898.
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The people of Jagatpur attribute the infection of their village both to Khankhanan and to Gunachaur.

Infection from two sources.

They say that Hira Singh, son of Nagina, Jat, and his son Gurdit Sing went to Khankhanan on or about February 15th, to se one Harnam Singh there, to whom they are related, and in whose family certain persons had been attacked with plague.

They only stayed a day at Khankhanan, when they returned to Jagatpur bringing with them some clothes. Gurdit Singh was attacked with plague on February 21st, and Hira Singh himself was attacked some days later. It is also said that Partapi, wife of a younger son of Hira Singh, was attacked with plague the day after Gurdit Singh was, and died; but her case is not recorded.

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Spread of the disease in the village.

The houses on the map are numbered according to the sequence of their becoming infected: contiguity with other infected houses will explain the infection of many. The following notes contain such information as has been obtained concerning the spread of the disease, the figures referring to corresponding ones on the map. The only house about which any definite information about rats has been obtained is No. 39, in which a large number of dead rats was found when it was being disinfected; dead rats were also found in other houses, but in which has not been recorded.

(1), (2), (3) *Vide supra.*
(4), (6) Patients were servants in (1).
(7), (8) Relatives of (1).
(10) Adjoins (6).
(11) Relatives of (10).
(18) Patients, servants of (3).
(19) Patients several residents of (1), in segregation camp.
(23) Lehna, *teli*, combed cotton for families of (1) and (2).
(27) Gahia, *chamar*, worked in village in disinfecting gang.
(33), (35), (36) *Chamars* working at disinfection.
38 Patient entered village to get something from his shop. When he became ill he went to houses (38 a), and (38 b), in a garden outside the village, thus infecting Dalipa, who lived in (40).
(39) This man entered the village from the healthy camp to get something from his house on March 30th; he found several dead rats in his house and threw them away: he was attacked with plague on April 6th.

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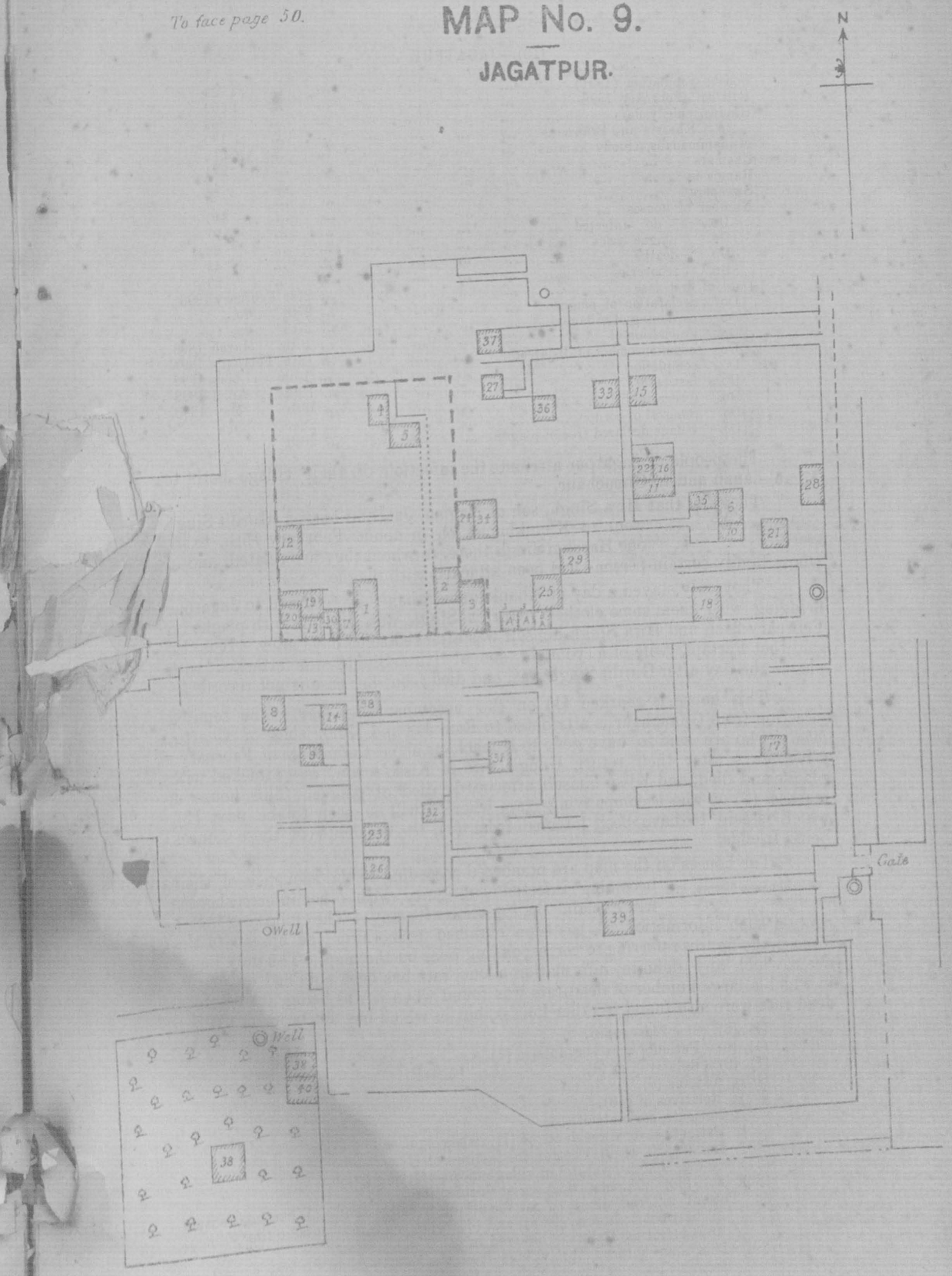
MAP No. 9.

JAGATPUR.



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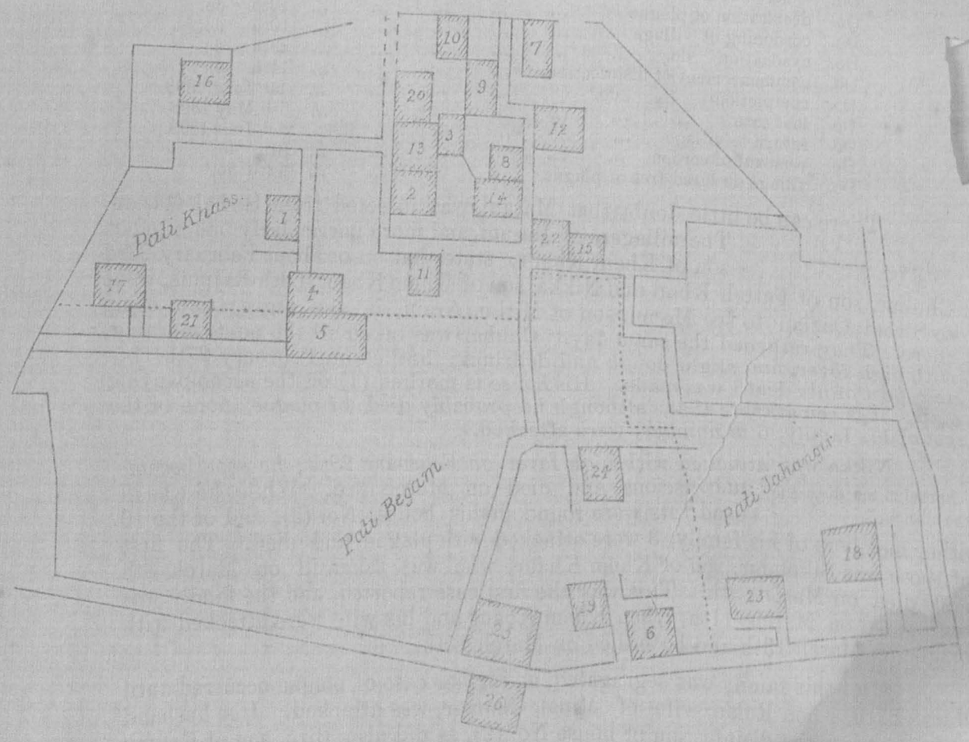
MAP No. 10.

MASANI.



Note by Surgeon-Captain James.

An attempt was made at first to evacuate only a portion of this village on February 27th: 12 families who lived in the part enclosed by dotted lines in the map were placed in camp. They included 3 families of Jats, 1 Brahmin, 1 *sonar*, 3 *lohars*, 2 *jalahas*, 1 *kahar*, and 1 *chuhra* family. But as the disease continued to spread, the whole village was evacuated on March 10th.

(24).—MASANI.

Census population (1891)	1,380
Roll call (March 1898)	1,499
Muhammadans, Rajputs and Arains	901
Sikhs	62
Other Hindus	162
Chamars	321
Sweepers	36
Ramdasis	9
Sahnsis	8
Number of houses	312
Do. do. infected	26
Do. plague cases returned	33, actual 36
Do. deaths do.	24, ,, 26
Do. recoveries do.	9, ,, 10
Date of first case	24th February 1898.
Do. do. recorded	10th March 1898.
Do. declaration of plague	10th do.
Do. cordoning of village	10th do.
Do. evacuation do.	29th do.
Do. commencement of disinfection	14th do.
Do. completion do.	1st June 1898.
Do. last case	6th May 1898.
Do. return to village	2nd June 1898.
Do. removal of cordon	8th do.
Do. village declared free of plague	12th do.

There can be little doubt that Masani was infected from Sirhal Qazian.

Mode of infection.

The villagers of Masani, and more particularly one Sundar, son of Khem Khaur, state that on or about February 23rd Chuhar, son of Fatteh Khan and Nikka, son of Khem Khaur, both Rajputs, went to Sirhal Qazian to see Mamu, son of Mithu, Arain, in the segregation camp there. They returned the same day. Chuhar was taken ill the next morning, with high fever, and slight cough and delirium; he died on February 27th, but no report of his death was made. His house is marked (1) on the accompanying map: it is remarkable that, although he probably died of plague, none of the rest of his family, 6 in number, were attacked.

Spread of the disease in the village.

Nikka was attacked with high fever on February 28th; he soon became unconscious and died on March 3rd. While he was ill dead rats were found in his house, No. (2), and of the 10 other members of his family, 3 were attacked with plague and died. The first of these was Sikundar, son of Khem Khaur, who was taken ill on March 8th and died on March 9th. This was the first case reported, and the family was segregated on March 11th, when Khem Khaur and his wife were attacked with plague on March 13th and both died on March 15th.

After this family was segregated, no further case of plague occurred until March 27th, when Rulda, wife of Minal, Chamar, was attacked. Her husband took part in the disinfection of house No. (2), as did also Biru, son of Ratana another inmate, house No. (3). This family was segregated, and the village evacuated on March 29th.

The following notes contain such information as could be obtained regarding the spread of plague through the village. The figures have reference to the houses numbered on the accompanying map—

(1), (2), (3) *Vide supra.*

(4) Bhulli, wife of Sharo, Gujar, attended patients in (2); her case is not recorded, but she is stated to have been taken ill on or about March 27th with slight fever and a bubo from which she recovered.

(5) Bhagwani, daughter of Gulab Singh, was attacked on March 31st. This house is next to (4), and Bhulli was a servant of the family; the dead rats were found in this house on March 29th.

(6) Khemi, wife of Manglu, a Chamar, probably entered (2), but nothing definite known.

(7) Gujar, son of Boota, Chamar, worked in (2).

(8), (9) Chamars working in disinfecting gang.

(11) Aisa, daughter of Jhanda, Arain, a friend of resident of 2, into whose house she often went. Dead rats were found here during disinfection. She was attacked on April 3rd and recovered, but her mother Rajan, who nursed her in hospital, was attacked on April 7th and died the next day.

(12) Chamar working in disinfecting gang.

(13) Friends of (2); houses adjoin.

(15) Several dead rats found in this house: the patient Naimat went into the village from the camp to get things from her house several times.

(17) Ishar Singh, son of Utam Singh, is a friend of resident of (5) and attended them when ill.

(18) Thalu, son of Nihala, Chamar, attended Gaya, Chamar, when ill.

(19) Same history as (18).

(20) Achero, daughter of Nathu, sweeper; her father was employed in the plague hospital; she also occasionally worked there.

21) Ishar Singh, house No. (17), was the servant of this house.

(23), (24), (25) Attack attributed to infection during the whitewashing of their houses.

(30).—TAHIRPUR.

Census population (1891)	531
Roll call, March 1898...	523
Sikhs	263
Other Hindus	98
Muhammadans	96
Chamars	65
Sweeper	1
Number of houses	103
Do. do. infected	17
Number of plague cases	Returned 31, actual 32
Do. deaths	„ 22, „ 23
Do. recoveries	„ 9, „ 9
Date of first case	8th March 1898.
Do. do. returned	18th do.
Do. declaration of plague	18th do.
Do. cordoning of village	18th do.
Do. evacuation of village	24th do.
Do. commencement of disinfection	5th April 1898.
Do. completion do.	9th May 1898.
Do. last case	9th April 1898.
Do. return to village	3rd June 1898.
Do. removal of cordon	9th do.
Do. village declared free of plague	13th do.

Mode of infection.

There is no very definite evidence as to how Tahirpur became infected with plague. The people of the village attribute their infection to one Devi Chand, son of Nagina Singh, who with his father went several times to Khankhanan while there was plague there, to see Nathu Singh, son of Khem Singh. This man lived in the healthy camp at Khankhanan, and none of his relatives had plague. Devi Chand and his father are reported to have brought back food and clothes from Khankhanan. Devi Chand was attacked with plague on March 10th, having high fever and bubo in the left axilla, and he died on March 16th. He was treated by a hakim, and no report was made of his illness or death. His house is marked (1) in the accompanying map.

The spread in the village.

The following numbers refer to the figures on the accompanying map:—

(2) Thalu, wife of Ram Singh, nursed Devi Chand, and herself became ill on March 13th: no report of her illness was made until March 17th. Dead rats were found in this house on March 16th, and the fright caused by this discovery led to the report of Thalu's illness being made.

(3), (4) Dead rats were found in these houses on March 16th.

(12) Relatives of residents of (10).

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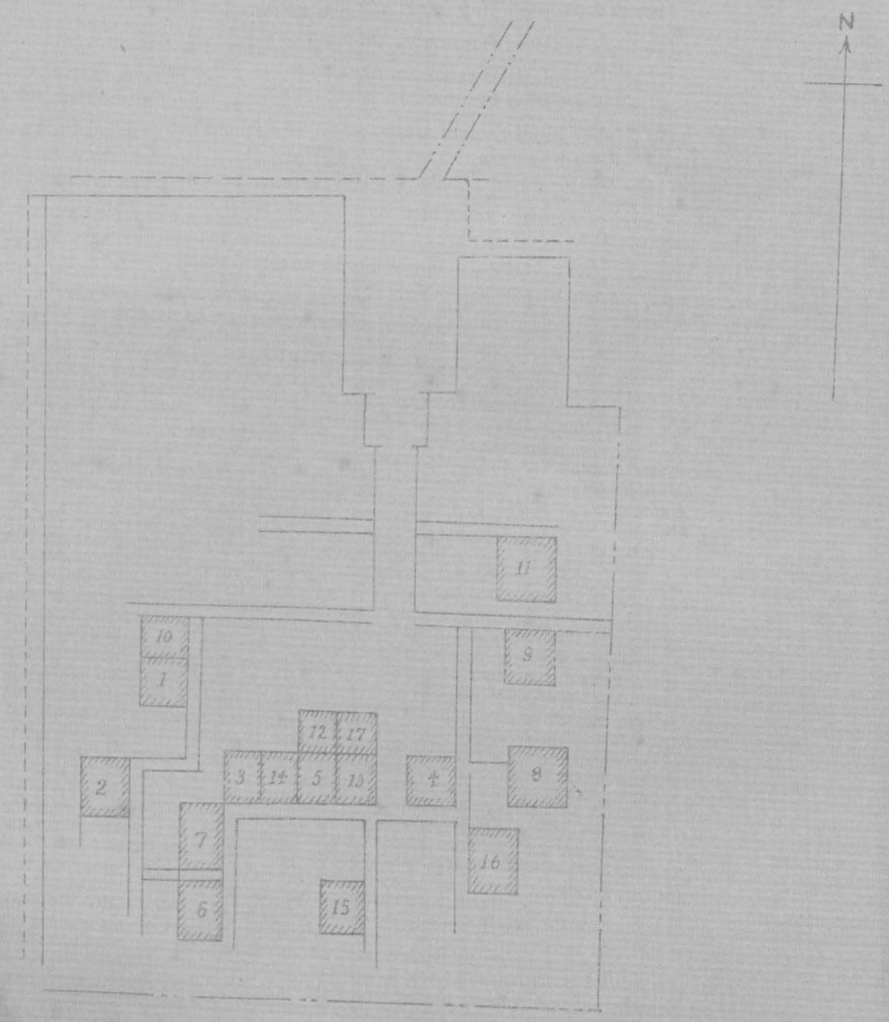
MAP No. 11.

TAHIRPUR.



(6) Khemi, wife of Manglu, a Chamar, probably entered (2), but nothing definite known.

(7) Gujar, son of Boota, Chamar, worked in (2).

(8), (9) Chamars working in disinfecting gang.

(11) Aisa, daughter of Jhanda, Arain, a friend of resident of 2, into whose house she often went. Dead rats were found here during disinfection. She was attacked on April 3rd and recovered, but her mother Rajan, who nursed her in hospital, was attacked on April 7th and died the next day.

(12) Chamar working in disinfecting gang.

(13) Friends of (2); houses adjoin.

(15) Several dead rats found in this house: the patient Naimat went into the village from the camp to get things from her house several times.

(17) Ishar Singh, son of Utam Singh, is a friend of resident of (5) and attended them when ill.

(18) Thalu, son of Nihala, Chamar, attended Gaya, Chamar, when ill.

(19) Same history as (18).

(20) Achero, daughter of Nathu, sweeper; her father was employed in the plague hospital; she also occasionally worked there.

21) Ishar Singh, house No. (17), was the servant of this house.

(23), (24), (25) Attack attributed to infection during the whitewashing of their houses.

(30).—TAHIRPUR.

Census population (1891)	...	...	...	...	...	...	...	531		
Roll call, March 1898...	...	...	...	...	...	...	...	523		
Sikhs	...	...	...	...	...	...	...	263		
Other Hindus	...	...	...	...	...	...	...	98		
Muhammadans ...	...	...	...	...	...	...	...	96		
Chamars	...	...	...	...	...	...	...	65		
Sweeper	...	...	...	...	...	...	...	1		
Number of houses ...	...	...	...	...	...	...	...	103		
Do. do. infected	...	...	...	...	...	...	...	17		
Number of plague cases	...	...	...	...	Returned	31,	actual	32		
Do. deaths ...	...	...	...	...	...	"	22,	"	23	
Do. recoveries ...	...	...	...	...	...	"	9,	"	9	
Date of first case ...	...	...	...	...	...	...	8th March 1898.			
Do. do. returned	...	...	...	...	...	...	18th do.			
Do. declaration of plague	...	...	...	...	...	...	18th do.			
Do. cordoning of village ...	...	...	...	...	...	...	18th do.			
Do. evacuation of village	...	...	...	...	...	...	24th do.			
Do. commencement of disinfection	...	...	...	...	...	5th April 1898.				
Do. completion do.	...	...	...	...	...	9th May 1898.				
Do. last case	...	...	...	...	...	...	9th April 1898.			
Do. return to village	...	...	...	...	...	...	3rd June 1898.			
Do. removal of cordon	...	...	...	...	...	...	9th do.			
Do. village declared free of plague	...	...	...	...	...	13th do.				

Mode of infection.

There is no very definite evidence as to how Tahirpur became infected with plague. The people of the village attribute their infection to one Devi Chand, son of Nagina Singh, who with his father went several times to Khankhanan while there was plague there, to see Nathu Singh, son of Khem Singh. This man lived in the healthy camp at Khankhanan, and none of his relatives had plague. Devi Chand and his father are reported to have brought back food and clothes from Khankhanan. Devi Chand was attacked with plague on March 10th, having high fever and bubo in the left axilla, and he died on March 16th. He was treated by a hakim, and no report was made of his illness or death. His house is marked (1) in the accompanying map.

The spread in the village.

The following numbers refer to the figures on the accompanying map:—

(2) Thalu, wife of Ram Singh, nursed Devi Chand, and herself became ill on March 13th: no report of her illness was made until March 17th. Dead rats were found in this house on March 16th, and the fright caused by this discovery led to the report of Thalu's illness being made.

(3), (4) Dead rats were found in these houses on March 16th.

(12) Relatives of residents of (10).

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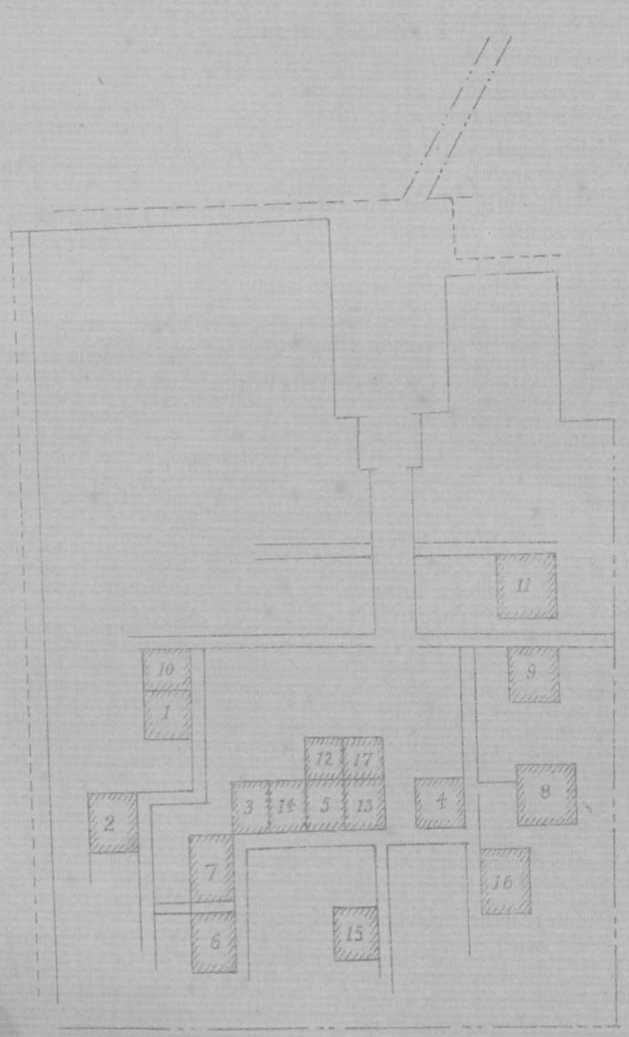
MAP No. 11.

TAHIRPUR.



(6) Khemi, wife of Manglu, a Chamar, probably entered (2), but nothing definite known.

(7) Gujar, son of Boota, Chamar, worked in (2).

(8), (9) Chamars working in disinfecting gang.

(11) Aisa, daughter of Jhanda, Arain, a friend of resident of 2, into whose house she often went. Dead rats were found here during disinfection. She was attacked on April 3rd and recovered, but her mother Rajan, who nursed her in hospital, was attacked on April 7th and died the next day.

(12) Chamar working in disinfecting gang.

(13) Friends of (2); houses adjoin.

(15) Several dead rats found in this house: the patient Naimat went into the village from the camp to get things from her house several times.

(17) Ishar Singh, son of Utam Singh, is a friend of resident of (5) and attended them when ill.

(18) Thalu, son of Nihala, Chamar, attended Gaya, Chamar, when ill.

(19) Same history as (18).

(20) Achero, daughter of Nathu, sweeper; her father was employed in the plague hospital; she also occasionally worked there.

(21) Ishar Singh, house No. (17), was the servant of this house.

(23), (24), (25) Attack attributed to infection during the whitewashing of their houses.

(30).—TAHIRPUR.

Census population (1891)	531
Roll call, March 1898	523
Sikhs	263
Other Hindus	98
Muhammadans	96
Chamars	65
Sweeper	1
Number of houses	103
Do. do. infected	17
Number of plague cases	Returned 31, actual 32
Do. deaths	" 22, " 23
Do. recoveries	" 9, " 9
Date of first case	8th March 1898.
Do. do. returned	18th do.
Do. declaration of plague	18th do.
Do. cordoning of village	18th do.
Do. evacuation of village	24th do.
Do. commencement of disinfection	5th April 1898.
Do. completion do.	9th May 1898.
Do. last case	9th April 1898.
Do. return to village	3rd June 1898.
Do. removal of cordon	9th do.
Do. village declared free of plague	13th do.

Mode of infection.

There is no very definite evidence as to how Tahirpur became infected with plague. The people of the village attribute their infection to one Devi Chand, son of Nagina Singh, who with his father went several times to Khankhanan while there was plague there, to see Nathu Singh, son of Khem Singh. This man lived in the healthy camp at Khankhanan, and none of his relatives had plague. Devi Chand and his father are reported to have brought back food and clothes from Khankhanan. Devi Chand was attacked with plague on March 10th, having high fever and bubo in the left axilla, and he died on March 16th. He was treated by a hakim, and no report was made of his illness or death. His house is marked (1) in the accompanying map.

The spread in the village.

The following numbers refer to the figures on the accompanying map:—

(2) Thalu, wife of Ram Singh, nursed Devi Chand, and herself became ill on March 13th: no report of her illness was made until March 17th. Dead rats were found in this house on March 16th, and the fright caused by this discovery led to the report of Thalu's illness being made.

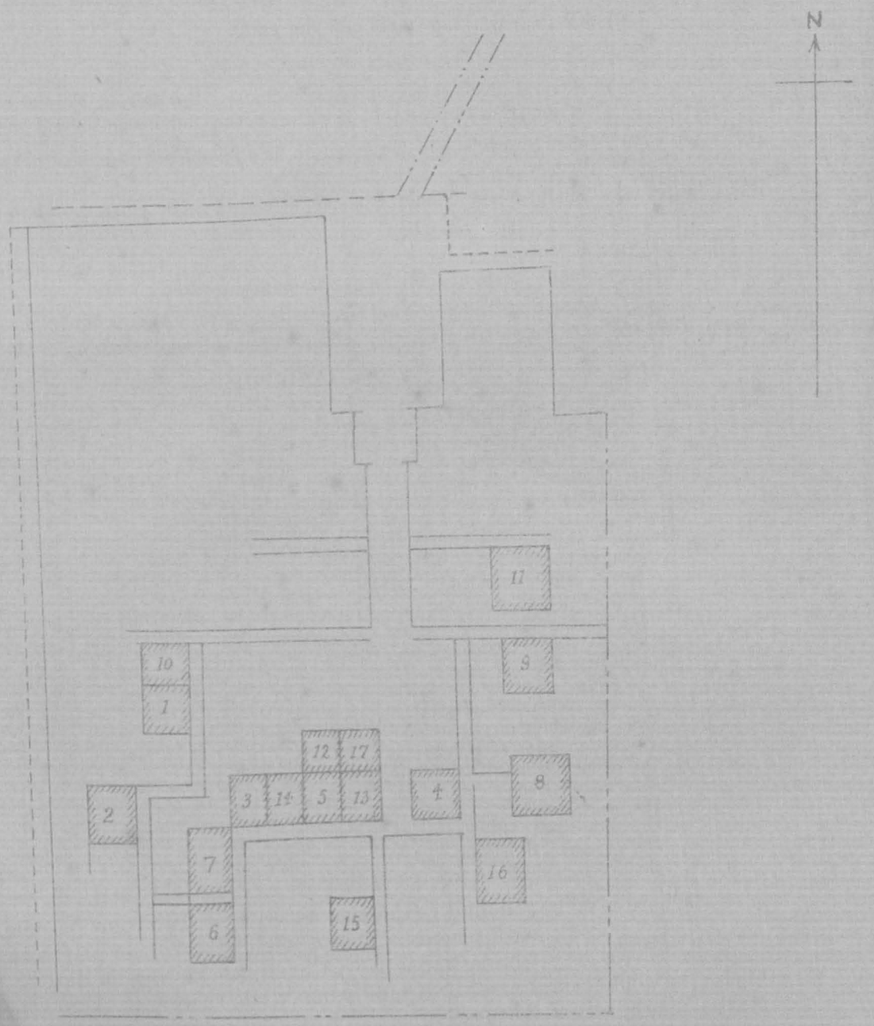
(3), (4) Dead rats were found in these houses on March 16th.

(12) Relatives of residents of (10).

To face page 52.

MAP No. 11.

TAHIRPUR.



... free of plague

(31).—MAZARA NAUABAD.

Census population (1891)	548
Roll-call, March 1898	597
Jats	299
Other Hindus	112
Muhammadans	43
Chamars	129
Ramdasis	14
Number of houses	113
Do. do. infected	3
Do. plague cases	3
Do. deaths	2
Do. recoveries	1
Date of first case	20th March 1898.
Do. declaration of plague	21st do.
Do. cordoning of village	21st do.
Do. evacuation of do.	28th do.
Do. commencement of disinfection	1st April 1898.
Do. completion of do.	4th May 1898.
Do. last case	27th March 1898.
Do. return to village	9th May 1898.
Do. removal of cordon	14th do.
Do. village declared free of plague	19th do.

Mode of infection.

There is very definite evidence concerning the conveyance of the infection of plague to Mazara Nauabad. Ralli, daughter of Khana, Jat, was the wife of Ganga Ram, Jat, of Mahmudpur, and lived with him there. Ganga Ram died of plague on March 4th, and after the 13 days of mourning were over her father, Khana, came from Mazara Nauabad to fetch her, returning thither with her on March 19th. Ralli complained of headache on reaching home; undoubted plague manifested itself on March 21st, and she died on the evening of March 25th. She and her relatives were segregated on March 21st, and none of the latter contracted the disease.

Spread of the disease.

Only 2 other cases of plague occurred in the village, both of them doubtful ones, one on March 25th, the other on March 27th, the day after which the village was evacuated. No infection can be traced to either of these cases; their houses adjoin, but both are distant from Ralli's.

The first of these two cases was Gurditta, son of Punjab Singh, aged 8; he became suddenly unconscious at 10 P.M. on March 25th and died in convulsions four hours later. He is said to have had fits before. His body was seen next morning, but the only indications of plague found were some slightly enlarged hard glands in the right axilla.

The second case, Watana, son of Shera, had fever and enlarged glands in both axilla, on March 27th, but he recovered in a few days.

(33).—SOTRAN.

Census population (1891)	308
Roll-call (March 1898)	304
Sikhs	154
Other Hindus	28
Chamars	101
Muhammadans	12
Sweepers	9
Number of houses	105
Do. do. infected	9
Do. plague cases	17
Do. deaths	12
Do. recoveries	5
Date of first case	18th March 1898.
Do. declaration of plague	24th do.
Do. cordoning of village	24th do.
Do. evacuation of village	24th do.
Do. commencement of disinfection	15th April 1898.
Do. completion of do.	10th May 1898.
Do. last case	30th April 1898.
Do. return to village	28th May 1898.
Do. removal of cordon	3rd June 1898.
Do. village declared free of plague	7th do.

The infection of Sotran with plague is accounted for as follows:—Sukhi, wife of Gainda, Granthi, was a *fakirni*, and begged from the surrounding villages including Khankhanan from which she had received clothes before it was cordoned. On March the 8th or 9th she received some clothes from the house of her sister-in-law who lived in Pind Mazari in the Hoshiárpur District. On March 13th three or four rats were seen in her house, in a dying condition, staggering about as if they were drunk. She was attacked with plague on March 18th and died on March 24th. She lived outside the village in the *dharamsala* which is marked "1" in the accompanying map, and in this three of the remaining four of her family contracted plague.

Mode of infection.

The following brief notes contain such information as has been obtained regarding the spread of plague through the village, the numbers refer to corresponding ones on the accompanying map.

The spread of the disease.

(1). *Vide supra.*

(2). Rai Kaur nursed patient Sukhi in 1: dead rats found in house on March 22nd.

(3). Dia Singh was a loafer who spent most of his time in the *dharamsala*, but took his meals and slept in this, his brother's, house: dead rats were found here on March 22nd.

(4). Hira nursed Rai Kaur: dying rats found on March 23rd.

(5). House next to (4): dead rats seen March 23rd.

(6). Maya, sweeper, was given clothes from (3).

(7), (8), (9). No definite history, but all are known to have gone into the village to things out while in camp.

(36).—LIDHAR KALAN.

Census population (1891)	671
Roll-call, March 1898	672
Hindu Jats	252
Other Hindus	220
Muhammadans	49
Chamars	83
Ramdasis	68
Number of houses	163
Do. do. infected	14
Do. plague cases	26
Do. deaths	14
Do. recoveries	12
Date of first case	25th March 1898.
Do. declaration of plague	29th do.
Do. cordoning of village	29th do.
Do. evacuation of do.	29th do.
Do. commencement of disinfection	20th April 1898.
Do. completion of do.	19th May 1898.
Do. last case	28th April 1898.
Do. return to village	22nd May 1898.
Do. removal of cordon	28th do.
Do. village declared free of plague	1st June 1898.

Mode of infection.

That infection was brought to Lidhar Kalan from previously infected villages will appear clear from the following statement, but owing to the many possible sources of infection it cannot be stated with any certainty from which village the infection was brought. The first case of plague at Lidhar Kalan was Balu, son of Bishen Das, Ramdasi fakir, who with his father went begging to several villages including Mazari and Jagatpur towards the end of March. On March 25th on the way back from Ladha Ganja, the boy was taken ill and his father carried him. The pair arrived thus at Lidhar Kalan, but the chaukidar seeing that the boy was ill refused them admittance, and they were made to stay in an open space about hundred yards from the village, whither necessaries were brought to them by chaukidar Devi Das. Although the boy entered his house, marked "1" on thea ccompanying map, his brother, Bahman, was attacked with plague on April 9th, and died the next day.

On the very day that Balu was refused admittance to the village, March 25th, two other persons were attacked with plague, these were Mahtab Singh, Ramdasi, chaukidar, and his son, Pertab Singh. Mehtab Singh died on

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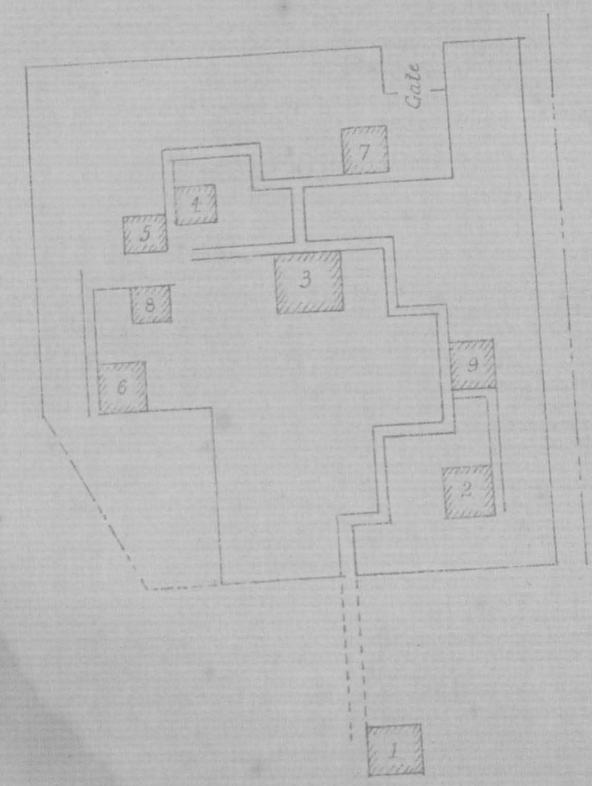
MAP No. 12.

SOTRAN.





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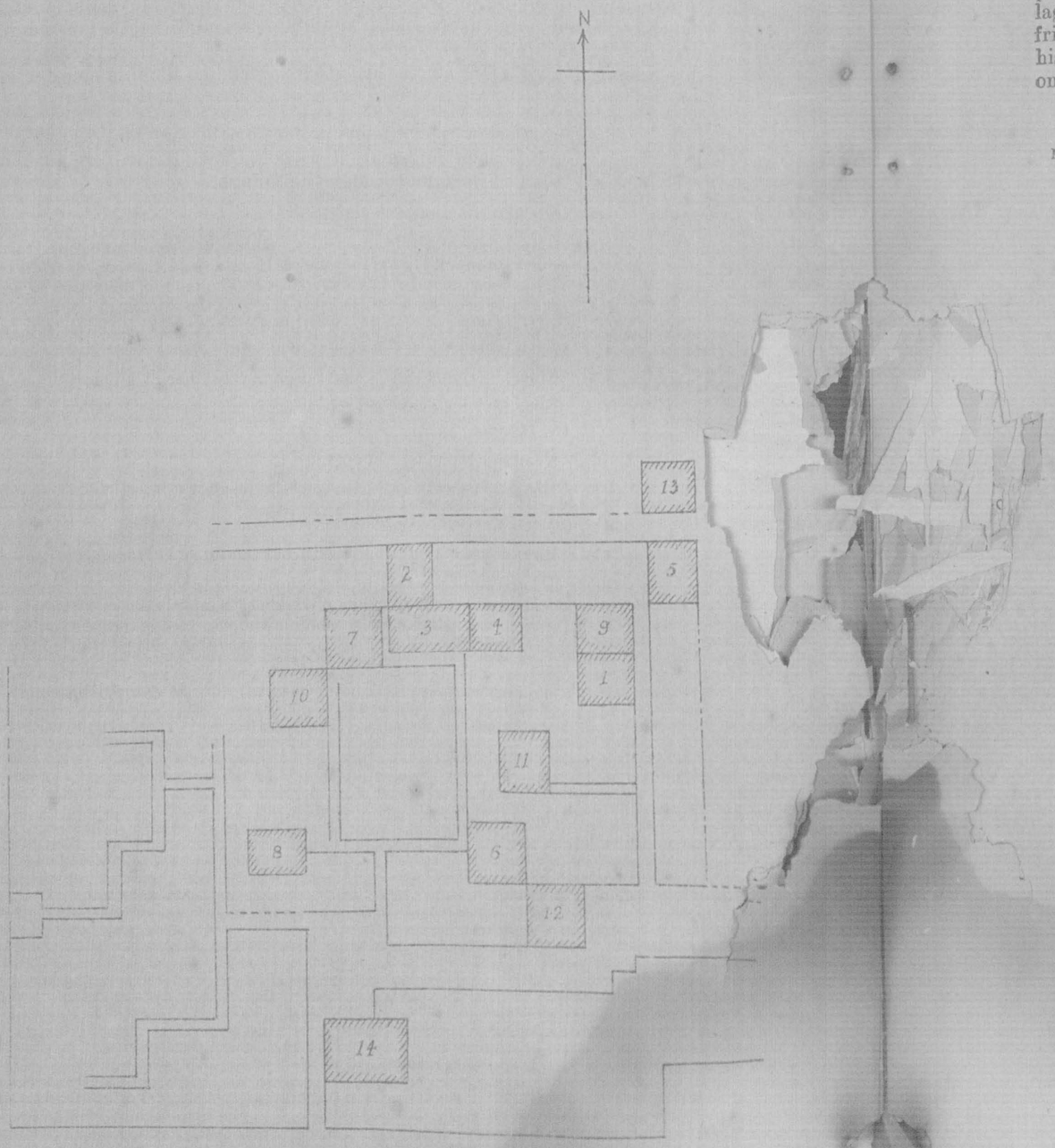
MAP No. 13.

LIDHAR KALAN.



March 30th, but Pertab Singh, who is blind recovered. He says his father had often to go to other villages, and he had to take his chaukidar's books to Banga every week; he would have done so on March 26th had he not been taken ill the previous evening. On the way to, and from, Banga it was his habit to stop at villages he passed through, especially at Mallupota and Sirhal Qazian, where he had friends. He does not know if he had recently done so. Dead rats were found in his house ten days before he and his father were taken ill; this house is marked 2 on the map.

Mode of spreading.

The figures below refer to similar ones on the map and the notes contain such information as could be obtained as to the spread of plague through the village.

(1) and (2). *Vide supra.*

(3). Gopal, son of Utam, carpenter, states that ten days before the villages went into camp, that is, on March 19th, a dead rat was found in his house another was found a few days later. The back of his house adjoins I, but as will be seen by a reference to the map the houses are approached from different sides of the village. Gopal was taken ill on March 29th, and three of the remaining seven of his family were attacked on March 31st.

(4). House adjoins (2). Ala Singh is a brother of Mehtab Singh.

(5). Near (2): residents are relatives of patients in (1), and were frequently in the house.

(6). Near the Ramdasi's houses.

(7). House is near (4); residents are relatives. Jhandu frequently went in to (4).

(8), (9), (12), (14). No history.

(10). Dhunno used to get her food from the infected Ramdasi's houses.

(11). Lohar Singh assisted in Mehtab Singh's funeral.
Constable No. 291, Khuda Bakhsh, son of Aman Bakhsh, Gurgaon District, was attacked with plague while on cordon duty at Lidhar Kalan on April 13th. He admits having gone into the village "to get something from a house."

(13). The father of Jawali, Bhulla Chamar, worked in the disinfection gang.

(37).—KHANPUR.

Census population (1891)	628
Roll-call, (March 1898)	618
Jats	288
Other Hindus	81
Muhammadans, chiefly Arains	98
Chamars	148
Sweepers	3
Number of houses	130
Do. do. infected	11
Do. plague cases	22
Do. deaths	15
Do. recoveries	7
Date of first case	27th March 1898.
Do. declaration of plague	30th do.
Do. cordoning of village	30th do.
Do. evacuation of do.	1st April 1898.
Do. commencement of disinfection	12th do.
Do. completion of do.	12th May 1898.
Do. last case	26th April 1898.
Do. return to village	22nd May 1898.
Do. removal of cordon	28th do.
Do. village declared free of plague	1st June 1898.

It is probable that Khanpur was infected simultaneously from two villages, Katharon and Dahan.

Mode of infection of village.

The first person to be attacked with plague in the village was Jamal Singh, son of Jowala Singh, who fell ill on March 27th. The day previous he, with his daughter-in-law Ralli, had gone to Katharon to see the girl's mother. They stayed the night there, and returned to Khanpur, taking with them some clothes: and shortly after reaching his house Jaimal Singh was taken ill. It is said that Ralli's brother, Gulaba, was given three months' imprisonment for breaking through the cordon at Katharon, Jaimal Singh' house is marked 1 on the accompanying map.

The same day that Jaimal Singh was taken ill, Thaba, wife of Hakim Singh, was attacked with plague. Hakim Singh, some four or five days previously had gone to Dahan, which was then cordoned, to see his wife's nieces, and he is said to have brought back some clothes from there. This house is marked 2.

Manner of spreading in the village.

The notes below contain such information as has been obtained about the spread of plague through the village, the figures referring to houses correspondingly numbered on the map.

(1) and (2), *Vide supra.*
(3). Close to (2): inmates of this house, (2) and (5) related.
(4). Next to (1): Kishni also went into (2), where she had relatives.
(5). Close to (2) and (3), with residents of both of which patients are related; its roof is continuous with that of (3).
(6), (7). Houses touching previously infected ones.
(8). The residents of this house are servants of (2), (3) and (5).
(9). The patient was a Grunthi, and was frequently in infected houses.
(10), (11). Patient used to come into segregation camp hospital.

(49).—BIKA.

Census population (1891)	320
Roll-call (April 1898)	353
Hindu Jats	162
Other Hindus	55
Muhammadans	30
Chamars	97
Sweepers	9
Number of houses	73
Do. do. infected	12
Do. plague cases	16
Do. deaths	10
Do. recoveries	6
Date of first case	9th April 1898.
Do. declaration of plague	10th do.
Do. cordoning of village	10th do.
Do. evacuation of do.	10th do.
Do. commencement of disinfection	20th do.
Do. completion of do.	10th May 1898.
Do. last case	17th do.
Do. return to village	11th June 1898.
Do. removal of cordon	17th do.
Do. village declared free of plague	21st do.

Mode of infection.

No very good evidence has been obtained as to how Bika became infected: the people, however, say that Ganga, son of Vadhava Singh, the first case to be attacked, had been to several villages in which there was plague, mentioning especially Mazara Nauabad and Shikohpur. He went to the latter place shortly before he became ill, April 9th, and stayed with his sister Pertapi, wife of Dhem, bringing back some clothes with him to Bika. It is said that Pertapi's house was close to infected houses, but that nobody in her house was attacked with plague. Ganga's house is marked 1 on the accompanying map, and it will be seen that the infection seems to have spread from it. No dead rats were found in it, though these were in other houses subsequently infected.

Mode of spreading in the village.

The following notes refer to houses with corresponding numbers on the map.

(1). *Vide supra.*
(4). The residents are friends of Ganga, and were often in his house: two dead rats were found in this house on April 10th.
(3). House touching (4): four dead rats found here on April 10th, and several more during the disinfection of the village.
(2). House touches (4): residents of both related.
(5). House touches (4): patients in all the houses numbered (2), (3), (4) and (5) were attacked on the same day, April 14th.
(6). Bana attended Ram Singh in hospital: house close to infected ones.
(7). Bunno attended Bana.
(8). Ganga Singh was attacked the day after he went into the village to get something from his house.
(10). House next (2): three dead rats found here on April 10th.
(11), (12). Patients were Chamars working in the disinfecting gang: father of patient in (4).

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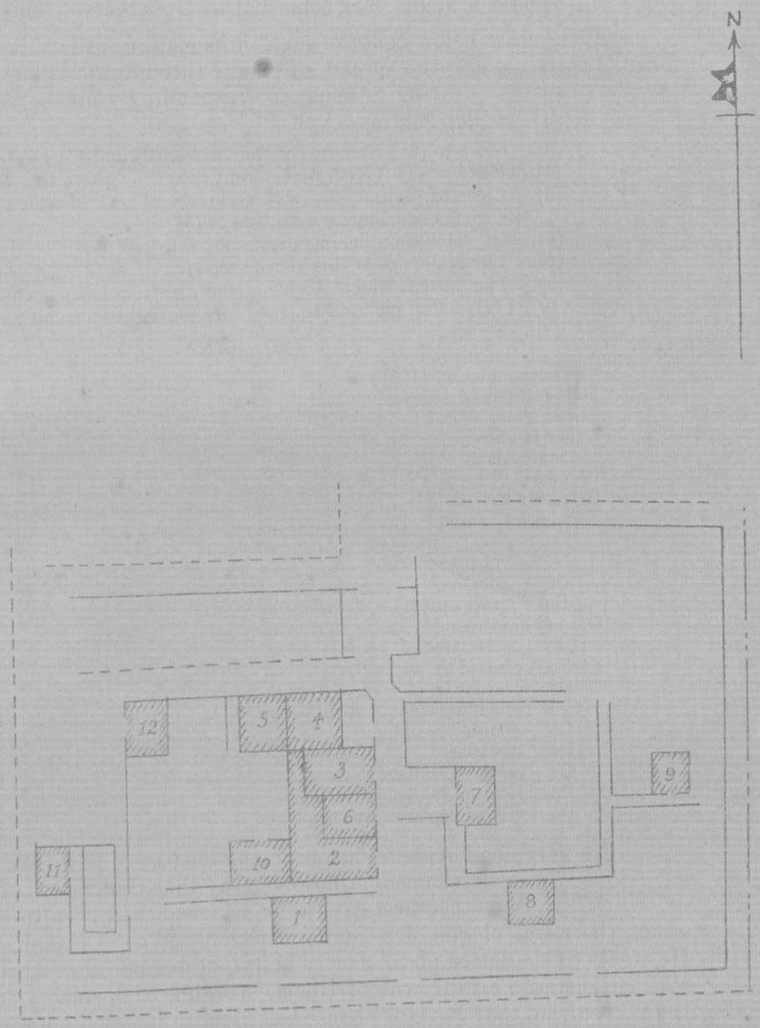
MAP No. 14.

BIKA.



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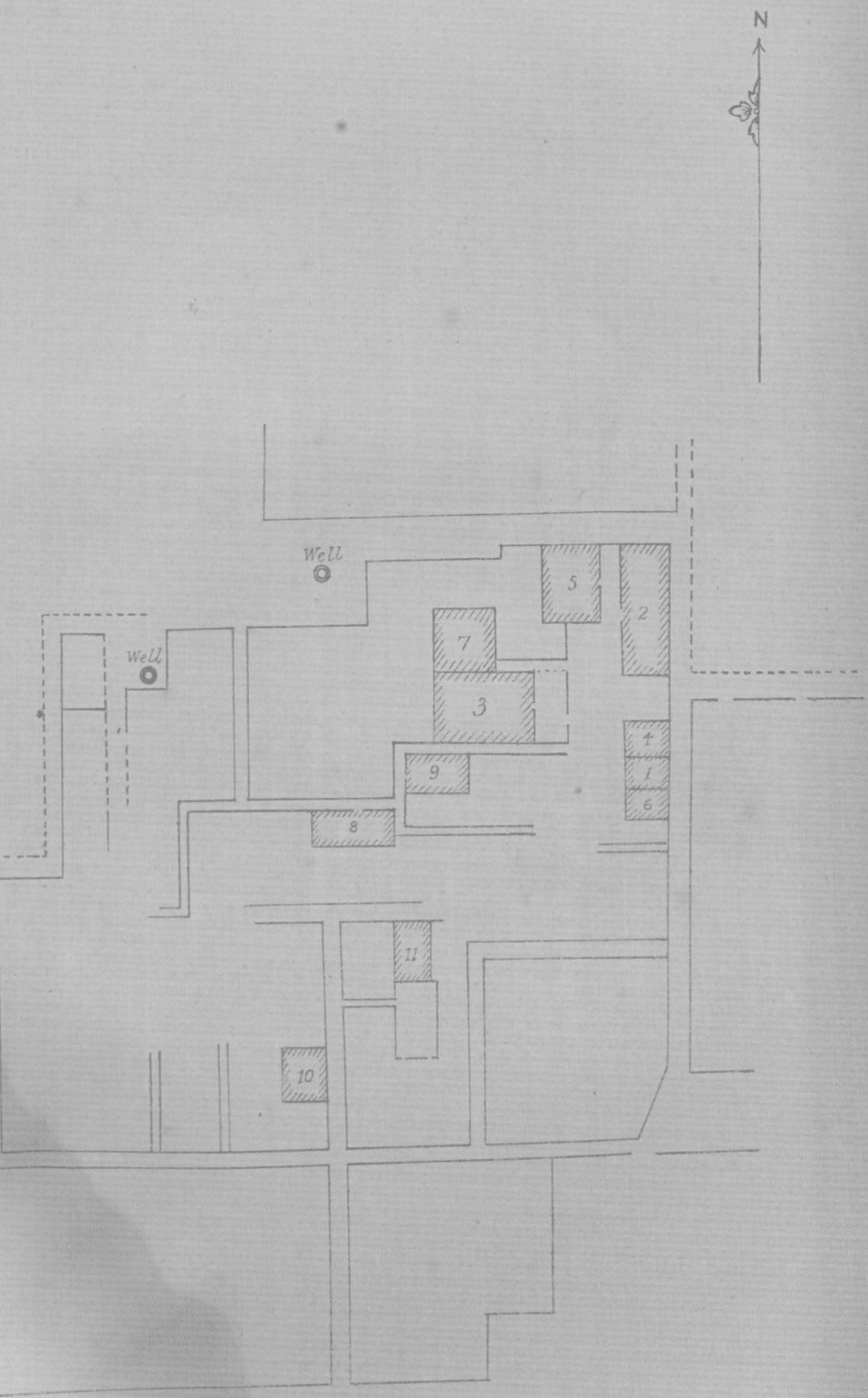
MAP No. 15.

KHANPUR.



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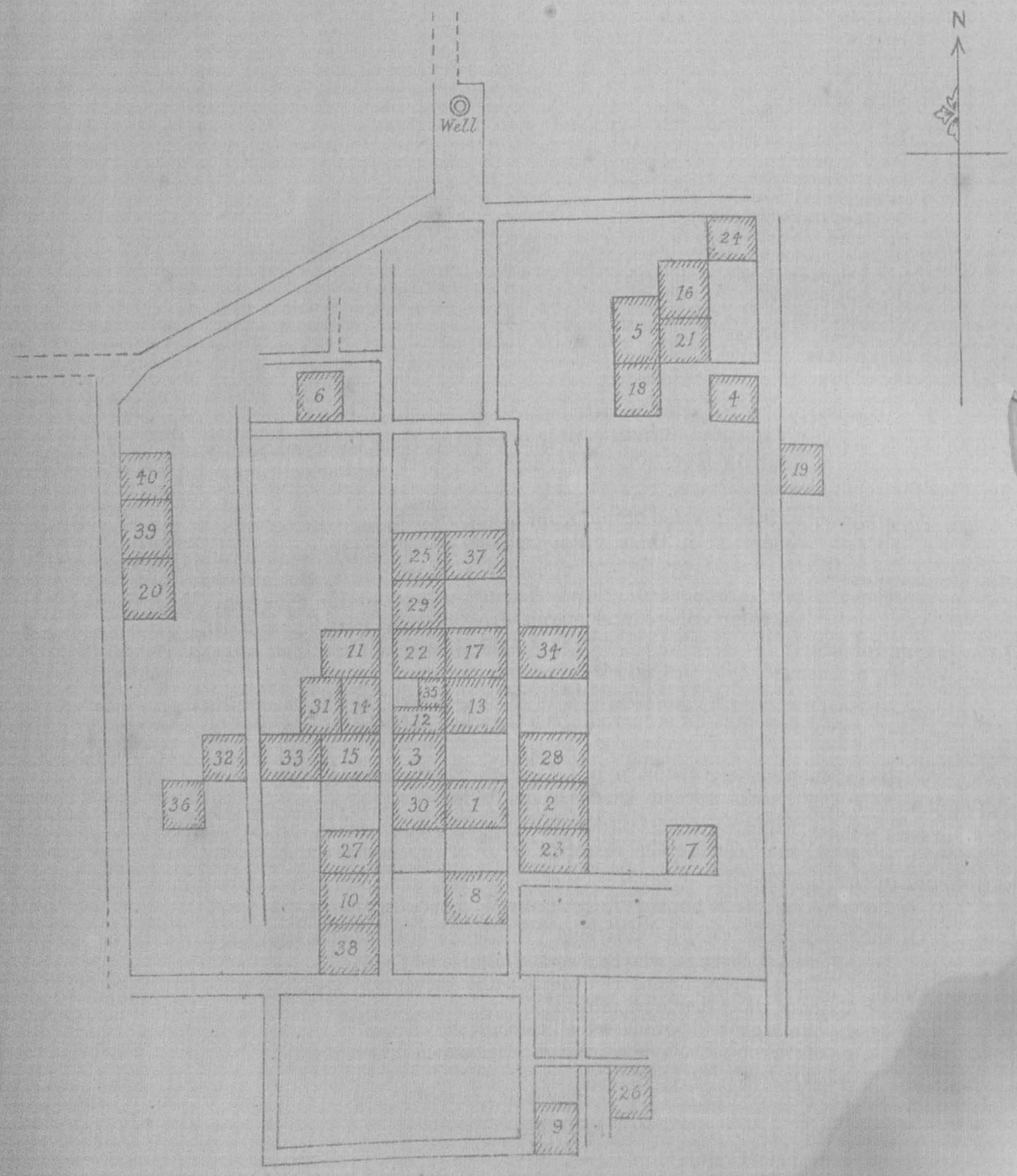
MAP No. 16.

SIRHAL MANDI.



(51).—SIRHAL MANDI.

Census population (1891)	851
Roll-call, (May 1898)	943
Hindu Rajputs	312
Other Hindus	171
Muhammadans, Arains	211
Do. others	129
Chamars	63
Sweepers	26
Sahnsis	16
Ramdasis	15
Number of houses	242
Do. do. infected	40
Do. plague cases	57
Do. deaths	34
Do. recoveries	23
Date of first case about	13th April 1898.
Do. declaration of plague	14th do.
Do. cordoning of village	14th do.
Do. evacuation of do.	7th May 1898.
Do. commencement of disinfection	15th do.
Do. completion do.	2nd June 1898.
Do. last case	15th May 1898.
Do. return to village	6th June 1898.
Do. removal of cordon	12th do.
Do. village declared free of plague	16th do.

Mode of infection of village.

The people of Sirhal Mandi attribute their infection with plague to Tahirpur, which is only separated from their village by a narrow lane, and in which plague had been previously existing for some weeks.

The people at first refused to come out. A great many people affected in the village.

This, however, is a revised opinion, for when the first case of plague occurred in their village they refused to go out into camp because they did not consider that plague was in any way an infectious disease. Acting on this opinion they stayed in their village, and mixed freely with persons suffering from plague for nearly three weeks, when, either because they had altered their opinion, or because they feared other consequences they came out into camp; it is interesting to note that only two of these fifty-seven cases occurred after they had left the village.

Rapid disappearance of the disease after evacuation.

Great mortality of rats in the village.

These statements, together with a reference to the accompanying map will explain how the disease spread through the village. The people say that while they were in the village rats died in every house, and that during the disinfection over a maund of dead rats were found in the village.

Most of the infected houses form a large group in the middle of the village. Of the outlying houses the following brief notes have been obtained :—

(4), (5). Houses of chamars, who had worked in infected houses.
(6), (20). Houses of poor Arains who had acted as servants in houses of Hindu Rajputs, while they were infected.
(7). House of a beggar who wandered all through the village.
(9). House of the only dhobi in the village: he washed infected clothes.
(19). Worked in house No. (13).
(26). House of a teli who had worked in infected houses.

(53).—MOKANDPUR.

Census population (1891)	3,348
Roll-call, (April 1898)	3,045
Jats	491
Brahmins	419
Khatris and Banias	305
Other Hindus	464
Muhammadans, Arains	236
Do. others	619
Chamars	292
Ramdasis	115
Sweepers	104
Number of houses	1,219
Do. do. infected	12
Do. plague cases returned	15, actual 17
Do. deaths do.	7 „ 8
Do. recoveries do.	8 „ 9

Date of first case	... ...	... 9th April 1898.
Do. declaration of plague	... ...	... 14th do.
Do. cordoning of village ...	... ...	... 16th do.
Do. evacuation of mohallas	... ...	... 16th April and 4th May 1898.
Do. do. whole village	... ...	... 10th May 1898.
Do. commencement of disinfection	... ...	... 25th do.
Do. completion do.	... ...	... 13th June 1898.
Do. last case do.	... ...	... 10th May 1898.
Do. return to village	... ...	... 13th June 1898.
Do. removal of cordon	... ...	... 21st do.
Do. village declared free of plague	... ...	... 23rd do.

Mode of infection.

The people of Mokandpur accuse Maula, son of Jai Dial, Khatri, of having brought plague to their village. They say that he used to bring sugar from Lalpur and Khankhanan, the latter place especially, but not while either of these villages were cordoned. This man was certainly the first person to be attacked with plague in Mokandpur, but there was another possible source of infection. It appears that on April 2nd a Nai, Basanta, son of Chajju, came from Bilron, and in spite of the watch the people of Mokandpur had set on their village to prevent strangers entering, he managed to get into the shop of Sibhu, son of Dosaundi, Khatri, shown as "1" on the accompanying map. This Nai had left Bilron on horseback the day the cordon was removed from that village to take message from one Kharak Singh, Bedi, of Bilron, to his two daughters, one of whom lived at Apra, the other being the wife of Prebhu, son of Dosaundi, brother of Sibhu mentioned above.

It is said that the people of Apra, noticing that the nai looked ill, refused him admission, fearing plague, upon which he rode on to Mokandpur, arriving there late in the evening. It is further stated that Sibhu took the man into his shop and poulticed a swelling he had in the groin, and prevailed upon Maula to let him sleep in his shop, saying that he had brought a message about a suitable wife for his son. Maula's house is marked (2) on the map. This nai only stayed a night at Mokandpur, when he returned to Bilron, leaving behind him some clothes he had brought for Prebhu's wife.

Great mortality among rats.

Dead rats were found in Sibhu's shop on April 3rd, and in the street outside the shop. He lived in another house marked (4) on the accompanying map where his sister, Raji, was attacked with plague on April 10th, and he himself on April 17th. It is said that when this house was being disinfected nearly 200 dead rats were found in it. During the disinfection of the village dead rats were found in many houses in which there had been no cases of plague, and in the streets.

The remaining rats have left the village, and are living in the surrounding fields.

The people say that there is not a single rat in the village now; they say they are in the neighbouring fields, but nothing will induce them to come into the village, even though corn is scattered for them. They also state that many dogs died in the village before the people left it.

The natives formed a plague committee of their own.

A certain number of persons at Mokandpur formed themselves into a sort of "Plague Committee," when Khankhanan was first attacked, with the object of trying to prevent the plague attacking their villages. They visited and inspected houses, and made the chaukidars responsible for reporting to them every case of sickness in their respective *pattis*. They also had the village cleaned, and made a *chanda* for the payment of special chaukidars whom they appointed to prevent strangers entering the village and for the provision of medicines, &c., for the sick and food for the poor. When the plague broke out they appointed their own hakim with a paid assistant and a bhisti, cook and sweeper for the hospital; the only Government servant employed in the treatment of their sick was a *dhai*.

The people were treated by their own hakim.

The following notes have been obtained about the spread of plague through the village, the figures referring to similar ones on the map.

The mode of the spread of the disease.

(1), (2), (4). *Vide supra.*

(3). House next to (2): no dead rats were found here, but there was a very bad smell in the house when she was taken ill.

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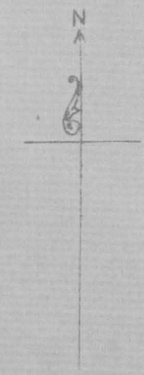
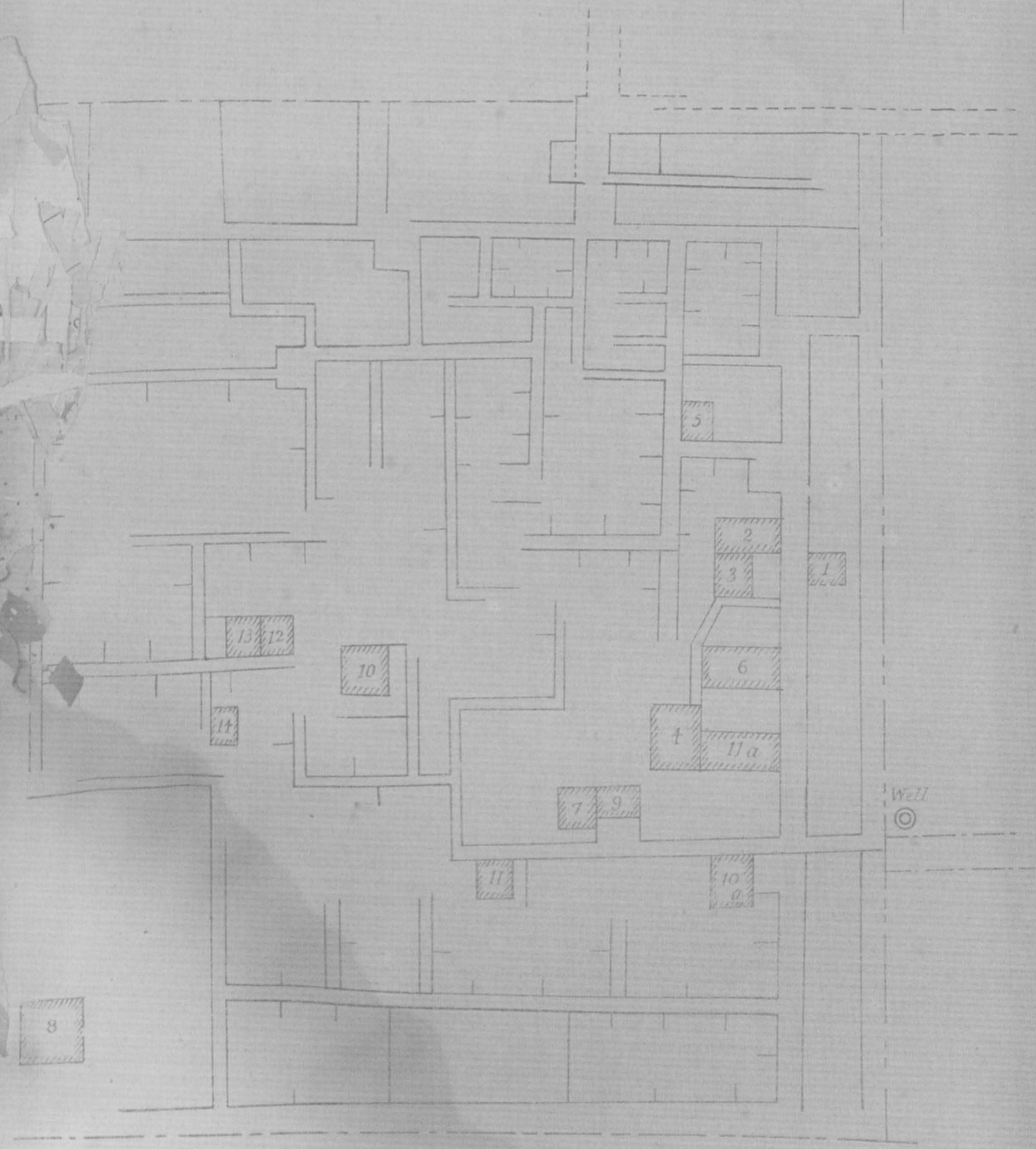
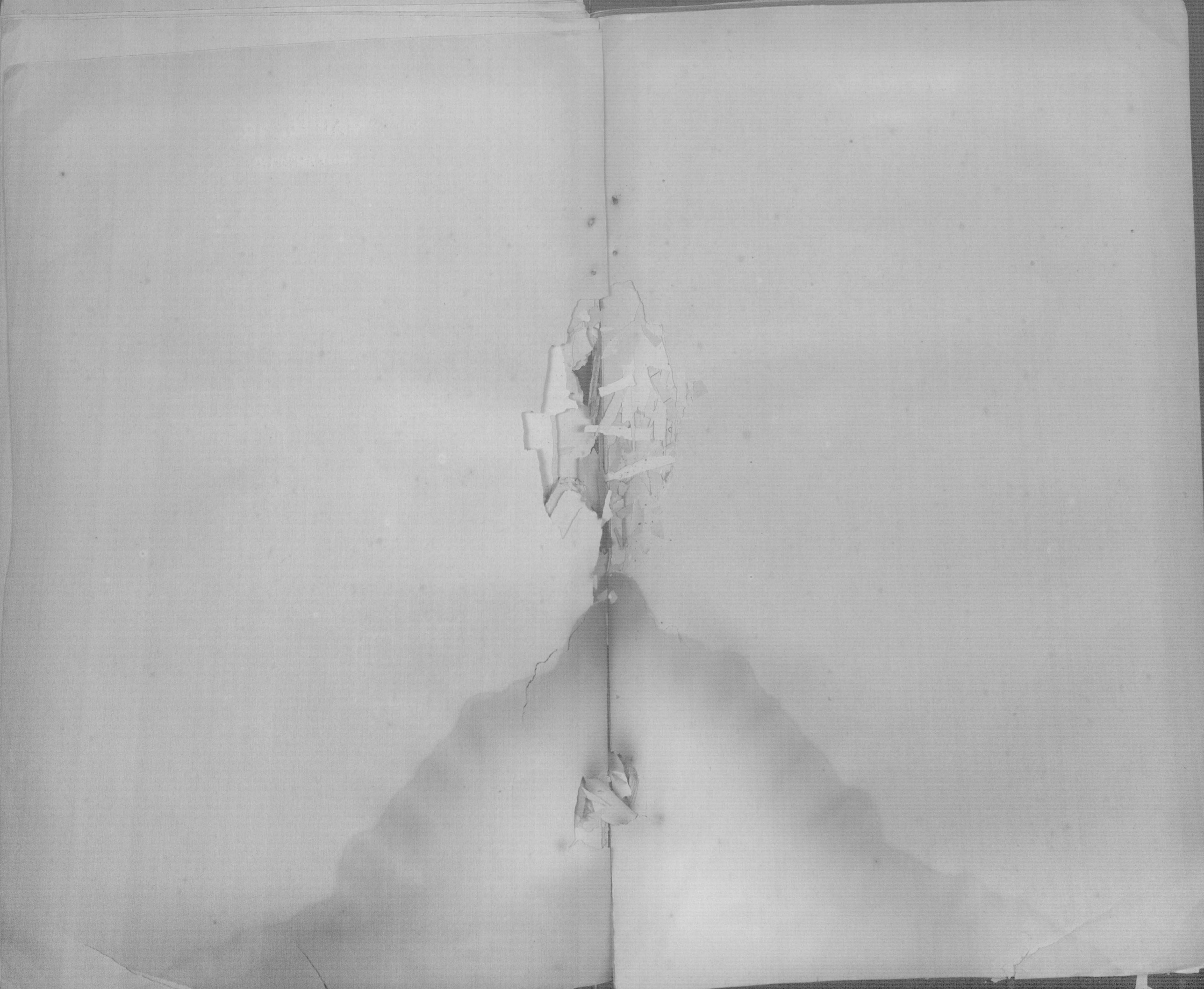
MAP No. 18.

MOKANDPUR.







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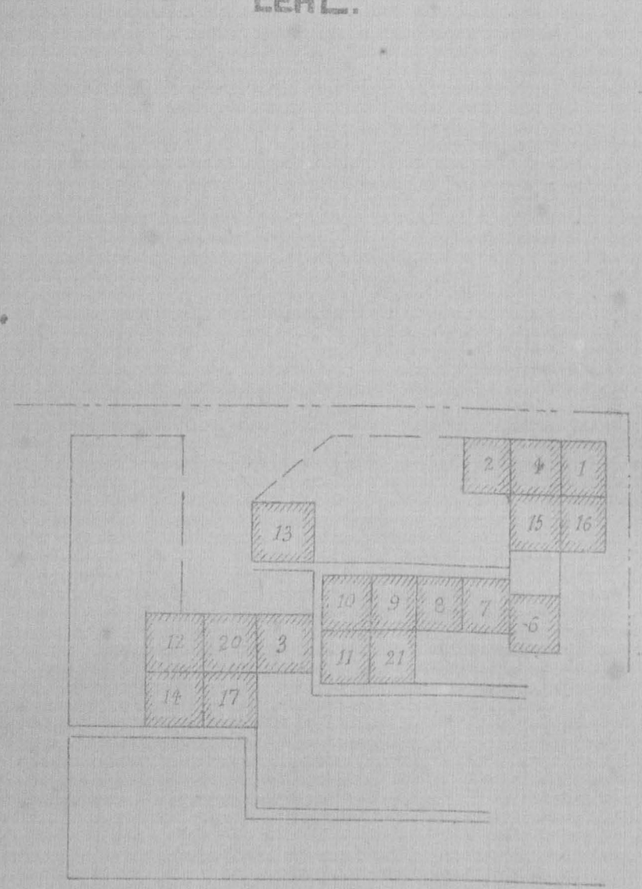
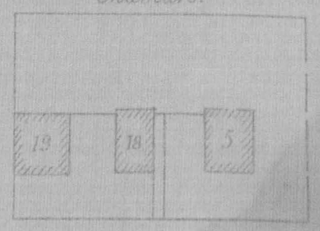
MAP No. 17.

LEHL.



Chamars.



(5). Sina, son of Jai Dial, is brother of Maula, mentioned above. The brothers share this house and Maula took his meals in it. Sixteen or seventeen dead rats were found in this house when they removed their things to camp.

(6). No special history except that the patient Rupa constantly played in shops (1) and (2).

(7). Chuni, son of Gulab, nai, was a servant of residents of (1) and (4).

(8). Jatani, daughter of Nihala, sweeper, was a servant in house (4), which she swept out and removed filth, &c., from it.

(9). House next to (7): a rat was seen to stagger out of this house and die in the street two days before the patient was attacked.

(10). Ram Chand, lohar, is said to have been infected by Nathu, a resident of (9), who constantly sat in his workshop, (10*a*).

(11). Residence of Thakur, Brahmin, whose shop (11*a*) is next (4).

(12), (13). Infected by Thakur, who is their *parohit* and frequently comes into their houses.

(15). History same as (12) and (13): many dead rats were seen here the day before the patient was taken ill.

(55).—LEHL.

Census population (1891)	487
Roll-call (April 1898)	501
Jats	250
Other Hindus	121
Chamars	122
Muhammadan Telis	8
Number of houses	121
Do. do. infected	21
Do. plague cases	34
Do. deaths	18
Do. recoveries	16
Date of first case	12th April 1898.
Do. declaration of plague	17th „
Do. cordoning of village	17th „
Do. evacuation of do.	18th „
Do. commencement of disinfection	10th May 1898.
Do. completion do.	26th „
Do. last case	13th „
Do. return to village	31st „
Do. removal of cordon	31st „
Do. village declared free of plague	31st „

Mode of infection. Spread by rats.

Very little reliable information of a definite character has been obtained concerning the spread of plague to Lehl, owing to the reticence of the inhabitants. They all say that they were infected from Sirhal Mandi with which they had free communication. Dead rats were seen in several houses before anybody was attacked; first in the house of Nihal Singh and Sham Singh, marked (1) and (2), respectively, on the accompanying map. They were seen in these houses about April 10th, "three or four days before Baisakh"; persons were attacked in (1) on April 12th and in (2) the next day.

Spread of the disease from house to house.

It will be seen on the map that the infected houses, numbered in accordance with the date on which their inmates were first attacked, are nearly all close together.

The chamars live in a collection of houses quite separate from the village, and it is stated that the patient in the first of these houses to be attacked, (5) on the map, was infected at Sirhal Mandi, as she was taken ill on her way back from there.

Dead rats were found in (3) and (8) on April 13th and in (4) on April 17th. No definite information could be obtained about other houses.

The patients attacked in (18) and (19) were chamars working in the disinfecting gang.

Police constable attacked.

Constable No. 350, Hakim Beg, Jullundur District, was attacked with plague at Lehl while on cordon duty on May 10th, and died on May 14th. He came into the segregation camp.

(56).—CHAK KALAL.

Census population (1891)	315
Roll-call, (April 1898)	246
Kalals	123
Other Hindus	62
Chamars	60
Muhammadan	1
Number of houses	80
Do. do. infected	18
Do. plague cases	33
Do. deaths	20
Do. recoveries	13
Date of first case	17th April 1898.
Do. declaration of plague	17th do.
Do. cordoning of village	17th do.
Do. evacuation of do.	5th do.
Do. commencement of disinfection	8th May 1898.
Do. completion do.	31st do.
Do. last case	27th April 1898.
Do. return to village	4th June 1898.
Do. removal of cordon	10th do.
Do. village declared free of plague	14th do.

The rats first affected. The people go into camp before any one is attacked.

The people of Chak Kalal state that on April 4th or 5th they noticed dead rats in several houses in different parts of the village, and reported this to Mr. Johnston, who advised them to leave the village at once, which they did, leaving most of their property in their houses.

A few days later a dying rat was found in the *diwankhana* of the village and was brought to Dr. James, who examined it and found the characteristic bacilli of plague in its greatly enlarged spleen.

The people became attacked on their return to the village.

On April 15th there was a heavy shower of rain and most of the people returned to the village. The first case of plague occurred on April 17th, and thirty-three persons were attacked between that date and April 27th.

The distribution of the "infected" houses in the village.

The houses on the accompanying map are numbered with reference to the date on which their residents were first attacked with plague, though, as will be seen from what has been written above, all the patients were attacked while in camp.

In addition to what has been recorded above it is stated that on March 24th, Uttam Singh, son of Dalel Singh, Kalal, brought over clothes from the *dharamsala* of Sotran, to which place he was in the habit of going. There was plague in the *dharamsala* at the time and Sotran was cordoned the next day,

A history of clothes brought from Sotran, but none of the people keeping these became attacked.

Uttam Singh was reported to Dr. James, who segregated him for ten days and disinfected him and the clothes he brought from Sotran; it is said, however, that he had previously given some of the clothes to other persons in the village. Neither he nor any of his family were attacked with plague.

(57).—PUNIAN.

Census population (1891)	454
Roll-call, (April 1898)	443
Jats	222
Other Hindus	109
Chamars	74
Muhammadans	24
Sweepers	14
Number of houses	171
Do. do. infected	...
Do. plague cases	58
Do. deaths	25
Do. recoveries	33
Date of first case	14th April 1898.
Do. declaration of plague	18th do.
Do. cordoning of village	18th do.
Do. evacuation of village	24th do.
Do. commencement of disinfection	28th do.
Do. completion do.	1st June 1898.
Do. last case	4th May 1898.
Do. return to village	16th June 1898.
Do. removal of cordon	22nd do.
Do. village declared free of plague	27th do.

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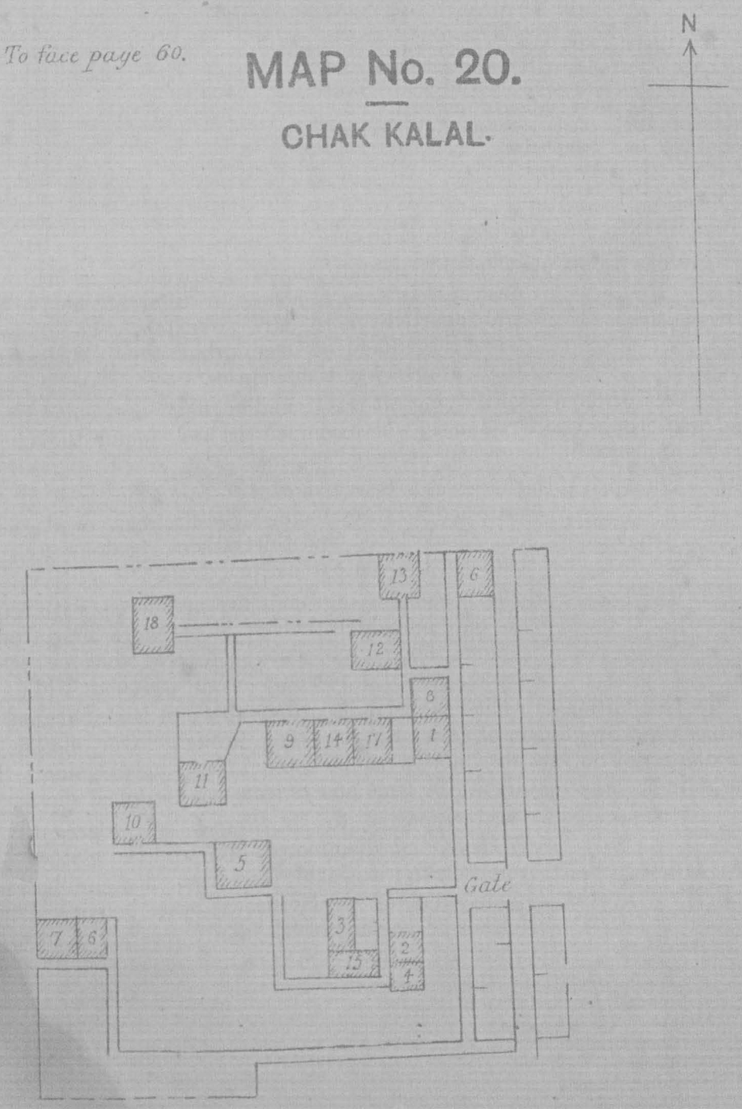
MAP No. 20.

CHAK KALAL.



There is rather strong evidence that there were two almost simultaneous sources of infection at Punian ; four persons were attacked within a day of each other in distant parts of the village between which there was no direct connection, and in both cases there was a history of infection from without, and the disease spread throughout the village from these two centres of infection.

The first person to be attacked with plague in Punian was Sang Singh, son of Lida, a lambardar. He was attacked on April 14th. He had been to Banga on April 8th or 9th, and had brought some *jala* grass from the house of Saiva, Brahmin, whose two daughters, it is said, were then suffering from plague, but concealed. Dead rats were noticed in Sang Singh's house on April 10th or 11th ; this house is marked (1) on the accompanying map. On the same day that Sang Singh was attacked or the next, Gangi, wife of Har Bhagwan, was taken ill with plague. She lived in quite a different part of the village, and neither she nor any of her relatives have had anything to do with Sang Singh or his family. She had not been out of the village for some time, but her husband had a *halwai* shop in Banga and went there daily taking some of his stock there and back. Dead rats were noticed in this house, which is marked (1) on the map on April 10th or 11th.

The following notes have reference to the spread of plague through the village, the houses on the map have been numbered, one set with Arabic, the other with Roman numerals, according as to whether their infection can be traced from Sang Singh's or Gangi's house, respectively.

1. *Vide supra.*
2. Next to 1 : dead rats noticed here some days before Rao was attacked on 8th April. She attended patients in 1.
3. Kahno, wife of Subha Singh, attacked April 20th ; attended patients in 1.
4. Lalu is a servant of residents in 1.
5. House next to 1 : dead rats noticed some days before Jawala was attacked.
6. House next to 2 : dead rats noticed as above.
7. Bani had been working in 1 : attacked April 24th.
8. Roda had attended patients in 5.
9. Jiwi had frequently been in house of other patients.

I.—*Vide supra.*

II.—House next to 1 : there is a hole in the wall between the two houses ; dead rats were found here on April 11th or 12th.

III.—No history.

IV.—Permeshari, daughter of Ram Singh, Brahmin, was attacked here on April 19th : dead rats were found in the house some days previously ; her brother Nandu attacked on April 24th had attended patients in I.

V.—Dosaunda Singh attended patients in II : house next to I.

VI.—No history, next to III.

VII.—Permeshari, daughter of Rupa, had been living in VI.

VIII, IX—No history.

X.—Next to I, II and V.

XI.—Next to III : dead rats found in the house before the residents left the village.

XII, XIII.—Next to III and I, respectively ; Basanti, resident of XIII, was a frequent visitor in I.

XIV, XV.—No history. The former was an exceedingly dirty house.

Basant Ram, Compounder, was attacked with plague on May 4th, while on duty at Chak Kalal. He had left Punian the previous day where he had superintended the disinfecting gang. He is thought to have contracted the disease from house No. IX, into which he went to get a ruler, before it was disinfected.

Hamerowal also evacuated though there were no cases of plague, but a mortality among the rats.

The little village of Hamerowal with a population of 89 persons, chiefly Muhammadan Rajputs, is close to Punian, only a few yards separating their outlying houses. There was no plague in Hamerowal, but it was considered to be in the interest of the inhabitants that they should evacuate the village, which, in spite of considerable disinclination on their part, they did on April 24th.

The village was treated as an infected one, its houses were disinfected and whitewashed, and holes were made in the roof of every house, 28 in number: during this process of disinfection thirty dead rats were found in the village, and the people afterwards admitted that on the very day they left the village dead rats had been found in one of the houses.

Note by Surgeon Captain James —

The rats attacked previously to human beings.

On subsequent enquiry at Punian the information was elicited from several sources that rats had begun to die in the village eight or nine days before any one was attacked with plague. The disease, if brought from Banga as stated by Dr. Wilkinson, must have been subsequent to the infection of the rats. As a matter of fact, it is very doubtful if Saiva ever had plague in his house in Banga, as, at the time, we had a very complete list of the inhabitants and daily inspections were being made by the hospital assistants in every part of Banga. Har Bhagwan's shop was situated in a portion of the town which was not infected. It is therefore probable that the people of Punian, not knowing of the possibility of rats bringing the disease from other villages, tried to account for the curious simultaneous appearance of the disease in two parts of their village in the manner recorded by Dr. Wilkinson. They certainly were very definite about the rats being previously attacked when questioned on the subject.

(61). REHPA.

Census population (1891)	677
Roll-call, April 1898	743
Hindus, chiefly Jats	423
Chamars	150
Ramdasis	100
Muhmamadans...	66
Sweepers	4
Number of houses	145
Do. do. infected	12
Do. plague cases	21
Do. deaths	12
Do. recoveries	9
Date of first case	16th April.
Do. declaration of plague	22nd do.
Do. cordoning of village	22nd do.
Do. evacuation of do.	23rd do.
Do. commencement of disinfection	8th May.
Do. completion of do	30th do.
Do. last case	9th do.
Do. return to village	2nd June.
Do. removal of cordon	8th do.
Do. village declared free of plague	12th do.

Mode of infection.

It is only with great difficulty that any information concerning the conveyance of plague to their village has been obtained from the inhabitants of Rehpa: the first person to be attacked was Chandi, wife of Variyam Singh, who was taken ill on April 16th, and died the next day; she had buboes on both sides of the neck.

It is said that Gulab Singh, a Darzi of Jagutpur, had brought clothes to this house on April 14th. A member of his family, name not ascertained, is said to have died of plague, and it is stated that he made these clothes in the segregation camp at Jagatpur.

With reference to these statements it may be mentioned that it has been ascertained that there is a tailor named Gulab Singh at Jagatpur and that he lived in a house next to that in which Partapi, wife of Sham Singh, was attacked with plague. An inhabitant of Jagatpur stated independently that Gulab Singh had taken clothes to the house of the person first attacked at Rehpa, whose name he did not know.

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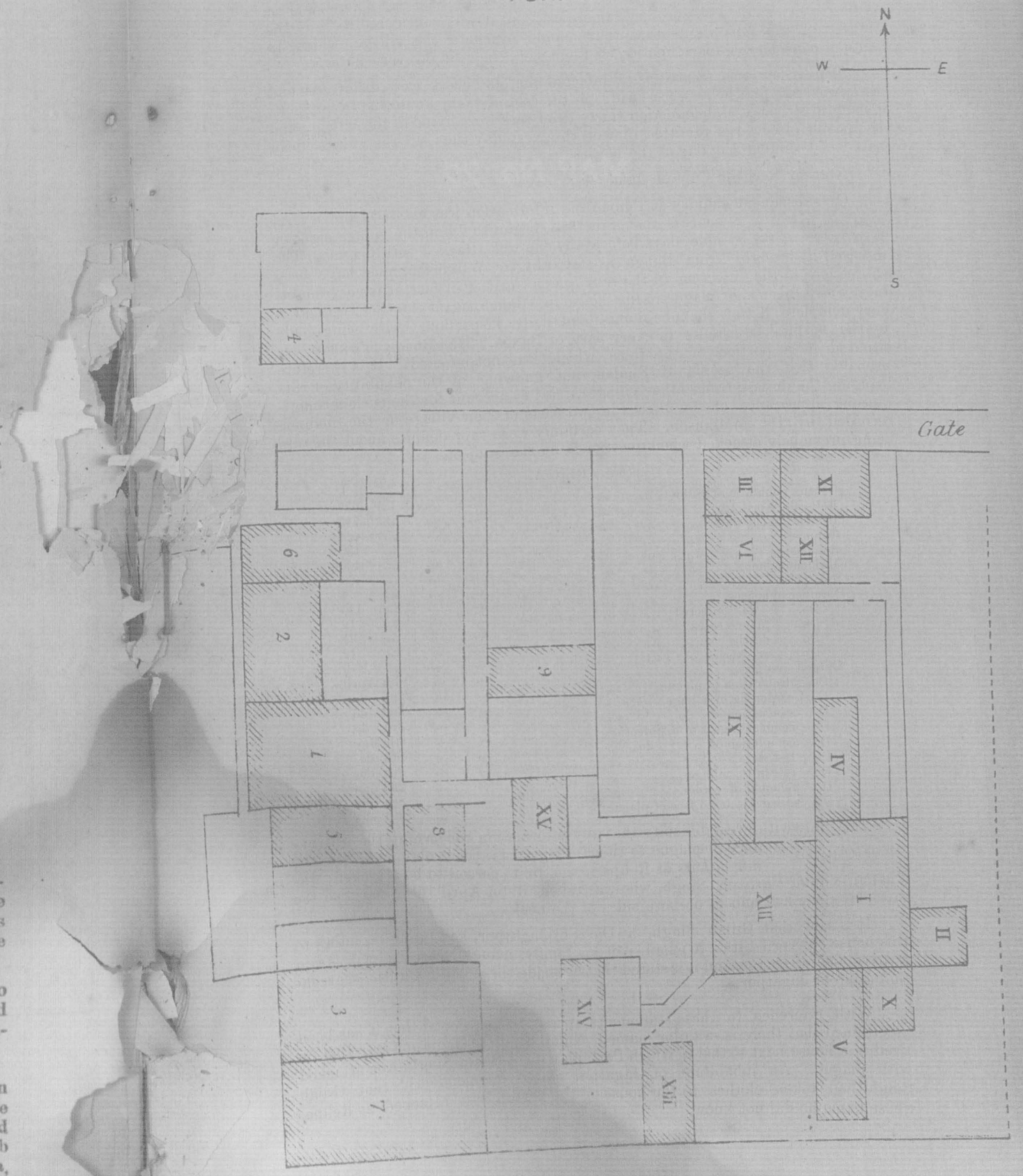
MAP No. 21.

PUNIAN.



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The rats attacked previously to human beings.

On subsequent enquiry at Punian the information was elicited from several sources that rats had begun to die in the village eight or nine days before any one was attacked with plague. The disease, if brought from Banga as stated by Dr. Wilkinson, must have been subsequent to the infection of the rats. As a matter of fact, it is very doubtful if Saiva ever had plague in his house in Banga, as, at the time, we had a very complete list of the inhabitants and daily inspections were being made by the hospital assistants in every part of Banga. Har Bhagwan's shop was situated in a portion of the town which was not infected. It is therefore probable that the people of Punian, not knowing of the possibility of rats bringing the disease from other villages, tried to account for the curious simultaneous appearance of the disease in two parts of their village in the manner recorded by Dr. Wilkinson. They certainly were very definite about the rats being previously attacked when questioned on the subject.

(61). REHPA.

Census population (1891)	677
Roll-call, April 1898	743
Hindus, chiefly Jats	423
Chamars	150
Ramdasis	100
Muhmamadans...	66
Sweepers	4
Number of houses	145
Do. do. infected	12
Do. plague cases	21
Do. deaths	12
Do. recoveries	9
Date of first case	16th April.
Do. declaration of plague	22nd do.
Do. cordoning of village	22nd do.
Do. evacuation of do.	23rd do.
Do. commencement of disinfection	8th May.
Do. completion of do	30th do.
Do. last case	9th do.
Do. return to village	2nd June.
Do. removal of cordon	8th do.
Do. village declared free of plague	12th do.

Mode of infection.

It is only with great difficulty that any information concerning the conveyance of plague to their village has been obtained from the inhabitants of Rehpa: the first person to be attacked was Chandi, wife of Variyam Singh, who was taken ill on April 16th, and died the next day; she had buboes on both sides of the neck.

It is said that Gulab Singh, a Darzi of Jagutpur, had brought clothes to this house on April 14th. A member of his family, name not ascertained, is said to have died of plague, and it is stated that he made these clothes in the segregation camp at Jagatpur.

With reference to these statements it may be mentioned that it has been ascertained that there is a tailor named Gulab Singh at Jagatpur and that he lived in a house next to that in which Partapi, wife of Sham Singh, was attacked with plague. An inhabitant of Jagatpur stated independently that Gulab Singh had taken clothes to the house of the person first attacked at Rehpa, whose name he did not know.

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MAP No. 21.

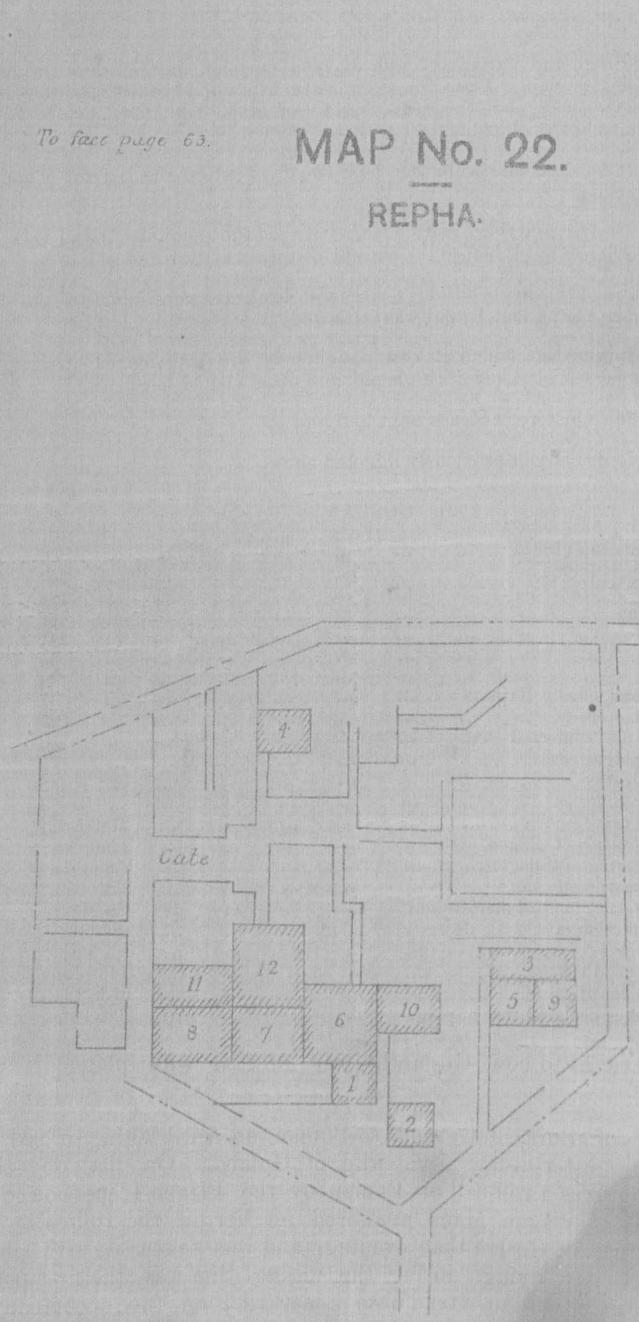
PUNIAN.



To face page 63.

MAP No. 22.

REPHA.



The spread in the village.

The house of Chandi, wife of Variyam Singh, is marked (1) on the accompanying map, and the other houses are numbered in the order in which they became infected.

2. Close to 1, and the families are closely related: Variyam Singh being the brother of four patients in this house.

3. Rulda, Chamar, was a servant in 2.

4. Attar Singh and Variyam Singh have a common *haveli* which is next to 1 on the map. Attar Singh was also often in 1: dead rats were found in his house, one three days and the other two days before he was attacked, April 22nd.

5. Next to 3: dead rats were seen here two days before the patient Thani was attacked.

6. House near 1, and there is friendship between the families: dead rats were seen here a week before the patient Katora was attacked.

7. The back of this house adjoins 6: several dead rats were found in the house before the patient Kinmi was attacked.

8. Mian Singh was a friend of Veri, daughter of the last named patient, who was herself attacked with plague, and often visited her in 7.

9. No definite history. House next to 3 and 5.

11, 12. Houses adjoin previously infected ones.

(62). GOSLAN.

Census population (1891)	494
Roll-call, April 1898	504
Sikhs	188
Other Hindus	102
Chamars	112
Sweepers	35
Ramdasis	30
Muhammadans, chiefly Rajputs	37
Number of houses	127
Do. do. infected	10
Do. plague cases	11
Do. deaths	8
Do. recoveries	3
Date of first case	21st April
Do. declaration of plague	22nd do.
Do. cordoning of village	22nd do.
Do. evacuation of do.	25th do.
Do. commencement of disinfection	7th May.
Do. completion of do.	5th June.
Do. last case	5th May.
Do. return to village	10th June.
Do. removal of cordon	16th do.
Do. villages declared free of plague	20th do.

The evidence as to how Goslan became infected with plague is very precise.

Mode of infection.

Manu, wife of Bura, Jat, went to Punian on April 20th, to see her sister-in-law Jivi, wife of Gulaba. On that day there was a roll-call of Punian by the Plague Inspection Staff, and Jivi being ill of plague Manu answered for her in the roll-call. She returned to her house at Goslan that evening, and was taken ill with plague at noon the next day, dying during the night. She was the first person attacked with plague at Goslan. Her house is marked 1 on the accompanying map.

No dead rats found before evacuation; some found during disinfection of houses.

Very little reliable information could be obtained concerning the spread of the disease through the village. The people deny ever having seen dead rats in their houses, but numbers were found during the disinfection of the village; this may be due to the fact that the village was evacuated the day after the first case occurred there.

(66). AUJLA.

Census population (1891)		630
Roll-call, April 1898		424
Jats		201
Other Hindus		102
Muhammadans		30
Chamars		91
Number of houses		109
Do. do. infected		4
Do. plague cases returned	5, Actual	9
Do. deaths returned	4, Do.	8
Do. recoveries returned	1, Do.	1
Date of first case	21st April.	
Do. do. returned	27th do.	
Do. declaration of plague	27th do.	
Do. cordoning of village	27th do.	
Do. evacuation of do.	13th May.	
Do. commencement of disinfection	...	
Do. completion of do.	...	
Do. last case	18th May.	
Do. return to village	7th June.	
Do. removal of cordon	13th do.	
Do. village declared free of plague	17th do.	

Very little reliable information can be obtained on account of the reticence of the people.

No evidence whatever can be obtained concerning the infection of Aujla. The inhabitants maintain that nobody entered or left the village for at least a month previous to the first person being attacked; they further insist that no person in their village ever suffered from plague, though eight persons, of the nine who became ill between April 21st and May 20th, died.

The first case was Agali, wife of Attru, Chamar, who was attacked on April 21st and died on April 30th. Three others of the fifteen residents of her house were attacked. It should be stated that one of these was a child a few days old, whose mother, Khemi, was attacked with plague on April 25th, and died on May 3rd.

No history can be obtained as to how the other patients became attacked.

(67). CHHOKRAN.

Census population (1891)		847
Roll-call, April 1898		905
Hindu Jats		551
Other Hindus		69
Muhammadans		106
Chamars		142
Ramdasis		24
Sweepers		13
Number of houses		161
Do. do. infected		14
Do. plague cases returned	10, Actual	19
Do. deaths returned	4, Do.	13
Do. recoveries returned	6, Do.	6
Date of first case	16th April.	
Do. do. returned	10th May.	
Do. declaration of plague	10th do.	
Do. cordoning of village	10th do.	
Do. evacuation of do.	10th do.	
Do. commencement of disinfection	2nd June.	
Do. completion of do.	14th do.	
Do. last case	25th May.	
Do. return to village	15th June.	
Do. removal of cordon	21st do.	
Do. village declared free of plague	25th do.	

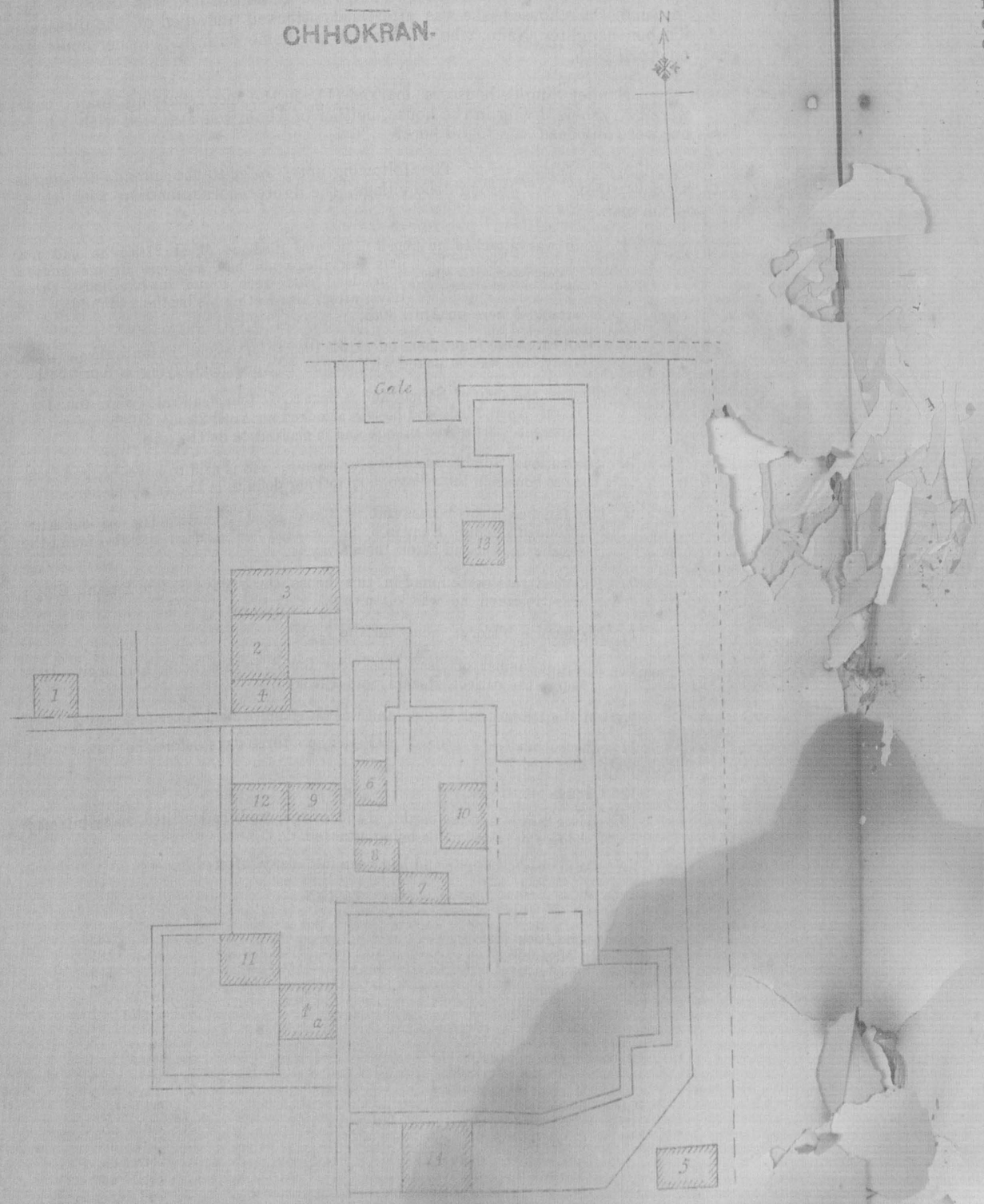
Mode of infection.

The first case of plague at Chhokran was Sunder Singh, son of Nihal Singh, who was attacked on April 6th; he died on April 21st and was burnt, no mention of his illness or death having been made to the authorities. He had gone to Salh Kalan about the end of March, and had stayed there nearly a fortnight with his sister, Gulab Dai, wife of Ganda, Jat, and on returning to Chhokran had brought back with him his sister's son, Nama, and her two daughters, Nami and Guzari, together with a widow named Malan.

To face page 65.

MAP No. 23.

CHHOKRAN.



There was plague at Salh Kalan while Sunder Singh was there, but not in Gulab Dai's house; she was afterwards attacked and died of the disease as did her daughter Nami, who returned to her home with her brother and sister on April 24th.

Sunder Singh's house is marked (1) on the accompanying map: there were two others living in the house, neither of whom was attacked with plague nor were any dead rats found here.

The spread of plague brough the village.

The following notes refer to the spread of plague through the village, the figures corresponding with those on the map.

2. Said was attacked on April 21st and died on April 27th: he had not left the village nor had any one in his house: four dead rats were found in his house three days after his death: his brother, Bhudda, was attacked here on April 30th.

Dead rats found in seven of the infected houses.

3. Dead rats were found here on April 19th: the patient Basanti threw them away, and was attacked with plague on April 22nd, dying on April 28th.

4. This is the shop of Saindi, and is next to 3: four dead rats were found in it on April 22nd, and he was attacked on April 25th. His house is in a different part of the village and is marked 4*a* on the map.

5. The patient Gulabi was a beggar woman, and is said to have begged from most houses in the village, but nothing definite is known about her.

6. The families in this house and in 3 are great friends. The patient Attri attended Mehtab Kaur in 3, and washed her clothes; she also found the dead rats in 3 and threw them away.

7. The dead rats were found in this house three days before Basant Singh was attacked, he was often in 6.

8. No definite history: house next to 7.

9. A large number of dead rats were found in this house four or five days before the patient, Hazara, was attacked.

10. Meli attended Attri in 6, and was attacked a week after first going there.

11. House next to 4*a*: dead rats seen here three days before the patient was attacked.

12. House next to 9.

13. Ishar Singh is a lambardar of the village, and had visited many infected houses previous to his being attacked.

14. Dauli was a beggar and had been into many infected houses.

(72). TURAN.

Census population (1891)		233
Roll-call, May 1898		185
Hindus, chiefly Jats		119
Muhammadans		32
Others		34
Number of houses		47
Do. do. infected		3
Do. plague cases returned	4, Actual	6
Do. deaths returned	2, Do.	4
Do. recoveries returned	2, Do.	2
Date of first case	5th	May.
Do. do. returned	25th	do.
Do. declaration of plague	25th	do.
Do. cordoning of village	25th	do.
Do. evacuation of do.	25th	do.
Do. commencement of disinfection	2nd	June.
Do. completion of do.	12th	do.
Do. last case	27th	May.
Do. return to village	15th	June.
Do. removal of cordon	21st	do.
Do. village declared free of plague	25th	do.

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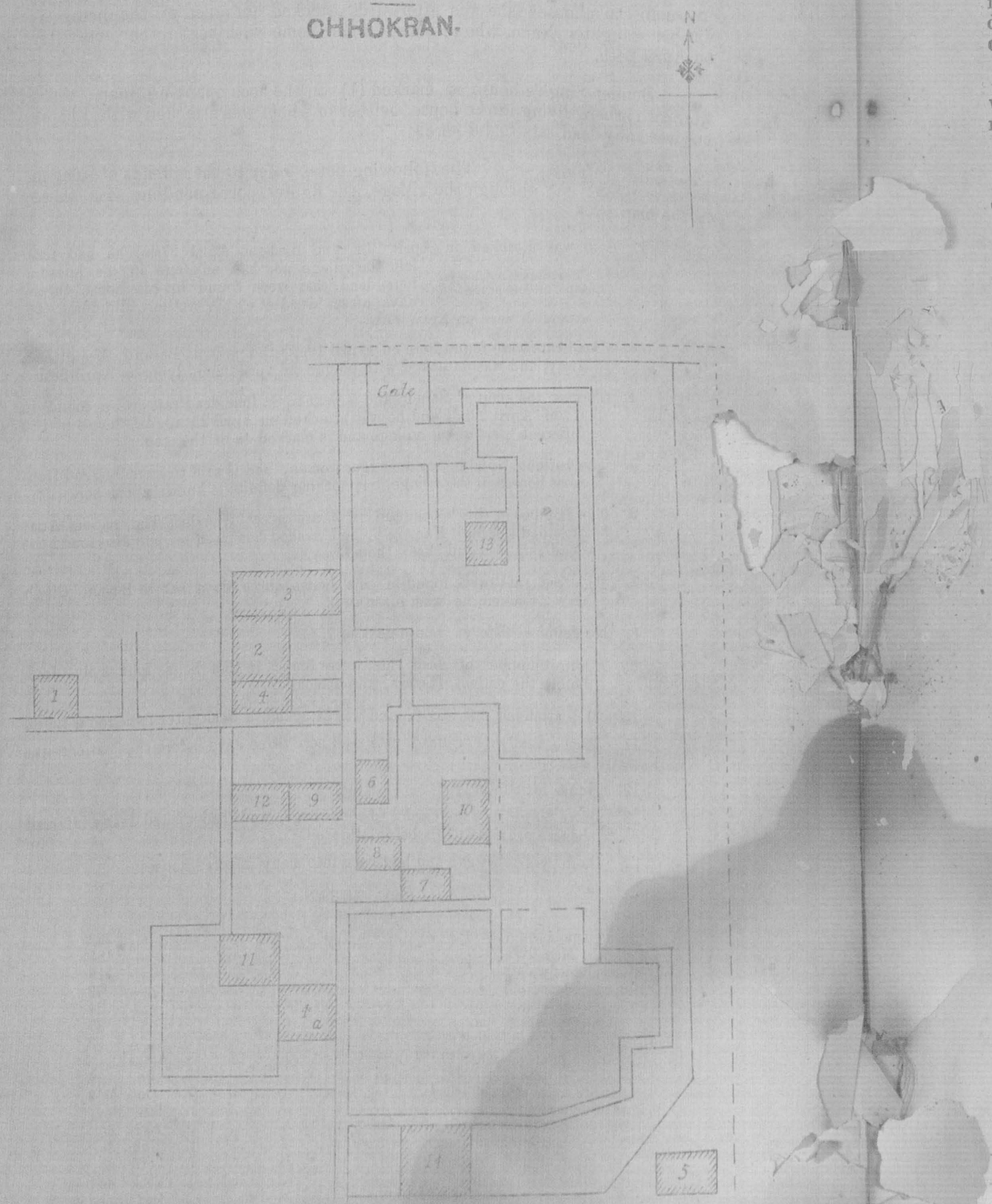
MAP No. 23.

CHHOKRAN.



There was plague at Salh Kalan while Sunder Singh was there, but not in Gulab Dai's house; she was afterwards attacked and died of the disease as did her daughter Nami, who returned to her home with her brother and sister on April 24th.

Sunder Singh's house is marked (1) on the accompanying map: there were two others living in the house, neither of whom was attacked with plague nor were any dead rats found here.

The spread of plague through the village.

The following notes refer to the spread of plague through the village, the figures corresponding with those on the map.

2. Said was attacked on April 21st and died on April 27th: he had not left the village nor had any one in his house: four dead rats were found in his house three days after his death: his brother, Bhudda, was attacked here on April 30th.

Dead rats found in seven of the infected houses.

3. Dead rats were found here on April 19th: the patient Basanti threw them away, and was attacked with plague on April 22nd, dying on April 28th.

4. This is the shop of Saindi, and is next to 3: four dead rats were found in it on April 22nd, and he was attacked on April 25th. His house is in a different part of the village and is marked 4*a* on the map.

5. The patient Gulabi was a beggar woman, and is said to have begged from most houses in the village, but nothing definite is known about her.

6. The families in this house and in 3 are great friends. The patient Attri attended Mehtab Kaur in 3, and washed her clothes; she also found the dead rats in 3 and threw them away.

7. The dead rats were found in this house three days before Basant Singh was attacked, he was often in 6.

8. No definite history: house next to 7.

9. A large number of dead rats were found in this house four or five days before the patient, Hazara, was attacked.

10. Meli attended Attri in 6, and was attacked a week after first going there.

11. House next to 4*a*: dead rats seen here three days before the patient was attacked.

12. House next to 9.

13. Ishar Singh is a lambardar of the village, and had visited many infected houses previous to his being attacked.

14. Dauli was a beggar and had been into many infected houses.

(72). TURAN.

Census population (1891)		233
Roll-call, May 1898		185
Hindus, chiefly Jats		119
Muhammadans		32
Others		34
Number of houses		47
Do. do. infected		3
Do. plague cases returned	4, Actual	6
Do. deaths returned	2, Do.	4
Do. recoveries returned	2, Do.	2
Date of first case	5th	May.
Do. do. returned	25th	do.
Do. declaration of plague	25th	do.
Do. cordoning of village	25th	do.
Do. evacuation of do.	25th	do.
Do. commencement of disinfection	2nd	June.
Do. completion of do.	12th	do.
Do. last case	27th	May.
Do. return to village	15th	June.
Do. removal of cordon	21st	do.
Do. village declared free of plague	25th	do.

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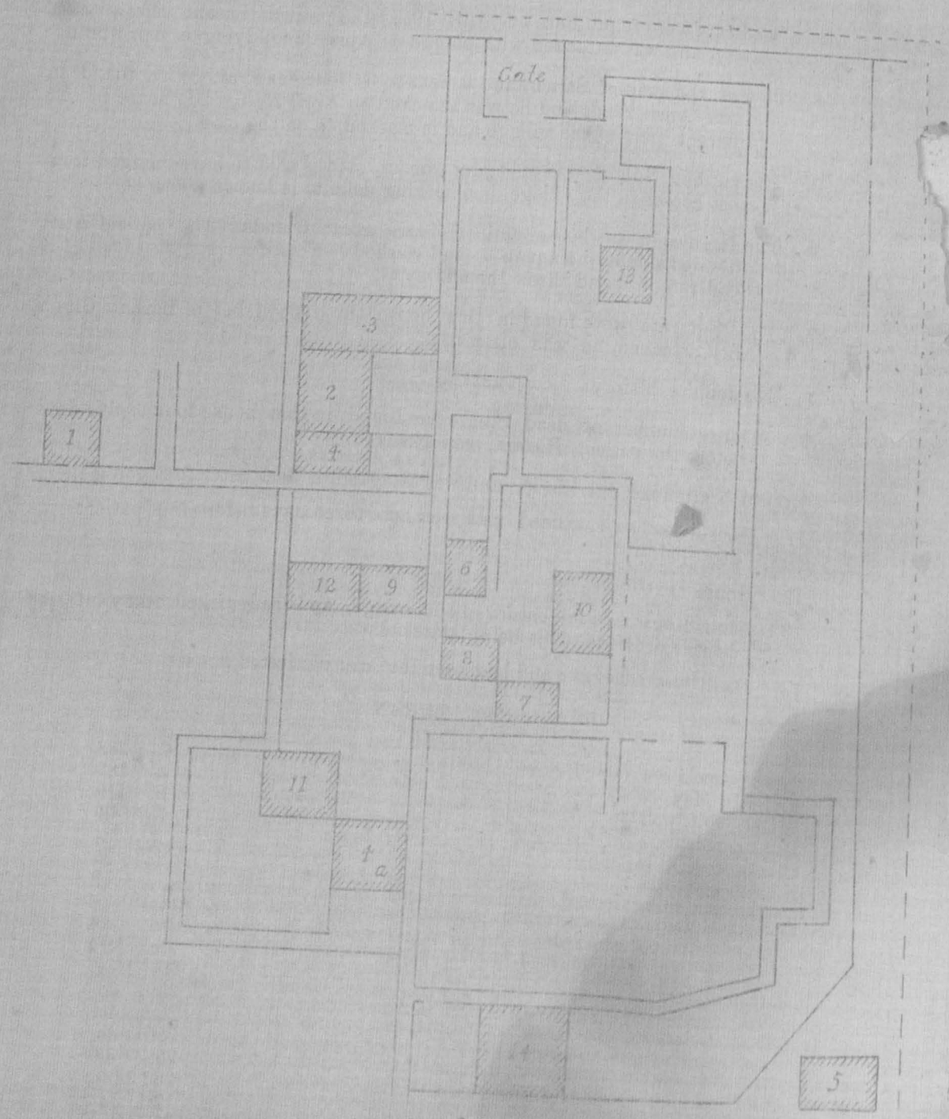
MAP No. 23.

CHHOKRAN.



There was plague at Salh Kalan while Sunder Singh was there, but not in Gulab Dai's house; she was afterwards attacked and died of the disease as did her daughter Nami, who returned to her home with her brother and sister on April 24th.

Sunder Singh's house is marked (1) on the accompanying map: there were two others living in the house, neither of whom was attacked with plague nor were any dead rats found here.

The spread of plague through the village.

The following notes refer to the spread of plague through the village, the figures corresponding with those on the map.

2. Said was attacked on April 21st and died on April 27th: he had not left the village nor had any one in his house: four dead rats were found in his house three days after his death: his brother, Bhudda, was attacked here on April 30th.

Dead rats found in seven of the infected houses.

3. Dead rats were found here on April 19th: the patient Basanti threw them away, and was attacked with plague on April 22nd, dying on April 28th.

4. This is the shop of Saindi, and is next to 3: four dead rats were found in it on April 22nd, and he was attacked on April 25th. His house is in a different part of the village and is marked 4*a* on the map.

5. The patient Gulabi was a beggar woman, and is said to have begged from most houses in the village, but nothing definite is known about her.

6. The families in this house and in 3 are great friends. The patient Attri attended Mehtab Kaur in 3, and washed her clothes; she also found the dead rats in 3 and threw them away.

7. The dead rats were found in this house three days before Basant Singh was attacked, he was often in 6.

8. No definite history: house next to 7.

9. A large number of dead rats were found in this house four or five days before the patient, Hazara, was attacked.

10. Meli attended Attri in 6, and was attacked a week after first going there.

11. House next to 4*a*: dead rats seen here three days before the patient was attacked.

12. House next to 9.

13. Ishar Singh is a lambardar of the village, and had visited many infected houses previous to his being attacked.

14. Dauli was a beggar and had been into many infected houses.

(72). TURAN.

Census population (1891)		233
Roll-call, May 1898		185
Hindus, chiefly Jats		119
Muhammadans		32
Others		34
Number of houses		47
Do. do. infected		3
Do. plague cases returned	4, Actual	6
Do. deaths returned	2, Do.	4
Do. recoveries returned	2, Do.	2
Date of first case		5th May.
Do. do. returned		25th do.
Do. declaration of plague		25th do.
Do. cordoning of village		25th do.
Do. evacuation of do.		25th do.
Do. commencement of disinfection		2nd June.
Do. completion of do.		12th do.
Do. last case		27th May.
Do. return to village		15th June.
Do. removal of cordon		21st do.
Do. village declared free of plague		25th do.

Mode of infection.

Shankar Devi, the first person attacked with plague at Turan, was a relative of Gunda, son of Choga, a resident of Chhokran; he went to see Gunda on April 25th, and found him suffering from plague.

Shankar Devi was attacked with plague on May 2nd, and his daughter, Partapi, fell ill on May 6th.

Only three infected houses which adjoin one another.

Only two other persons were attacked with plague in Turan, and their houses adjoin that of the first case.

B.—NAWASHAHR CIRCLE.

THE NOTES CONCERNING THE FOLLOWING TWENTY-ONE VILLAGES OF THE NAWASHAHR CIRCLE HAVE BEEN SENT US BY SURGEON-CAPTAIN H. SMITH, I. M. S., WHO SUCCEEDED SURGEON-LIEUTENANT WALTON, I. M. S., IN MEDICAL CHARGE OF THIS AREA.

(5). SHIKOHPUR.

Census population (1891)	592
Roll-call	517
Muhammadans (Fakirs)	66
Hindus, all classes	332
Chamars	118
Sweepers	1
Number of houses	124
Do. do. infected	not stated.
Do. plague cases returned	75
Do. deaths do.	41
Do. recoveries do.	34
Date of first case	early in December 1897.
Do. do. returned	1st February 1898.
Do. declaration of plague	1st do.
Do. cordoning of village	1st do.
Do. evacuation of do.	2nd do.
Do. commencement of disinfection	6th do.
Do. completion of do.	29th March 1898.
Do. last case	5th do.
Do. return to village	9th April 1898.
Do. removal of cordon	9th do.
Do. village declared free of plague	19th do.

As already stated, plague probably existed in this village at the beginning of December or even earlier. On the 28th January, on account of some rumours which were floating about, a medical officer inspected the village. From the inquiries he made he found that 9 deaths had taken place since December 28th, only 5 of which had been entered in the registers. The village only contained about 500 inhabitants, and the fact that in the past month there had been so many deaths was in itself very suspicious, and when it was found that four cases had been concealed the suspicions were strengthened. The whole population of the village was collected in a suitable place outside the walls and examined, and a full list of the names according to families made. The village was also searched, but nothing definite discovered. However, a cordon was placed round it, and a hospital assistant sent down to make daily roll-calls and examine anybody who happened to get ill. For two days nothing happened. But on the 3rd day, February 1st, 2 Chamars did not answer to their names at the morning roll-call. They were afterwards found in their houses suffering from plague, and the fact was duly reported. When the people found that the disease had been discovered they gave up all further duplicity and brought forward their sick for treatment. By the evening 13 cases of plague were shown. In one case a sick man was brought out of a cattle-shed where he had been kept locked up for several days. Afterwards, when the disinfection was being carried out, dead bodies were found hidden away within the village walls, and one man admitted that there had been many more deaths in the village before our arrival, of which we had no knowledge. There seems to have been a very systematic attempt in this village to conceal the existence of the disease, and the attempt was for a time most successful. But the casualties in consequence were very heavy. Not counting the many cases which occurred before our arrival, and of which we have very little definite knowledge, 75 persons were attacked and 41 died making a percentage of 19 attacked and 8·2 killed by the disease.

The people were all got out into camp by the evening of February 2nd, which was quick work, as the huts for them had to be brought from Banga, 10 miles away by road. They were placed in four camps, *viz.*, Segregation Camp, Hospital Camp, Healthy Jats' Camp, and Healthy Chamars' Camp, on the south side of the village. The hospital was situated south-east of the village. Even after the people came out, dropping cases occurred among them; in consequence of which Dr. Walton had all the clothes and property in all the camps disinfected. The result was immediate. The disease stopped, and with the exception of one dropping case of a man on the disinfecting staff, who was attacked on March 3rd, no new cases occurred. The people returned to their house on April 9th, having spent two months and seven days in camp.

Plague was discovered in the village of Shikohpur on the 2nd February when the hospital registers show, that 13 cases were taken out at once. With regard to the origin of the disease in Shikohpur it was never possible to

establish such relations with the people of the village as to render it possible to arrive at the truth, and this is not to be wondered at as the village lambardars underwent a criminal prosecution. Such prosecutions establish a peculiar reticence in the people, not only of the particular village, but in those of other villages, in giving us information as regards the true facts concerning the importation of the disease, lest it might bring an official judgment on some one for what they regard as a very small offence, if any offence at all. Such is the reticence of a people, Hindu, Sikh and Musalman, who apart from plague daily pray for the release of all prisoners. The only thing we could find was that fully 30 deaths occurred before the village was evacuated. We can say with a reasonable amount of certainty that the disease existed in Shikohpur, from the end of December or the beginning of January at which time the nearest plague village was 7 or 8 miles off, so the question of human agency in connection with the infection does not admit of doubt. Rats would not be at all likely to pass all the other villages on the way and pitch on Shikohpur.

(10). SAHLON.

Census population (1891)	983
Roll-call	979
Muhammadans	29
Hindus, all classes (chiefly Jats)	848
Chamars	102
Number of houses	157
Do. do. infected	Not stated.
Do. plague cases returned	107
Do. deaths returned	74
Do. recoveries	33
Date of first case	During January 1898.
Do. do. returned	23rd February 1898.
Do. declaration of plague	23rd do.
Do. cordoning of village	23rd do.
Do. evacuation of do.	4th March 1898.
Do. commencement of disinfection	8th do.
Do. completion of do.	26th April 1898.
Do. last case	31st March 1898.
Do. return to village	29th April 1898.
Do. removal of cordon	9th May 1898.
Do. village declared free of plague	9th do.

Sahlon is some 200 yards from Shikohpur and is on the main line of traffic. Besides, the Sahlon people cultivate land as tenants in Shikohpur and there is frequent intercourse between them.

Sahlon was discovered on the 22nd February at which time it was found to be infected throughout. It is impossible under the same circumstances as referred to in Shikohpur to say when the first case occurred. We are of opinion from its intensity and from what information we can obtain that it existed about a month prior to its discovery. From the facts above stated there is no room for doubt but that it was infected from Shikohpur, and that the agency was human, when we compare rough facts and dates. There is no necessity for a "rat" theory here.

(12). KAMAM.

Census population (1891)	1,969
Roll-call	2,075
Muhammadans (Arains)	855
Hindus, all classes (Rajputs)	949
Chamars	181
Sweepers	86
Sahnsis	4
Number of houses	596
Do. do. infected	Not stated.
Do. plague cases returned	61
Do. deaths returned	45
Do. recoveries returned	16
Date of first case	20th February 1898.
Do. do. returned	26th do.
Do. declaration of plague	26th do.
Do. cordoning of village	26th do.
Do. evacuation of do.	6th March 1898.
Do. commencement of disinfection	19th do.
Do. completion of do.	30th April 1898.
Do. last case	31st March 1898.
Do. return to village	4th May 1898.
Do. removal of cordon	14th do.
Do. village declared free of plague	14th do.

The first case of plague in this village was a Chamar, named Ramu, who died on February 22nd. It is not known how he contracted the disease. When the village was inspected by the Medical Officer on February 26th, 4 cases of plague were found in two houses; one a blacksmith's house and the other a Brahmin's. Of these, the blacksmith's seem to have been first affected, Nihala, son of Narain Singh, had been ill five days, and Wazir Singh's wife the same time. Nihali, wife of Bashambar, was attacked two days later, but was already dead when the inspecting officer arrived. Her body was examined and found to present signs of plague. Amin, a Brahmin, was not the first person attacked, but his case is interesting. He was willingly shown up to Dr. Davidson by the lambardars on February 27th. He was a shop-keeper whose home was in Kamam, but he carried on business with his brother Jeora in Karnana. He is said by the lambardars of Kamam to have spent some two or three weeks in Shikohpur and later on in the adjoining village of Sahlon, dealing in sugar-cane juice. Sahlon is a central place for the neighbouring villages to get their sugar-cane juice expressed: January and February being the season for such work. On leaving Sahlon apparently about the 17th February, possibly on business, and possibly on discovering that plague existed there (which was not officially known till 22nd February) Amin went off to Kamam, stayed there a day or two, and then went on to his shop in Karnana. He stayed in Karnana a few days with his brother Jeora, and then went back to Kamam saying he felt ill. This seems to have been on the 24th February. On the 27th, the lambardars showed Amin to Dr. Davidson, who decided that he was suffering from plague. The following facts are interesting concerning Amin's family:—On the 2nd March Dr. Davidson found in Karnana that Amin's brother and partner—Jeora—was ill with plague. He was sent to Kamam hospital and his house disinfected with phenyle and locked up, Karnana being kept under observation and no fresh cases having occured, was declared free after some weeks. Plague was re-discovered on the 6th April.

(15). KATHARON.

Census population (1891)	1,020
Roll-call	983
Muhammadans	182
Hindus (Jats)	615
Chamars	173
Sweepers	13
Number of houses	229
Do. do. infected	Not stated.
Do. plague cases returned	38
Do. deaths returned	22
Do. recoveries returned	16
Date of first case	During January 1898.
Do. do. returned	1st March 1898.
Do. declaration of plague	1st do.
Do. cordoning of village	1st do.
Do. evacuation of do.	10th do.
Do. commencement of disinfection	31st do.
Do. completion of do.	12th May 1898.
Do. last case	16th April 1898.
Do. return to village	18th May 1898.
Do. removal of cordon	28th do.
Do. village declared free of plague	28th do.

In this village as in Kamam the lambardars behaved very decently throughout. The first case owned to by them is that of Bora, son of Wazira, a teli, who recovered about the 24th or 25th February.

The chaukidar's book, however, shows that Mussammat Asu, wife of Wazira, teli, died on the 2nd February. This, 2nd of February is, I take it, approximate, as chaukidar's registers are not filled up daily, but in spurts, so that dates are a good deal of guess work. It is very likely from the facts that this woman died of plague and not from another disease as the chaukidar's register shows, and I think, I am justified in assuming such from the following facts:—

One Uttam Singh, son of Sahib Singh, of Shikohpur, went to Jullundur before Shikohpur was cordoned on business, *i.e.*, before the 2nd February. He came back on February the 2nd, to find it cordoned, and not being able to get into Shikohpur went to stay at Katharon, and slept in the house of this very Wazira. Next day he went again to Shikohpur and got permission to go in, and as is borne out by the hospital register, got ill by the 4th February and went into hospital, after having been away at Jullundur for some days and on his return through Wazira's house into the approximately infected camp of Shikohpur. I think it is fairly conclusive from the dates and facts that he got the infection in Wazira's house on the 2nd February, and that Wazira's wife, Asu, died of plague.

As to how Wazira's house became infected, I think it is substantially conclusive. It is customary here for telis to clean cotton for the zamindars, and Wazira was the most famous cleaner about here, and did a large business with Shikohpur. Throughout January plague was raging in Shikohpur officially unknown, and all that time the Shikohpur Jat women were taking cotton to be cleaned to Wazira's house in Katharon. From these facts, I think it is fairly conclusive that Asu, Wazira's wife, got plague from the Shikohpur customers.

The second case was that of Wazira's son, and the next two occurred in the houses of two Rajputs adjoining that of Wazira's, and from this it is spread over the village.

Plague was officially recognized in Katharon on the 2nd March.

NOTE.—When the Medical Officer went to Shikohpur on January 28th he heard that plague existed in both Katharon and Sahlon; but could not get any details which would enable him to find the cases. The disease was therefore probably in both these villages at an earlier date than stated above. (C. H. J.).

(16). KARNANA.

Census population (1891)	1,328
Roll-call	1,436
Muhammadans	292
Hindus, all classes	857
Chamars and Ramdasis	264
Sweepers	23
Number of houses	282
Do. do. infected	1
Do. plague cases returned	1
Do. deaths returned	1
Do. recoveries returned	0
Date of first case	28th February 1898.
Do. do. returned	2nd March 1898.
Do. declaration of plague	2nd do.
Do cordoning of village	2nd do.
Do. evacuation of do.	Not evacuated.
Do. commencement of disinfection	19th March 1898.
Do. completion of do.	20th do.
Do. last case	2nd do.
Do. return to village	29th do.
Do. removal of cordon	29th do.
Do. village declared free of plague	29th do.
Further infection (No. 45).	
Date of declaration of plague	6th April 1898.
Do. cordoning of village	6th do.
Do. evacuation of do.	7th do.
Do. commencement of disinfection	12th May 1898.
Do. completion of do.	10th June 1898.
Do. last case	3rd May 1898.
Do. return to village	11th June 1898.
Do. removal of cordon	22nd do.
Do. village declared free	22nd do.

The first case in Karnana was discovered on the 2nd March and details of it are given above in connection with Kamam. I think there is absolutely no doubt that this was the first case. After the infected house had been disinfected and the village kept under observation for a few weeks, it was declared free. On the 6th April, it was found to be again infected. We could not get out any information in connection with this so-called re-infection until the villagers got into a more happy mood after their return to their houses. They were, while in camp, most obstructive in a passive way, and most reluctant in giving information of any kind. After their return to their houses it transpired that shortly after the man Jeora was removed and his house had been disinfected and locked-up, a girl in the next house got ill: she recovered. Next followed Mussammat Utmi, wife of Suba, Mahton and Mussammat Premi, wife of Ralla, Lahore. These people's

houses were adjoining one another, as well as that of Jeora. The next to fall ill were their neighbours Mussammats Gujri and Ishri, and Sada Singh, and then Nihal, the Brahmin. Until the return of the village, the Karnana people concealed all the above cases.

When the Brahmin got ill, the people of the village romanced a good deal as to where he might have got infected, but we could put no credence in this, as he was recognised on the 6th ; and between the 6th and 9th, 16 cases were taken out, so that it was certain there must have been other cases before him. It is plain that the first case was steadily followed by the others which were concealed. If we had accepted—as we were very near having to do—the romancing about the infection of the Brahmin, there would have been very fine scope for a "rat theory."

NOTE.—Dr. Smith does not show how the infection spread from Jeora's house to those surrounding it, after he had left the locality and the house had been locked up. May not this have been due to rats ? (C. H. J.)

(20). LODHIPUR.

Census population (1891)	
Roll-call	1,165
Muhammadans (Arains)	1,233
Hindus, all classes	806
Chamars	274
Sweepers	150
Number of houses	3
Do. do. infected	275
Do. plague cases returned	Not stated.
Do. deaths returned	49
Do. recoveries returned	33
Date of first case	16
Do. do. returned	14th February 1898.
Do. declaration of plague	7th March 1898.
Do. cordoning of village	7th do.
Do. evacuation of do.	7th do.
Do. commencement of disinfection	10th do.
Do. completion of do.	31st do.
Do. last case	9th May 1898.
Do. return to village	13th April 1898.
Do. removal of cordon	14th May 1898.
Do. village declared free of plague	24th do.
	24th do.

The lambardars of this village behaved excellently, and ultimately assisted us in tracing the origin of the disease. Plague was reported on the 6th March, when 3 cases and 1 death were found to have occurred. The lambardars recently stated that about the beginning of February, Achhru, son of Taba, went to Karnal in the Hoshiarpore District, to visit his maternal grandmother, Mussammat Resan. On his way back from Karnal he stopped in the village of Simul Mazara, at the house of one Saon, Chamar, the brother-in-law of the father-in-law of Achhru's uncle—Hira—and in whose house —Saon's—plague is said to have existed at the time. Plague, I understand, existed in Simul Mazara for a considerable time before it was officially recognised. Achhru after staying for the night in Simul Mazara returned to Lodhipur, and about two days after his return, I believe, plague was discovered in Simul Mazara, and it was cordoned. We are given to understand from the Lodhipur people that Achhru got ill about the middle of February. The cordoning of Simul Mazara was about that date. The disease spread amongst the Chamars from this centre and from a couple of infected Chamar children is said to have infected the first Jat—the child of Fazia, who had been playing about with them just before they got ill. From this latter centre the disease also spread. There is here a fairly conclusive evidence of human agency.

(22). MAHRAMPUR.

Census population (1891)	
Roll-call	831
Muhammadans	814
Hindus, all classes	64
Chamars and Ramdasis	594
Number of houses	156
Do. do. infected	155
Do. plague cases returned	Not stated.
Do. deaths returned	56
Do. recoveries returned	33
	23

Date of first case	7th March 1898.
Do. do. returned	9th do.
Do. declaration of plague	9th do.
Do. cordoning of village	9th do.
Do. evacuation of do.	14th do.
Do. commencement of disinfection	19th April 1898.
Do. completion of do.	19th May 1898.
Do. last case	30th April 1898.
Do. return to village	21st May 1898.
Do. removal of cordon	31st do.
Do. village declared free of plague	31st do.

The first man to get ill was Ram Singh, son of Dial Singh, a tarkhan. It is generally admitted that he was in the habit of going into Sahlon, the neighbouring village, in which plague was rife at that time. He is said to have brought clothes out of Sahlon belonging to a Sadhu, named Kahn Das. In Mahrampur two Sahdus, named Kahn Das and Kishen Das, have a home in common. When plague broke out in Shikohpur and in Sahlon later on, the latter village determined on a solemn reading of the Granth to avert the evil. Kahn Das was asked to act as reader and he went to Sahlon and after performing the religious rites stayed a while longer in the village. Kahn Das amongst other things received, as is customary, for performing *paths*, many presents of clothes from the relatives of the deceased in whose memory the *path* is performed. The Ram Singh above mentioned, a pupil of Kishen Das, is said to have broken the Sahlon cordon in order to see a relative named Hira Singh who lived in Sahlon. Kishen Das, brother of Kahn Das, was at this time occupying an out-house of Ram Singh for the purpose of performing a *path* for a neighbour of Ram Singh. Ram Singh is said to have at this time gone to Sahlon—breaking the cordon—mixed with the people and brought back the cloth which Kahn Singh had got for performing the ceremonies in Sahlon to the home of the Sadhus whose pupil he was. Sahlon at that time was having six or seven attacks of plague daily. From Ram Singh's house the disease spread over the village in a wandering fashion. It was turned into camp early before the disease had time to fasten on any quarter in a wholesale fashion. I think this is again fairly conclusive evidence of human agency.

(32). MAHMUDPUR.

Census population (1891)	
Roll-call	411
Muhammadans (Jats)	394
Hindus all classes	321
Chamars	2
Number of houses	71
Do. do. infected	80
Do. plague cases returned	Not stated.
Do. deaths returned	24
Do. recoveries returned	16
Date of first case	8
Do. do. returned	4th March 1898.
Do. declaration of plague	22nd do.
Do. cordoning of village	22nd do.
Do. evacuation of do.	22nd do.
Do. commencement of disinfection	24th do.
Do. completion of do.	21st April 1898.
Do. last case	29th May 1898.
Do. return to village	13th April 1898.
Do. removal of cordon	30th May 1898.
Do. village declared free of plague	9th June 1898.
	9th do.

The lambardars did their utmost to conceal the disease and were successful in doing so for some time. Instructions were issued for a criminal prosecution for them, which was subsequently abandoned. It has, as a consequence, been extremely difficult to get any trace of the infection of this village. They were opposed to our interference from beginning to end and the idea of the criminal prosecution having been abandoned was still doubtful to them, however much we endeavoured to persuade them. Being utterly powerless to get any information from them direct or through our native staff, we got the lambardar of a friendly village to try and elicit the information for us in

an unsuspecting way. He found out that one Ganga Ram, who died, was the first case and that he had contracted the disease from Sahlon, where he had been to see his friend Bela Singh on hearing that his family was ill. That Ram Singh was the first case is fairly evident from the following facts :—

On the 16th March funeral meats were seen at the door of Ganga Ram's house by the British Officers then making a search for plague cases. These meats normally I understand remain out for from four to seven days, though they may remain out as long as thirteen days. I think it is fairly evident that Ganga Ram died between the 11th and 16th.* The friendly lambardar found out that a case was hidden amongst the crops when the British Officers made another search. This case was Mussammat Rajji, a member of Ganga Ram's household, and that about the 20th Ganga Ram's wife died of plague in Mazara Nauabad. On the 22nd nearly all the cases were in houses adjoining that of Ganga Ram. The above facts elicited by the friendly lambardar independently, when compared with the hospital register of Sahlon in which plague had been raging for over a month at the time, is fairly conclusive. Neither the friendly lambardar nor the Mahmudpur people were at all likely to have any thing approaching correct dates of cases in Sahlon.

The Sahlon hospital register shows that the wife and daughter of the Bela Singh with whom Ganga Ram was said to have gone to condole in Sahlon when his family became ill—Mussammat Gujri and Puru—died on the 9th March and that Bela Singh's brother died on the 5th March and that Bela Singh himself died on the 6th March. As above stated, Ganga Ram must have died himself between the 11th and 16th. We can find no room for the concoction of this story from spite. It is, I think, conclusive evidence of human agency.

*NOTE.—From information received from Mazara Nauabad, to which village Ram's wife fled, we found that he died on March 4th (*vide* page 54). (C. H. J.).

(34). MUSAPUR.

Census population (1891)	
Roll-call	
Muhammadans	
Hindus all classes (Jats)	
Chamars and Ramdasis	
Sweepers	
Number of houses	2
Do. do. infected	)
Do. plague cases returned	Not st
Do. deaths returned	
Do. recoveries returned	
Date of first case	3
Do. do. returned	9
Do. declaration of plague	25th arch 1898.
Do. cordoning of village	25 do.
Do. evacuation of village	2 do.
Do. commencement of disinfection	1 do.
Do. completion of do.	n do.
Do. last case	9th April 1898.
Do. return to village	27th May 1898.
Do. removal of cordon	9th do.
Do. villlage declared free of plague	28th do.
...	8th June 1898.
...	8th do.

Plague was first discovered in Musapur on the 21st March officially. By the 23rd, 5 deaths had occurred. The first case was that of Rora, son of Massa, Chamar, who must have got ill on or about the 18th March. We find that Rora had business transactions and friendly relations with Jhandoo, son of Manga, a wealthy trading Chamar of Lodipur. The Musapur people make no secret of it that Rora used to go to Lodipur to see this man, and the Lodipur people, who are a most reticent lot, say that they met "on the boundary." Jhandoo got ill in Lodipur on the 8th of March and his wife and son got ill on the 12th March. I think that there is no doubt that the infection of Musapur was thus acquired.

(35). SODHIAN.

Census population (1891)	291
Roll-call	328
Muhammadans	27
Hindus, all classes	212
Chamars and Ramdasis	89
Number of houses	55
Do. do. infected	Not stated.
Do. plague cases returned	21
Do. deaths returned	13
Do. recoveries returned	8
Date of first case	26th March 1898.
Do. do. returned	29th do.
Do. declaration of plague	29th do.
Do. cordoning of village	29th do.
Do. evacuation of do.	29th do.
Do. commencement of disinfection	20th April 1898.
Do. completion of do.	31st May 1898.
Do. last case	24th April 1898.
Do. return to village	1st June 1898.
Do. removal of cordon	11th do.
Do. village declared free of plague	11th do.

Plague was discovered in Sodhian on the 28th of March officially. There is little doubt that Jodh Singh, son of Kishen Singh, was the first case. A few days before he got ill, he had carried in his cart the luggage of a police guard from Kamam to Mehl Gahla, an infected village. The police guard was from Ludhiana, and Jodh Singh had himself served for some time in the Ludhiana police. His cart had been used on more than one occasion to carry police luggage. Having been a policeman himself, it is said that the police allowed him to go into the village of Mehl Gahla to see some friends and get bhusa for his bullocks. From Mehl Gahla he went to Banga for his pay and from there he was sent to Shikohpur for it. This took about three days, after which he returned to his home and got ill next day, the 26th March. The Sodhian people, when they saw he had plague, reported the fact. In this case the proof of actual personal contact with plague infected people is wanting, though from the facts stated and from the results, I think, the presumption that such was the case is a very rational one.

(44). CHAHLAN.

Census population (1891)	583
Roll-call	549
Muhammadans	34
Hindus, all classes	421
Chamars	94
Number of houses	115
Do. do. infected	Not stated.
Do. plague cases returned	29
Do. deaths returned	18
Do. recoveries returned	11
Date of first case	31st March 1898.
Do. do. returned	6th April 1898.
Do. declaration of plague	6th do.
Do. cordoning of village	6th do.
Do. evacuation of do.	6th do.
Do. commencement of disinfection	5th May 1898.
Do. completion of do.	1st June 1898.
Do. last case	1st May 1898.
Do. return to village	2nd June 1898.
Do. removal of cordon	12th do.
Do. village declared free of plague	12th do.

Plague was officially discovered in Chahlan on 6th April. But by that time it had got a firm hold on the village, as on the 6th, 6 cases more were discovered. The first person to fall ill was, according to the villagers, a Gujri woman, Churi by name. About the same time they say her son Nabia got ill, and after him two other Gujri women, Gajon and Jindoon, who lived in the next neighbouring house. The next to fall ill was a Chamari named Mussammat Sultani, whose house was adjoining that of Gajon and Jindoon. Mussammat Atri, a Jati, next-door neighbour to Nabia, above-mentioned. Chahlan is about 400 yards from Kamam and the Chahlan and Kamam people cultivate within one another's village boundary. We find that Umbia was really the first case and his mother Churi, the second, both dying about the 1st or 2nd

of April. Nabia used to graze goats on land on the Chahlan-Kamam boundary. Towards the end of March, before the disease was extinct in Kamam, the Kamam people celebrated a *niaz* and Nabia, a fellow-Mussulman, slipped over the boundary to share in the feast. He brought back some of the food for the members of his household who did not venture across the cordon line. I think it is rational to infer that Nabia thus introduced the disease from Kamam. The people of Chahlan behaved well.

(47). AUR.

Census population (1891)	2,850
Roll-call	2,662
Muhammadans, chiefly Arains and Rawals	1,368
Hindus, all classes, chiefly Brahmins and Khatris	1,017
Chamars and Ramdasis	188
Sweepers	89
Number of houses	594
Do. do. infected	1
Do. plague cases returned	1
Do. deaths returned	0
Do. recoveries returned	1
Date of first case	5th April 1898.
Do. do. returned	7th do.
Do. declaration of plague	7th do.
Do. cordoning of village	7th do.
Do. evacuation do.	Not evacuated.
Do. commencement of disinfection	15th April 1898.
Do. completion of do.	16th do.
Do. last case	7th do.
Do. return to village	
Do. removal of cordon	19th do.
Do. village declared free of plague	19th do.

Re-appearance of disease (*No.* 75).

Date of declaration of plague	23rd July 1898.
Number of cases	4
Deaths	0
Recoveries	4
Infected houses	3
Date of cordoning of village	23rd July 1898.
Evacuation of village	11th August 1898.
Commencement of disinfection	11th do.
Completion of do.	8th September 1898.
Last case	24th July 1898.
Return to village	10th September 1898.
Village declared free	20th do.

There was one case in Aur on the 6th of April. It was shown up at once. The inmate occupied one of two houses which constituted an isolated block. Both houses were evacuated, disinfected, unroofed, lime-washed and allowed to remain empty for the usual time. No further case occurred in Aur. Aur was some miles from any infected village with many villages between. Under such circumstances few things are more certain than that the infection was brought there by human agency. Dr. Wilkinson found four more cases of plague on July 23rd, after which the whole village was evacuated and disinfected.

(48). MALPUR.

Census population (1891)	709
Roll-call	584
Muhammadans	47
Hindus, all classes, chiefly Jats	389
Chamars and Ramdasis	142
Sweepers	6
Number of houses	117
Do. do. infected	4
Do. plague cases returned	9
Do. deaths returned	7
Do. recoveries returned	2
Date of first case	Unknown.
Do. do. returned	9th April 1898.
Do. declaration of plague	9th do.
Do. cordoning of village	9th do.
Do. evacuation of village	9th do.
Do. commencement of disinfection	29th do.
Do. completion of do.	22nd May 1898.
Do. last case	17th April 1898.
Do. return to village	23rd May 1898.
Do. removal of cordon	2nd June 1898.
Do. village declared free of plague	2nd do.

Malpur is about 200 yards from Mahrampur. Plague in Malpur was discovered early, there being but 9 cases in all. They went into camp on the 9th April. All we can find out about this village concerning the first case is that the patient's husband was a frequent visitor to Mahrampur across the cordon, and that plague cases were occurring at the time in Mahrampur camp. The only instance in this circle in which there is any evidence of rats wandering outside the walls of the village is the following:—The Chamar Camp was outside the village close to the walls of their own quarter. The well which they were using was under the wall of their own quarter and outside the village. They requested that another well might be given to them as they had observed a number of rats running about the well and that they ultimately plunged into the well and were drowned. This is no evidence of migration. Rats drink water as other animals do, while in health. These rats were presumably in the feverish stage of the disease previous to the outset of delirium, and like all animals in this stage of any fever, they were intensely thirsty and went to the well they were accustomed to go to for water. Rats usually go out to drink at night, but the stress of the feverish thirst may have impelled them to go in the day time in this instance. That they jumped into the well I think admits of doubt; but if they did, it can only be inferred that they were determined to allay their thirst at any cost. This incident is no evidence of migration.

(50). HANSARON.

Census population (1891)	694
Roll-call	657
Muhammadans	...
Hindus, all classes, chiefly Jats	484
Chamars and Ramdasis	162
Sweepers	11
Number of houses	155
Do. do. infected	Not stated.
Do. plague cases returned	40
Do. deaths returned	23
Do. recoveries returned	17
Date of first case	14th March 1898.
Do. do. returned	13th April 1898.
Do. declaration of plague	13th do.
Do. cordoning of village	13th do.
Do. evacuation of village	13th do.
Do. commencement of disinfection	4th May 1898.
Do. completion of do.	24th do.
Do. last case	21st April 1898.
Do. return to village	25th May 1898.
Do. removal of cordon	4th June 1898.
Do. village declared free of plague	4th do.

We find that the first case in Hansaron was one Gonda who was taken out on the 14th March and who recovered. After a strong attempt to conceal matters the old *nai* of Hansaron let out that this was the real first case. The Hansaron people then freely admitted that he had been into Katharon which was cordoned, watching his crops which were situated within the Katharon boundary and that he used to associate there with one Bube Khan, a Rajput, whose land adjoined his, and that when Bube Khan became ill of plague he went to see him. Bube Khan was admitted into the Katharon hospital on the 7th April. Everything considered, I think the evidence is fairly presumptive of human agency.

(60). RASULPUR.

Census population (1891)	636
Roll-call	716
Muhammadans, chiefly Jats	508
Hindus	36
Chamars	158
Sweepers	4
Sahnsis	10
Number of houses	146
Do. do. infected	Not stated.
Do. plague cases returned	42
Do. deaths returned	25
Do. recoveries returned	17

Date of first case	10th April 1898.
Do. do. returned	22nd do.
Do. declaration of plague	22nd do.
Do. cordoning of village	22nd do.
Do. evacuation of do.	29th do.
Do. commencement of disinfection	17th May 1898.
Do. completion of do.	7th June 1898.
Do last case	7th May 1898.
Do. return to village	8th June 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

Plague was discovered in Rasulpur on 21st April. The first man to get ill was Indar, son of Buta, on the 10th April. About the time that Chahlan was cordoned, *viz.*, 6th April—Munshi and Sunder, sons of Kaka of Chahlan, went to Rasulpur and put up for the night with Indar above mentioned. At that time a member of the same household as Munshi and Sunder was ill. His name was Achru. The whole of Indar's household contracted the disease and from them it spread over the village in an erratic fashion, affecting but one Chamar—a woman who was acting as hakim in treating the cases. This erratic fashion is to be explained by the fact that the village corn-grinding mill was in the compound or court-yard into which Indar's house opened, and that by the custom of the village Chamars are debarred by caste rules from using the village mill, whereas it is a general meeting place for the Jats. The evidence of introduction into the village is fairly conclusive of human agency and the evidence is conclusive that, as compared with rats, human agency is the means of spread of the disease within the village.

The villagers say that there were about 40 cases of plague there between December and the time when the outbreak was recognised, with only 3 deaths, and that such fine results were due to the treatment of a Chamari hakim who had seen plague in some of the other villages. She herself got ill and died of the disease in Rasulpur. She claimed that she could only succeed in cases if she got them the moment fever set in. There are a few people in Rasulpur whom she scarified. Assuming that she scarified every fever case over the usual bubonic regions it is not to be wondered at that her recoveries were so numerous, as until early in April, I am convinced, that there was no plague in the village and that she had earned her reputation because she scarified every case of ordinary fever she came across. After careful investigation, I state this opinion, as unless the facts are known, a wrong impression may be formed which may be made much of elsewhere.

(59). PIRAGPUR.

Census population (1891)	484
Roll-call	413
Muhammadans, chiefly Rajputs	376
Hindus, all classes	3
Chamars	34
Number of houses	104
Do. do. infected	Not stated.
Do. plague cases returned	83
Do. deaths returned	61
Do. recoveries returned	22
Date of first case	Unknown.
Do. do. returned	21st April 1898.
Do. declaration of plague	21st do.
Do. cordoning of village	21st do.
Do. evacuation of do.	1st May 1898.
Do. commencement of disinfection	18th do.
Do. completion of do.	12th June 1898.
Do. last case	11th May 1893.
Do. return to village	14th June 1898.
Do. removal of cordon	25th do.
Do. village declared free of plague	25th do.

Plague was officially discovered in Piragpur on the 21st April. The people of this village behaved very badly. There were over 40 deaths before the inhabitants were turned out. They have been all along and still are in dread of criminal prosecutions for designedly concealing the disease and for refusing to go out into camp. So that all our efforts up to the present to get information as to the introduction of the disease into

this village has been fruitless. It may be obtained some day, if any one takes the trouble to investigate it. But, considering that we have so much exact information about other villages, it seems hardly necessary.

(58). KARIHA.

Census population (1891)	1848
Roll-call	1846
Muhammadans, chiefly Rajputs	1407
Hindus, all classes	141
Chamars	226
Sweepers	72
Number of houses	428
Do. do. infected	Not stated
Do. plague cases returned	195
Do. deaths returned	142
Do. recoveries returned	53
Date of first case	5th April 1898.
Do. do. returned	20th do.
Do. declaration of plague	20th do.
Do. cordoning of village	20th do.
Do. evacuation of do.	4th May 1898.
Do. commencement of disinfection	28th do.
Do. completion of do.	16th June 1898.
Do. last case	4th do.
Do. return to village	19th do.
Do. removal of cordon	12th July 1898.
Do. village declared free of plague	12th do.

Plague was discovered in Kariha on the 19th April. The people of this village refused to go into camp until the 30th April, and were not all completely out until the 3rd May. The approximate number of deaths before the village turned out were 126. Of the 69 cases admitted into hospital only 12 died. This is due to the fact that within the first few days after going into camp upwards of 60 of these cases were weeded out, and most of them had already passed the crisis. I have very grave doubts that the 126 deaths recorded before the village turned out into camp include the total death-rate within the village. That the cases, upward of 60 weeded out of camp within few a days after the village turned out, represent practically all the survivors of the outbreak in the village prior to the date when they turned out, is as near an approach to certainty as any fact of this kind can be. I am confident a patient does no get well of plague in a day. When careful inspection of the camp was carried out, it was an approach tc the impossible for patients in the early stage of recovery from such a disease to escape observation, and as we have ascertained that the first case was on the 5th April the cases which recovered must have been only in the early stage of recovery when the village turned out into camp. It is extremely unlikely that the disease, which had claimed so many victims in so short a time, should have naturally exhausted itself by the time the village was turned out into camp. But after evacuation the epidemic quickly subsided, and this quick termination, I think, must be attributed to the beneficial effects of the evacuation. In this village there are five factions with a lambardar each. Three of these factions are actively hostile to the other two and do not associate with them. The disease broke out amongst the latter two factions, who occupied about one-third of the village. Amongst the former three factions there were but 15 houses attacked when the village went into camp. If the disease had exhausted itself at this time, how was it that two factions were decimated and the other three factions living side by side with them practically escaped? To say that the disease had exhausted itself thus is absurd. With regard to the rat theory, if rats to any practical extent at all carry the disease from place to place in so far as infection of human beings is concerned, why was the disease in Kariha confined to the quarters of practically only two of the five factions? Why did they draw a hard and fast line at the houses of the enemies of those factions whose roofs they occupied? If we assume that they really have a prescience and calculate results beforehand, and leave a village from dread of the disease, as some would have us believe, we cannot understand them being thus loyal to the owners of the roofs which they occupied. The case of Kariha is to me conclusive evidence that rats within a village get ill and remain about their original abode and die

there without wandering away from it, except from a mere desire to quench their thirst in the early stage before delirium sets in. In the stage of delirium, they may appear in places in which they otherwise would not, but in this stage they are physically unable to wander far.

The first case was one Mussammat Jiwan. She got ill on the 5th April, and lives herself to tell the tale. Her brother-in-law, Karim Bakhsh—Rain—states that on the 1st April, or, in his own words, "four days before Mussammat Jiwan became ill," he went to Kamam on business, but was stopped by the Kamam cordon, and that on his return through Chahlan he called at the house of Nabia—the only Mussalman in Chahlan, and afterwards returned to his own house in which Mussammat Jiwan was living. We know that plague existed in Nabia's house at that date. There is doubt as to whether Karim Bakhsh got ill himself. On inspection there was no evidence of his having been ill. When Mussammat Jiwan got a bad bubo her neighbours—women—came to touch the wound with the "hem of their garment" so as to distribute the pain over several persons, and this diffuse it so that the particular individual attacked might then be alleviated. It is a custom amongst women and low castes to meet and touch the sufferer from painful inflammatory affections in the belief that they will thus diffuse and alleviate the pain. This touching of the inflammatory swelling probably caused the disease to be spread all over the Rain's quarters. On investigation we find that the first a Chamar—a servant of the fourth case, and from that Chamar it spread all over the Chamar's quarter.

(63). BHANGAL.

Census population (1891)	1,014
Roll-call	965
Muhammadans	106
Hindús, all classes, chiefly Jats	719
Chamars	138
Sweepers	2
Number of houses	227
Do. do. infected	Not stated.
Do. plague cases returned	45
Do. deaths returned	32
Do. recoveries returned	13
Date of first case	10th April 1998.
Do. do. returned	24th do.
Do. declaration of plague	24th do.
Do. cordoning of village	24th do.
Do. evacuation of do.	27th do.
Do. commencement of disinfection	16th May 1898.
Do. completion of do.	11th June 1898.
Do. last case	8th May 1898.
Do. return to village	12th June 1898.
Do. removal of cordon	22nd do.
Do. village declared free of plague	22nd do.

Plague was reported in Bhangal on the 23rd of April by the zaildar of Kariha. The village went into camp on the 26th April. Prior to the 28th April eight deaths were admitted. On the 28th nine cases were weeded out, and on 30th nine more. Making a total of 29 cases up to the 30th April. The exact date of the first case we cannot accurately fix. But if we presume that plague existed in Bhangal from about the 10th April or earlier, we would not be far wrong. The first case is, according to his own statement, the Lambardar Harbhaj—who survived. This is borne out by other evidence. It is also proved satisfactorily that the Bhangal people while Katharon was cordoned did business transactions for them in Nawashahr. Harbhaj states that he had been several times to Katharon prior to his attack. This statement is corroborated by another patient who recovered. We also find that a Bhangal woman, the wife of Khazana, used to go regularly to Katharon to see her married daughter. About that time the infective principle of plague was abundant in Katharon. The second case was the wife of Harbhaj's neighbour, Dittu, who used to visit Harbhaj's wife to condole with her. The third case was Dittu's daughter. The next house it visited was Dittu's brother's house, and from these *foci* it spread. It is generally stated by the Bhangal people

that Harbhaj went to Katharon—cordoned—camp to visit the Lambardar, Narain Singh. Narain Singh's sister's son, Wariama, was attacked on the 16th April, and we may presume that as their huts were close, the relatives congregated around the same *hookah*. I think it is fairly evident that Harbhaj brought the disease from Katharon. Proof of actual contact in such cases is always concealed, but from the facts it is most probable.

(64). BAJON.

Census population (1891)	230
Roll-call	234
Muhammadans, chiefly Jats	197
Hindús, all classes	*nil*
Chamars	37
Number of houses	43
Do. do. infected	Not stated.
Do. plague cases returned	16
Do. deaths returned	10
Do. recoveries returned	6
Date of first case	20th April 1898.
Do. do. returned	26th do.
Do. declaration of plague	26th do.
Do. cordoning of village	26th do.
Do. evacuation of do.	29th do.
Do. commencement of disinfection	17th May 1898.
Do. completion of do.	5th June 1898.
Do. last c.	7th May 1898.
Do. return to village	6th June 1898.
Do. removal of cordon	16th do.
Do. village declared free of plague	16th do.

The first case in Bajon was Amin, son of Khazana, a sweetmeat-seller, who was attacked on the 20th and died on 25th April. His body was seen. The villages of Piragpur, Bajon and Laroya are but a few hundred yards from one another and depend on one another for supplies. The sweetmeat-seller of these three villages lived in Bajon. He had been daily in Piragpur on business up till it was cordoned on the 19th April. But there must have been plenty of plague in this village since April 19th. The source infection in this case is therefore fairly evident.

(68). LAROYA.

Census population (1891)	462
Roll-call	520
Muhammadans, chiefly Arains	246
Hindús, all classes, chiefly Jats	201
Chamars	73
Number of houses	98
Do. do. infected	Not stated.
Do. plague cases returned	13
Do. deaths returned	10
Do. recoveries returned	3
Date of first case	21st April 1898.
Do. do. returned	18th May 1898.
Do. declaration of plague	18th do.
Do. cordoning of village	18th do.
Do. evacuation of do.	18th do.
Do. commencement of disinfection	5th June 1898.
Do. completion of do.	19th do.
Do. last case	3rd do.
Do. return to village	23rd do.
Do. removal af cordon	30th July 1898.
Do. village declared free of plague	30th do.

There is no shop in Laroya except the sweetmeat-seller's. Laroya depends for its shop and its sweepers on Piragpur, a few hundred yards distant. Plague, as above noted, was raging in Piragpur about and prior to the time it was cordoned on 19th April. The first case in Laroya was Gonda, the son of Sahib Singh, who was attacked about the 21st April. This man had been in Piragpur a short time before to get drugs for cattle and had been purchasing seed from Sonda, son of Pir Bakhsh, in Piragpur. We now know that Sonda's daughter-in-law died of plague in Piragpur on the 19th and that Sonda himself died on 21st, and his son Munhsi on the 24th. His son Kira died on the 19th, it is said. It is thus practically certain that Gonda got the infection in Piragpur.

there without wandering away from it, except from a mere desire to quench their thirst in the early stage before delirium sets in. In the stage of delirium, they may appear in places in which they otherwise would not, but in this stage they are physically unable to wander far.

The first case was one Mussammat Jiwan. She got ill on the 5th April, and lives herself to tell the tale. Her brother-in-law, Karim Bakhsh—Rain—states that on the 1st April, or, in his own words, "four days before Mussammat Jiwan became ill," he went to Kamam on business, but was stopped by the Kamam cordon, and that on his return through Chahlan he called at the house of Nabia—the only Mussalman in Chahlan, and afterwards returned to his own house in which Mussammat Jiwan was living. We know that plague existed in Nabia's house at that date. There is doubt as to whether Karim Bakhsh got ill himself. On inspection there was no evidence of his having been ill. When Mussammat Jiwan got a bad bubo her neighbours—women—came to touch the wound with the "hem of their garment" so as to distribute the pain over several persons, and this diffuse it so that the particular individual attacked might then be alleviated. It is a custom amongst women and low castes to meet and touch the sufferer from painful inflammatory affections in the belief that they will thus diffuse and alleviate the pain. This touching of the inflammatory swelling probably caused the disease to be spread all over the Rain's quarters. On investigation we find that the first eight cases are traced to the above cause—all Rains. The ninth case was a Chamar—a servant of the fourth case, and from that Chamar it spread all over the Chamar's quarter.

(63). BHANGAL.

Census population (1891)	1,014
Roll-call	965
Muhammadans	106
Hindús, all classes, chiefly Jats	719
Chamars	138
Sweepers	2
Number of houses	237
Do. do. infected	Not stated.
Do. plague cases returned	45
Do. deaths returned	32
Do. recoveries returned	13
Date of first case	10th April 1998.
Do. do. returned	24th do.
Do. declaration of plague	24th do.
Do. cordoning of village	24th do.
Do. evacuation of do.	27th do.
Do. commencement of disinfection	16th May 1898.
Do. completion of do.	11th June 1898.
Do. last case	8th May 1898.
Do. return to village	12th June 1898.
Do. removal of cordon	22nd do.
Do. village declared free of plague	22nd do.

Plague was reported in Bhangal on the 23rd of April by the zaildar of Kariha. The village went into camp on the 26th April. Prior to the 28th April eight deaths were admitted. On the 28th nine cases were weeded out, and on 30th nine more. Making a total of 29 cases up to the 30th April. The exact date of the first case we cannot accurately fix. But if we presume that plague existed in Bhangal from about the 10th April or earlier, we would not be far wrong. The first case is, according to his own statement, the Lambardar Harbhaj—who survived. This is borne out by other evidence. It is also proved satisfactorily that the Bhangal people while Katharon was cordoned did business transactions for them in Nawashahr. Harbhaj states that he had been several times to Katharon prior to his attack. This statement is corroborated by another patient who recovered. We also find that a Bhangal woman, the wife of Khazana, used to go regularly to Katharon to see her married daughter. About that time the infective principle of plague was abundant in Katharon. The second case was the wife of Harbhaj's neighbour, Dittu, who used to visit Harbhaj's wife to condole with her. The third case was Dittu's daughter. The next house it visited was Dittu's brother's house, and from these *foci* it spread. It is generally stated by the Bhangal people

that Harbhaj went to Katharon—cordoned—camp to visit the Lambardar, Narain Singh. Narain Singh's sister's son, Wariama, was attacked on the 16th April, and we may presume that as their huts were close, the relatives congregated around the same *hookah*. I think it is fairly evident that Harbhaj brought the disease from Katharon. Proof of actual contact in such cases is always concealed, but from the facts it is most probable.

(64). BAJON.

Census population (1891)	230
Roll-call	234
Muhammadans, chiefly Jats	197
Hindús, all classes	*nil*
Chamars	37
Number of houses	43
Do. do. infected	Not stated.
Do. plague cases returned	16
Do. deaths returned	10
Do. recoveries returned	6
Date of first case	20th April 1898.
Do. do. returned	26th do.
Do. declaration of plague	26th do.
Do. cordoning of village	26th do.
Do. evacuation of do.	29th do.
Do. commencement of disinfection	17th May 1898.
Do. completion of do.	5th June 1898.
Do. last case	7th May 1898.
Do. return to village	6th June 1898.
Do. removal of cordon	16th do.
Do. village declared free of plague	16th do.

The first case in Bajon was Amin, son of Khazana, a sweetmeat-seller, who was attacked on the 20th and died on 25th April. His body was seen. The villages of Piragpur, Bajon and Laroya are but a few hundred yards from one another and depend on one another for supplies. The sweetmeat-seller of these three villages lived in Bajon. He had been daily in Piragpur on business up till it was cordoned on the 19th April. But there must have been plenty of plague in this village since April 10th. The source infection in this case is therefore fairly evident.

(68). LAROYA.

Census population (1891)	462
Roll-call	520
Muhammadans, chiefly Arains	246
Hindús, all classes, chiefly Jats	201
Chamars	73
Number of houses	98
Do. do. infected	Not stated.
Do. plague cases returned	13
Do. deaths returned	10
Do. recoveries returned	3
Date of first case	21st April 1898.
Do. do. returned	18th May 1898.
Do. declaration of plague	18th do.
Do. cordoning of village	18th do.
Do. evacuation of do.	18th do.
Do. commencement of disinfection	5th June 1898.
Do. completion of do.	19th do.
Do. last case	3rd do.
Do. return to village	23rd do.
Do. removal of cordon	30th July 1898.
Do. village declared free of plague	30th do.

There is no shop in Laroya except the sweetmeat-seller's. Laroya depends for its shop and its sweepers on Piragpur, a few hundred yards distant. Plague, as above noted, was raging in Piragpur about and prior to the time it was cordoned on 19th April. The first case in Laroya was Gonda, the son of Sahib Singh, who was attacked about the 21st April. This man had been in Piragpur a short time before to get drugs for cattle and had been purchasing seed from Sonda, son of Pir Bakhsh, in Piragpur. We now know that Sonda's daughter-in-law died of plague in Piragpur on th 19th and that Sonda himself died on 21st, and his son Munhsi on the 2[illegible] his son Kira died on the 19th, it is said. It is thus practically certain t[illegible]nda got the infection in Piragpur.

The hospital assistant on observation duty in the neighbourhood of Laroya at that time, is said to have pronounced Gonda's wife—whom I afterwards saw in hospital—to be suffering from ordinary fever, as well as another case. The first cases were all amongst the relatives of Gonda.

(73). JHINGRAN.

Census population (1891)	1,103
Roll-call	1,226
Muhammadans	60
Hindus, all classes, chiefly Jats	793
Chamars	340
Sweepers	33
Number of houses	225
Do. do. infected	Not stated.
Do. plague cases returned	13
Do. deaths returned	7
Do. recoveries returned	6
Date of first case	28th April 1898.
Do. do. returned	26th May 1898.
Do. declaration of plague	26th do.
Do. cordoning of village	26th do.
Do. evacuation of do.	26th do.
Do. commencement of disinfection	5th June 1898.
Do. completion of do.	21st do.
Do. last case	3rd do.
Do. return to village	30th do.
Do. removal of cordon	10th July 1898.
Do. village declared free of plague	10th do.

Plague was reported on 24th May in Jhingran. In all there were 13 cases amongst three neighbouring families. The first was Mussammat Ishrim, daughter of Nathu, Jat. She had been visiting her uncles Nathu and Gaya at Aujla in the Banga Circle and when plague broke out, about the 28th April in Aujla, her mother went there from Jhingran and brought her home. Eight other persons were attacked in the same family.

ARAPA.

Plague was reported in this village on the 12th of May.—I went there on the 13th, but did not see the case as the body had been burned. The hospital assistant and tahsildar's account were, if true, convincing that it was plague. But a certain amount of doubt attaches to their story as regards its truth. A number of neighbouring houses were cleared out into a Segregation Camp, and the village roll called. The roll-call was satisfactory. The above-named houses were isolated, disinfected, unroofed and lime-washed. After a reasonable time in segregation,—the roll-calls in the mean time having been satisfactory,—the people were allowed to return to their houses and the village cordon removed. No more cases occurred. This village does not appear in the returns owing to the doubt which hinges about the veracity of the reported case. Arapa is a long distance from any infected village and admits only of being infected by human agency.

D.—HOSHIARPUR DISTRICT.

WE ARE INDEBTED TO SURGEON-CAPTAIN RONALDSON CLARK, I. M. S., FOR THE NOTES OF THE SIXTEEN VILLAGES IN THE HOSHIARPUR DISTRICT. HE HAS OBTAINED MUCH USEFUL INFORMATION FROM THE DIARIES OF DOCTOR DATTA AND SURGEON-CAPTAIN HEARD, I. M. S. THE TABLES IN CONNECTION WITH EACH VILLAGE HAVE BEEN COMPILED FROM INFORMATION COLLECTED BY SURGEON-CAPTAIN G. Y. C. HUNTER, I. M. S.

[The figures preceded by H. refer to villages in the Hoshiarpur District].

H.—1. BIRAMPUR.

Census population (1891)	1,505
Roll-call, December 1897	1,493
Muhammadans (Rajputs) chiefly	1,086
Other Hindus	183
Chamárs and Ramdasis	147
Sweepers	77
Number of houses	347
Do. do. infected	40
Do. plague cases returned	49
Do. deaths returned	34
Do. recoveries returned	15
Date of first case	5th November 1897.
Do. do. recorded	11th December 1897.
Do. declaration of plague	11th do.
Do. cordoning of village	11th do.
Do. evacuation of do.	26th do.
Do. commencement of disinfection	16th February 1898.
Do. completion of do.	12th March 1898.
Do. last case	6th February 1898.
Do. return to village	15th March 1898.
Do. removal of cordon	26th do.
Do. village declared free of plague	26th do.

In Birampur, the village in which plague began, it broke out amongst the Chamars and sweepers, and the origin has been traced to one Ganeshi, daughter of Kudoo, sweeper, who had been away from the village for some time, living with her mother's people in Khatkar Kalan in the Jullundur District. On the outbreak of plague there, she came home and arrived at Birampur on or about the 5th of November. Almost immediately after her arrival she was taken ill, and soon afterwards died of a disease, which was thought, at the time, to be pneumonia. This was really the first case of plague in Birampur. The next person to be affected was Jiwi, the mother of Ganeshi, and thereafter the disease rapidly spread, at first amongst sweepers and Chamárs, and thereafter in the Rájput community.

The disease was reported on the 11th December, but by this time it had taken a firm hold on the village. Two new cases were reported on the 12th, 2 on the 14th, 6 on the 16th, 2 on the 17th, 3 on the 18th, 2 on the 19th and 3 on the 20th. Afterwards dropping cases occurred until the 6th of February 1898. The disease was all along characterised by the virulency of its type. Pneumonic cases were frequent and very fatal, and the percentage of deaths to cases was 69 during the whole outbreak. Measures were at once taken to check the spread of the disease. On the 11th December the sweepers and Chamars were removed into camp. Affected houses also were evacuated, but it was not until a fortnight later that the whole Rajput community went into camp, and even then we did not understand the necessity for very strict cordoning of the village site, for we allowed the people to keep their cattle in their cattle-houses in the village, and visit them as often as they liked. No doubt there was at this time much coming and going to the houses in the village, and this want of recognition of the danger of allowing people back to an infected village site, was the cause of the persistency with which the disease clung to Birámpur. The cordon too of Birámpur seems to have been somewhat lax, for we hear stories of men walking through it from and to the village.

H.—(2). PURKHOWAL.

Census population (1891)	712
Roll-call, February 1898	776
Muhammadans (chiefly Jats and Gajars)	624
Other Hindus	49
Chamars	103
Number of houses	166
Do. do. infected	14
Do. plague cases returned	23
Do. deaths returned	12
Do. recoveries returned	11

Date of first case	27th January 1898.
Do. do. recorded	3rd February 1898.
Do. declaration of plague	3rd do.
Do. cordoning of village	3rd do.
Do. evacuation of do.	3rd do.
Do. commencement of disinfection	15th do.
Do. completion of do.	2nd April 1898.
Do. last case	10th March 1898.
Do. return to village	2nd April 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

It was this laxity of the cordon which probably caused Purkhowal to get infected. I have been told that during the infection of Birampur, the Qazi Abdulla, a resident of the village, but who was much revered in the neighbouring villages, also used, with the connivance of the constables, to go to and from other villages to read prayers, and see to the bathing of the dead in them also. Another story is that Purkhowal, a Gujar village, used to be the great depôt from which the constables on duty at Birampur bought their supplies of *ghi* and *Ata*, and that this was the origin of the outbreak at Purkhowal. The village is one adjoining Birampur at a distance of about one mile. There are many relationships between Purkhowal and Birampur, and no lack of evidence as to the frequency of coming and going between them, even after a cordon was placed. It was not till the 1st of February that the disease was actually discovered in the latter village, as a persistent attempt was made at concealment of cases. By that time it had gained a firm hold, and our attention was only directed to it by a weekly report sent to the Police Station at Garhshankar, in which were recorded 5 deaths in eight days. A report was about the same time received from a Hakim of Sasauli, stating that plague was raging in Purkhowal, and that the people of the place were busy planning to send away any member of their families that they could to their relations in other villages. Our attention being thus directed to Purkhowal, and plague having been found there on its inspection by Dr. Datta, the village was immediately cordoned and evacuated on the 3rd of February, the date on which plague was declared.

H.—(3).—RAMPUR BILRON.

Census population (1891)	2,505
Roll-call	2,850
Muhammadans	355
Jats	196
Other Hindus (chiefly Rajputs)	1,920
Chamars	244
Sweepers	135
Number of houses	553
Do. do. infected	34
Do. plague cases returned	43
Do. deaths do.	16
Do. recoveries do.	27
Date of first case	31st January 1898.
Do. do. recorded	6th February 1898.
Do. declaration of plague	6th do.
Do. cordoning of village	6th do.
Do. evacuation of do.	6th May 1898.
Do. commencement of disinfection	16th do.
Do. completion of do.	23rd June 1898.
Do. last case	17th do.
Do. return to village	12th July 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

The next village to be infected was Bilron, and in it, at any rate, there is a very clear history of infection through human intercourse. I quote from Dr. Datta's report No. 8, dated 7th February 1898:—

"Mussammat Bakhtawari, the leech-woman of Bilron, used to go and apply leeches to the buboes of the Gujars of Purkhowal before we knew anything of the existence of this disease there. According to her own statement the last patient she applied leeches on was Chhajju, *lohar*, namely, on the 31st January last. I came to know of this on the 1st and 2nd instants when examining the village of Purkhowal. At first the villagers would not tell me the whereabouts of the leech-woman; but at last one of the patients told it out. On the 3rd, I went out to Bilron myself, and found the leech-woman's son suffering from plague. This son she used to take with her to Purkhowal, as he was a smart lad, and used to give her great assistance with the work. On the 5th instant I examined in this village the corpse of a young infant daughter of

Mandaria, *lohar*, and found it had died of bubonic plague, and had evidently taken the infection from Purkhowal from the family of Amolak, the *lohar*, in which there have been four deaths since the 30th ultimo. Amolak and Mandaria are near relations, and it is quite certain that the latter's wife with her child had gone to condole with the former on the 30th ultimo when the first death took place in that family."

So much for the first infection in Bilron. It seems evident that it was dependent on human intercourse and on that alone.

H.—(4).—SIMUL MAZARA.

Census population (1891)	1,003
Roll-call, March 1898	1,019
Muhammadans (chiefly Fakirs)	55
Jats	549
Other Hindus	215
Chamars	184
Sweepers	16
Number of houses	194
Do. do. infected	31
Do. plague cases returned	51
Do. deaths do.	34
Do. recoveries do.	17
Date of first case	28th January 1898.
Do. do. recorded	9th February 1898.
Do. declaration of plague	9th do.
Do. cordoning of village	9th do.
Do. evacuation of do.	5th March 1898.
Do. commencement of disinfection	14th do.
Do. completion of do.	18th April 1898.
Do. last case	1st do.
Do. return to village	19th do.
Do. removal of cordon	2nd May 1898.
Do. village declared free of plague	2nd do.

Simul Mazara was the next village attacked, and in it a history of infection due to human intercourse is no less clear. The history of the infection of this village is related to that at Bachhwan, and I cannot do better than relate it in Dr. Datta's words—*vide* Report No. 9, dated 10th February 1898 :—

"Whilst making an enquiry into how the infection had got into this village (Simul Mazara) we were informed that two members of the infected party, which had brought the poison here, had gone into a village called Bachhwan, and that one of these two had died there shortly after arrival, namely, on the 27th January last * *. The information that I had gathered at Simul Mazara was quite correct, namely, that Albela, Fakir, and his son, Maula, had gone to Shikohpur, an infected village in the Jullundur District, to condole with Mussammat Ralli, whose father and mother (Baz and Dauli) had died of plague. This was on the 25th of January last. They stopped there that night, and the next day they travelled back along with Mussammat Risi and her husband, Shadi Fakir, to Simul Mazara, Risi being Albela's daughter. They stayed there also for a night, and on the 27th Albela and his son, Maula, started back for their own house at Bachhwan. On the road Maula became ill, had headache, diarrhœa and vomiting, and died that night at Bachhwan. The first cases in Simul Mazara were :—

(1). Mussammat Risi, wife of Shadi, Fakir, and Albela's daughter.
(2). Shadi, her husband.
(3). Kalu, father of Shadi."

H.—(5).—DERON.

Census population (1891)	147
Roll-call, February 1898	165
Muhammadans (chiefly Jats)	69
Jats	34
Other Hindus	6
Chamars	56
Number of houses	39
Do. do. infected	4
Do. plague cases returned	4
Do. deaths do.	...
Do. recoveries do.	4
Date of first case	27th January 1898.
Do. do. recorded	19th February 1898.
Do. declaration of plague	19th do.
Do. cordoning of village	19th do.
Do. evacuation of do.	20th do.
Do. commencement of disinfection	14th March 1898.
Do. completion of do.	19th do.
Do. last case	18th February 1898.
Do. return to village	19th March 1898.
Do. removal of cordon	30th do.
Do. village declared free of plague	30th do.

Deron, the next village infected, is one about which there is some doubt. Several sources of infection are, however, possible.

(1). A Fakir, Bade Shah, had some relations in a village close to Khan Khanan. He used to go begging in Khan Khanan with his daughter. They returned to Deron about the 25th January, and on the 27th the girl died of fever accompanied with cough.

(2). On the 29th January Gulabi, a Chamar woman, died there also of fever and cough. Her parents were residents of Birampur, in which the disease was raging among the Chamars. Gulabi's brother-in-law, who lived in the same house, died on the 14th February of fever also, and in this house, on the 16th, were found the two undoubted Chamar cases of plague.

H.—(6).—BHAJJAL.

Census population (1891)	530
Roll-call, February 1898	484
Muhammadans (chiefly Fakirs)	57
Jats	289
Other Hindus	68
Chamars	70
Number of houses	107
Do. do. infected	27
Do. plague cases returned	52
Do. deaths do.	37
Do. recoveries do.	15
Date of first case	6th February 1898.
Do. do. recorded	21st do.
Do. declaration of plague	21st do.
Do. cordoning of village	21st do.
Do. evacuation of do.	24th do.
Do. commencement of disinfection	14th March 1898.
Do. completion of do.	7th April 1898.
Do. last case	30th March 1898.
Do. return to village	14th April 1898.
Do. removal of cordon	19th do.
Do. village declared free of plague	19th do.

The next village on the infected list is Bhajjal. A *kasai* family belonging to that village had become infected as early as the 6th of February while living in a *Beri* garden situated in the basima of Lahra. These people used to go into Purkhowal, before we knew of the infection existing there, to purchase their *ata* and other supplies. On the 7th February this family was found to have become infected, was stopped by a Police Constable when trying to escape back to their home in Bhajjal, and were examined by Dr. Datta, who found three members of the family suffering from plague. The family was segregated at Purkhowal ; but a *Mehon*, who lived with them, had previously eacaped.

This *Mehon*, it appears, had gone into Bhajjal on the 4th or 5th instant, while very ill, but still well enough to take a basket of fruit for sale. His appearance, however, excited the attention of the villagers who, suspecting him to be ill of plague, drove him from the village, scattering his basket of fruit as he went. The village lambardars now state that the first cases of plague, which occurred in Bhajjal, were amongst the people who assisted in driving the *Mehon* out, and in the children who ate the fruit that was scattered on the way. Be this as it may, it is, I think, sufficiently clear that the starting point of the infection in Bhajjal was from this *kasai* family living in the *Beri* garden at Lahra.

H.—(7).—SADHOWAL.

Census population (1891)	332
Roll-call, March 1898	338
Muhammadans (chiefly Jats)	251
Other Hindus	2
Chamars	85
Number of houses	62
Do. do. infected	14
Do. plague cases returned	22
Do. deaths do.	16
Do. recoveries do.	6

Date of first case	Unknown.
Do. do. returned	6th March 1898.
Do. declaration of plague	6th do.
Do. cordoning of village	6th do.
Do. evacuation of do.	6th do.
Do. commencement of disinfection	7th April 1898.
Do. completion of do.	15th do.
Do. last case	27th March 1898.
Do. return to village	17th April 1898.
Do. removal of cordon	19th do.
Do. village declared free of plague	19th do.

With reference to Sadhowal, the next village on the infected list, no very clear history of human intercourse is obtainable. The villagers themselves attribute it to the fact that some Policemen came from Birampur and Purkhowal on the occasion of the *Id* to say prayers in the mosque at Sadhowal. The Qazi of the village attributes it to the visit of a *kasai* from Tejpur, but, on the other hand, no cases are known by us to have occurred in the Tejpur section of Purkhowal. Of this village, therefore, we have no very good evidence of human intercourse having spread the infection.

H.—(8). HAJIPUR.

Census population (1891)	864
Roll-call, April 1898	784
Muhammadans	55
Jats	9
Other Hindus (chiefly Gujars)	663
Chamars	57
Number of houses	214
Do. do. infected	69
Do. plague cases returned	90
Do. deaths do.	62
Do. recoveries do.	28
Date of first case	6th March 1898.
Do. do. recorded	9th do.
Do. declaration of plague	9th do.
Do. cordoning of village	9th do.
Do. evacuation of village	2nd April 1898.
Do. commencement of disinfection	20th do.
Do. completion of do.	2nd May 1898.
Do. last case	27th April 1898.
Do. return to village	28th do.
Do. removal of cordon	8th May 1898.
Do. village declared free of plague	8th do.

On the 9th of March the next village, Hajipur, was found to be infected. Infection was confined wholly to the Chamar families of that village, and it appears that as late as the 5th instant, when infection was well spread in Sadhowal, and the first Chamar death had occurred, some of the Chamars of Hajipur had gone over to Sadhowal on a visit of condolence after the first Chamar death in the former village.

H.—(9). PAROWAL.

Census population (1891)	296
Roll-call, March 1898	260
Jats	133
Other Hindus	31
Chamars	96
Number of houses	54
Do. do. infected	9
Do. plague cases returned	30
Do. deaths do.	20
Do. recoveries do.	10
Date of first case	18th March 1898.
Do. do. recorded	24th do.
Do. declaration of plague	24th do.
Do. cordoning of village	24th do.
Do. evacuation of villlage	24th do.
Do. commencement of disinfection	20th April 1898.
Do. completion of do.	2nd May 1898.
Do. last case	29th April 1898.
Do. return to village	25th do.
Do. removal of cordon	7th May 1898.
Do. village declared free of plague	7th do.

An interval of 15 days now elapsed before the next village, namely, Parowal, was discovered. Plague was declared there on the 24th of March 1898. This village had been inspected on the 18th March, without any cases being found; but one death occurred on the 23rd and one on the 24th, and ten cases were discovered on the latter day when the village was again inspected. Several circumstances point to the conclusion that this village also was affected by human agency.

(1). The villagers themselves attribute the introduction of the plague to one Maiya, a Jat of Parowal, whose daughter was married in Bhajjal. They say that after the disease broke out in Bhajjal, Maiya had several interviews with his son-in-law, Rama, of Bhajjal.

(2). At the time plague was declared in Parowal, the worst infected house in the village was that of Maiya and his brother, Dari, (2 deaths and 2 cases had occurred in 2 days).

(3). Confirmatory evidence of Maiya's having had interviews with his son-in-law after the infection of Bhajjal, was received at the time of the disinfection of the personal effects of the people of Parowal.

At this time all the people in the house of Maiya had died, and the lambardár of the village took into his custody some embroidered clothes and other female garments which, he said, belonged to the eldest daughter of Maiya, who was married in Bhajjal. The probability is that Rama, the son-in-law, finding the disease had broken out in his own village, conveyed all his wife's best clothes over to Parowal, or that the father-in-law came and took them away to avoid the unpleasant and destructive process of disinfection. This practice has been a very common one in Garhshankar Tahsíl throughout the epidemic. On plague breaking out in a village, villagers immediately either convey their best clothes to some other village, or hide them in some convenient place of concealment in or about their own houses.

H.—(10). GARHSHANKAR.

Census population (1891)	6,000
Roll-call, May 1898	5,354
Muhammadans (chiefly Rájputs)	3,298
Other Hindus (chiefly Khatri and Brahmins)	1,443
Chamárs	135
Sweepers	478
Number of houses	1,278
Do. do infected	124
Do. plague cases returned	157 actual 217
Do. deaths do.	75
Do. recoveries do.	82
Date of first case	23rd March 1898.
Do. do. recorded	30th do.
Do. declaration of plague	30th do.
Do. cordoning of village	30th do.
Do. evacuation of village	2nd May 1898.
Do. commencement of disinfection	8th do.
Do. completion of do.	25th June 1898.
Do. last case	23rd do.
Do. return to village	9th July 1898.
Do. removal of cordon	15th do.
Do. village declared free of plague	15th do.

From about the 23rd of March suspicions began to be entertained that plague was present in Garhshankar, but it was not till the 29th that any positive evidence was obtained, when the son of a barber, called Atu, was found suffering from plague. As a matter of fact, from a list prepared for me by the Hakíms of the town, I find that there had been at least six deaths from plague before the case in Atu's house was discovered, and from information received from the inhabitants, I am inclined to think that the disease broke out first in the houses of some Rájputs who had relations in Birampur. The lambardár of Gambo Khana Patti tells me that these Rájputs used, when the cordon was on at Birampur, very frequently to go into the infected village for the purpose of enquiring about the welfare of their friends, that they used to do this either secretly or with lime carts thus evading the cordon, and in short that

there was almost daily intercourse between the Rájputs of Garhshankar and Birampur during time the cordon was placed round the latter village. Infection having occurred in Garhshankar, as the people strenuously resisted all efforts at segregation and made every attempt to conceal their cases, it was no wonder that the disease spread rapidly in the town, and as the cordon was owing to several circumstances very imperfect, surrounding villages during this period became infected also.

H.—(11). SANWALI.

Census population (1891)	165
Roll-call, April 1898	154
Muhammadans (chiefly Rájputs)	98
Other Hindus	11
Chamárs	45
Number of houses	34
Do. do. infected	8
Do. plague cases recorded	16
Do. deaths do.	9
Do. recoveries do.	7
Date of first cases	Unknown.
Do. do. recorded	4th April 1898.
Do. declaration of plague	4th do.
Do. cordoning of village	4th do.
Do. evacuation do.	5th do.
Do. commencement of disinfection	27th do.
Do. completion do.	3rd May 1898.
Do. last case	10th April 1898.
Do. return to village	4th May 1898.
Do. removal of cordon	5th do.
Do. village declared free of plague	5th do.

Thus on the 4th of April plague was discovered in Sanwali, a small village between Garhshankar and Birampur, amongst the Chamárs, and the evidence goes to prove that these people were in the habit of going to Garhshankar to sell wood and buy provisions. Theoretically, they went only as far as the cordon, but really, I am told, they went into the town carrying their loads of wood even into the infected houses.

BILRON.

(*See also No. H. 3, page 85.*)

About the 12th April a re-infection of Bilron occurred, the source of which was twofold:—

(1). The first cordon had been removed from Bilron on the 1st April and many of the villagers went out to their fields at once to look after the harvest. Amongst others there went out, one Nihála, Rájput, who had some fields adjoining the Hajipur village area. He stayed in these fields for about a week, not returning to his village, and when he did come in, he was so ill that he died on the following day (12th April). His child was the next patient, and the first cases during the reinfection of Bilron occurred in the Rájput quarter.

(2). Another focus of infection occurred about the same time in the house of one Gahia, a leech-man, who brought the disease from Garhshankar, and whose sister was a first case in this other quarter of the village.

H.—(12). GARHI.

Census population (1891)	1,696
Roll-call, April 1898	919
Muhammadans	46
Jats	422
Other Hindus	243
Chamárs	201
Sweepers	7
Number of houses	184
Do. do. infected	48
Do. plague cases returned	110
Do. deaths do.	64
Do. recoveries do.	46
Date of first case	Unknown.
Do. do. recorded	20th April 1898
Do. declaration of plague	20th do.
Do. cordoning of village	20th do.
Do. evacuation of village	30th do.
Do. commencement of disinfection	10th May 1898.

Date of completion of disinfection	8th June 1898.
Do. last case	22nd May 1898.
Do. return to village	11th June 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

From Garhshankar also Garhi became infected, plague was declared there on the 20th April. It had been necessary for some time before this to allow a certain amount of liberty to pass through cordons on account of the harvests; labourers had been allowed to overlap one another between Garhshankar and the neighbouring villages, and to this circumstance is due in all probability the infection of Garhi.

H.—(13). KULEWAL.

Census population (1891)	179
Roll-call, April 1898	310
Muhammadans (chiefly Jats)	127
Jats	145
Other Hindus	4
Chamárs	34
Number of houses	59
Do. do. infected	14
Do. plague cases recorded	27
Do. deaths do.	13
Do. recoveries do.	14
Date of first case	Exact date unknown.
Do. do. recorded	15th April 1898.
Do. declaration of plague	15th do.
Do. cordoning of village	15th do.
Do. evacuation of village	30th do.
Do. commencement of disinfection	7th May 1898.
Do. completion of do.	12th June 1898.
Do. last case	2nd do.
Do. return to village	14th do.
Do. removal of cordon	20th do.
Do. village declared free of plague	20th do.

On the 15th April plague was declared at Kulewal. The first case had occurred some days before, but the exact date of this it is impossible now to find out. The following account of the method in which the disease was introduced there is given by the zaildár of the place. Dula Singh, lambardár of Kulewal, and his brother, Hira Singh, both got through the police cordon at Simul Mazara while it was infected, for the purpose of getting some money from one of the lambardárs of that village. Having obtained the money, they brought it back, wrapped up in a cloth and kept it in their houses. Five or six days after this Chando, wife of Hira Singh, got plague and died. Dula Singh himself was the next case, and he also died.

H.—(14). CHINKOA.

Census population (1891)	886
Roll-call, May 1898	901
Muhammadans (chiefly Rájputs)	518
Other Hindus (chiefly Khatri and Brahmins)	191
Chamárs	166
Sweepers	26
Number of houses	180
Do. do. infected	10
Do. plague cases returned	14
Do. deaths do.	8
Do. recoveries do.	6
Date of first case	21st April 1898.
Do. do. recorded	23rd do.
Do. declaration of plague	23rd do.
Do. cordoning of village	23rd do.
Do. evacuation of village	1st May 1898.
Do. commencement of disinfection	7th do.
Do. completion of do.	7th June 1898.
Do. last case	7th do.
Do. return to village	17th do.
Do. removal of cordon	22nd do.
Do. village declared free of plague	22nd do.

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In Kulewal itself there were no sweepers, and Buti, sweeper. hinkoa, used to work in the house of the lambardár, Dula Singh, death of Chando and Dula Singh, Buti was given some clothes the deceased persons, which he took away to his own house in The first case at Chinkoa was an old Chamár who lived in the next

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Other Hindus	11
Chamárs	45
Number of houses	34
Do. do. infected	8
Do. plague cases recorded	16
Do. deaths do.	9
Do. recoveries do.	7
Date of first cases	Unknown.
Do. do. recorded	4th April 1898.
Do. declaration of plague	4th do.
Do. cordoning of village	4th do.
Do. evacuation do.	5th do.
Do. commencement of disinfection	27th do.
Do. completion do.	3rd May 1898.
Do. last case	10th April 1898.
Do. return to village	4th May 1898.
Do. removal of cordon	5th do.
Do. village declared free of plague	5th do.

Thus on the 4th of April plague was discovered in Sanwali, a small village between Garhshankar and Birampur, amongst the Chamárs, and the evidence goes to prove that these people were in the habit of going to Garhshankar to sell wood and buy provisions. Theoretically, they went only as far as the cordon, but really, I am told, they went into the town carrying their loads of wood even into the infected houses.

BILRON.

(*See also No. H.* 3, *page* 85.)

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(1). The first cordon had been removed from Bilron on the 1st April and many of the villagers went out to their fields at once to look after the harvest. Amongst others there went out, one Nihála, Rájput, who had some fields adjoining the Hajipur village area. He stayed in these fields for about a week, not returning to his village, and when he did come in, he was so ill that he died on the following day (12th April). His child was the next patient, and the first cases during the reinfection of Bilron occurred in the Rájput quarter.

(2). Another focus of infection occurred about the same time in the house of one Gahia, a leech-man, who brought the disease from Garhshankar, and whose sister was a first case in this other quarter of the village.

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Other Hindus	243
Chamárs	201
Sweepers	7
Number of houses	184
Do. do. infected	48
Do. plague cases returned	110
Do. deaths do.	64
Do. recoveries do.	46
Date of first case	Unknown.
Do. do. recorded	20th April 1898
Do. declaration of plague	20th do.
Do. cordoning of village	30th do.
Do. evacuation of village	10th May 1898.
Do. commencement of disinfection	
Date of completion of disinfection	8th June 1898.
Do. last case	22nd May 1898.
Do. return to village	11th June 1898.
Do. removal of cordon	18th do.
Do. village declared free of plague	18th do.

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H.—(13). KULEWAL.

Census population (1891)	179
Roll-call, April 1898	310
Muhammadans (chiefly Jats)	127
Jats	145
Other Hindus	4
Chamárs	34
Number of houses	59
Do. do. infected	14
Do. plague cases recorded	27
Do. deaths do.	13
Do. recoveries do.	14
Date of first case	Exact date unknown.
Do. do. recorded	15th April 1898.
Do. declaration of plague	15th do.
Do. cordoning of village	15th do.
Do. evacuation of village	30th do.
Do. commencement of disinfection	7th May 1898.
Do. completion of do.	12th June 1898.
Do. last case	2nd do.
Do. return to village	14th do.
Do. removal of cordon	20th do.
Do. village declared free of plague	20th do.

On the 15th April plague was declared at Kulewal. The first case had occurred some days before, but the exact date of this it is impossible now to find out. The following account of the method in which the disease was introduced there is given by the zaildár of the place. Dula Singh, lambardár of Kulewal, and his brother, Hira Singh, both got through the police cordon at Simul Mazara while it was infected, for the purpose of getting some money from one of the lambardárs of that village. Having obtained the money, they brought it back, wrapped up in a cloth and kept it in their houses. Five or six days after this Chando, wife of Hira Singh, got plague and died. Dula Singh himself was the next case, and he also died.

H.—(14). CHINKOA.

Census population (1891)	886
Roll-call, May 1898	901
Muhammadans (chiefly Rájputs)	518
Other Hindus (chiefly Khatri and Brahmins)	191
Chamárs	166
Sweepers	26
Number of houses	180
Do. do. infected	10
Do. plague cases returned	14
Do. deaths do.	8
Do. recoveries do.	6
Date of first case	21st April 1898.
Do. do. recorded	23rd do.
Do. declaration of plague	23rd do.
Do. cordoning of village	23rd do.
Do. evacuation of village	1st May 1898.
Do. commencement of disinfection	7th do.
Do. completion of do.	7th June 1898.
Do. last case	7th do.
Do. return to village	17th do.
Do. removal of cordon	22nd do.
Do. village declared free of plague	22nd do.

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In Kulewal itself there were no sweepers, and Buti, sweeper. hinkoa, used to work in the house of the lambardár, Dula Singh, death of Chando and Dula Singh, Buti was given some clothes , the deceased persons, which he took away to his own house in The first case at Chinkoa was an old Chamár who lived in the next

house to the sweepers, and had probably a good deal of intercourse with them. This occurred on the 21st April. The next case was in the family of the sweeper himself.

H.—(15). BHAGWAIN.

Census population (1891)	357
Roll-call, (May 1898)	360
Muhammadans	24
Jats	103
Other Hindus	167
Chamárs and Ramdasis	66
Number of houses	78
Do. do. infected	9
Do. plague cases recorded	11
Do. deaths do.	7
Do. recoveries do.	4
Date of first case	12th May 1898.
Do. do. recorded	19th do.
Do. declaration of plague	19th do.
Do. cordoning of village	19th do.
Do. evacuation of do.	20th do.
Do. commencement of disinfection	1st June 1898.
Do. completion of do.	21st do.
Do. last case	28th May 1898.
Do. returned to village	23rd June 1898.
Do. removal of cordon	28th do.
Do. village declared fee of plague	28th do.

On the 19th of May Bhagwain was declared infected. About this village the information is a little doubtful, but this much I have been able to ascertain for certain. On the 12th May Mussammat Jai Devi, wife of Saddu, Jat, died of fever and cough, probably of the pneumonic form of plague. She had been ill for only three days. Four days before her death her brother who was married in Garhi, arrived, stayed the night and took her away with him in the early morning. She came back in the evening, fell ill and died three days afterwards. The first cases, those found on the 19th, were all living in or in close contact with the house of Jai Dei.

H.—(16). PALEWAL.

Census population (1891)	600
Roll-call (June 1898)	584
Muhammadans	3
Hindus (chiefly Rájputs)	480
Chamárs	101
Number of houses	125
Do. do. infected	6
Do. plague cases returned	4
Do. deaths do.	1
Do. recoveries do.	3
Date of first case	Not stated.
Do. do. recorded	3rd June 1898.
Do. declaration of plague	3rd do.
Do. cordoning of village	3rd do.
Do. evacuation of do.	13th do.
Do. commencement of disinfection	15th do.
Do. completion of do.	12th July 1898.
Do. last case	12th June 1898.
Do. return to village	16th July 1898.
Do. removal of cordon	21st do.
Do. village declared free of plague	21st do.

At Palewal the disease started in the house of one Nathu, a *baid*, of whom there is very strong evidence that he used to go through the cordon at Garhi to treat the people there who were ill of plague. A rumour to this effect reached my ears at the time when the first suspicious case at Palewal occurred, and my suspicions were confirmed by the fact that when the patients from Garhi were removed to Palewal, the people in the segregation camp at the latter place said to the *baid* in the hearing of the hospital assistant :—" See, here are your friends from Garhi from whom you brought us the plague ; go and sit with them ; you have no longer anything to do with us."

So much for the detailed account of the origin and spread of the plague epidemic in the Hoshiarpur District. There is, it will be seen, a distinct history of an origin through human agency in eleven of the total of seventeen villages effected throughout the outbreak ; and in the six remaining villages there is some suspicion as to its having started in a like manner.

Remarks on the mode of infection of villages.

It will be seen from the previous pages that 86 separate villages in all were infected in the two districts. Six, *viz.*, Jhandher Khurd, Khatkar Khurd, Bahrwal, Karnanan, Aur and Bilron, had either a recrudescence or a reinfection of the disease. The mode of infection is unknown in 14 cases. But it was traced to human agency in 67 cases out of the remaining 72 villages. There was a history of clothes or property having been conveyed in 15 cases of these cases, and the infection seems to have been carried by rats in five cases.

Means of transference : 1, human ; 2, clothes ; 3 rats.

It is therefore pretty clear that human agency is the chief cause for the spread of the disease from one locality to another, and that any means which stops people from leaving an infected locality will also tend to prevent the spread of the disease. In almost every case the first action on the part of the authorities on finding plague was to place a cordon round the infected areas, so that the declaration of plague in a village and the placing of a police cordon round that village were usually synonymous. But on carefully studying the foregoing reports we find that the infection had been carried to new villages in 26 instances before any cordon was placed round the area, and that it spread in 48 instances after such a cordon had been regularly constituted. Of these the actual person who transferred the disease is not known in 4 cases before cordoning, and in 3 after cordoning. But that it was human agency seems fairly probable. It must be borne in mind that the villagers must always be the first persons to know that plague exists among their number and that there is always time for people to run away before the plague authorities arrive on the scene. Concerning this inadequacy of the cordon to stop the spread of the disease we have special remarks to make in another place (see page 126).

Human agency.

The villages from which most other villages were infected were : (1) *Khatkar Kalan*, which infected Birampur, Jhandher Khurd, Khan Khanan and Shikohpur ; (2) *Shikohpur*, which infected Mallupota, Sahlon, Ratheran, Katharon, Kamam, Simul Mazara and Bika ; (3) *Birampur*, which infected Purkhowal, Deron, Salh Kalan and Gunachaur ; (4) *Purkhowal* infected Rampur Bilron, Balon and Salh Kalan ; (5) *Mallupota* infected Mehlgahla, Dahan, Bahrwal and Mazari, while (6) *Mehlgahla* infected Ladhana ; Jhikka, Sodhian (?), Naura and Bhaura. These six villages were therefore the direct cause of 26 other villages being infected. The following table shows at a glance from which villages each new village got its infection. It will be seen that the disease in some cases passed through 5 villages during the ten months it was under observation.

Villages which infected several other villages.

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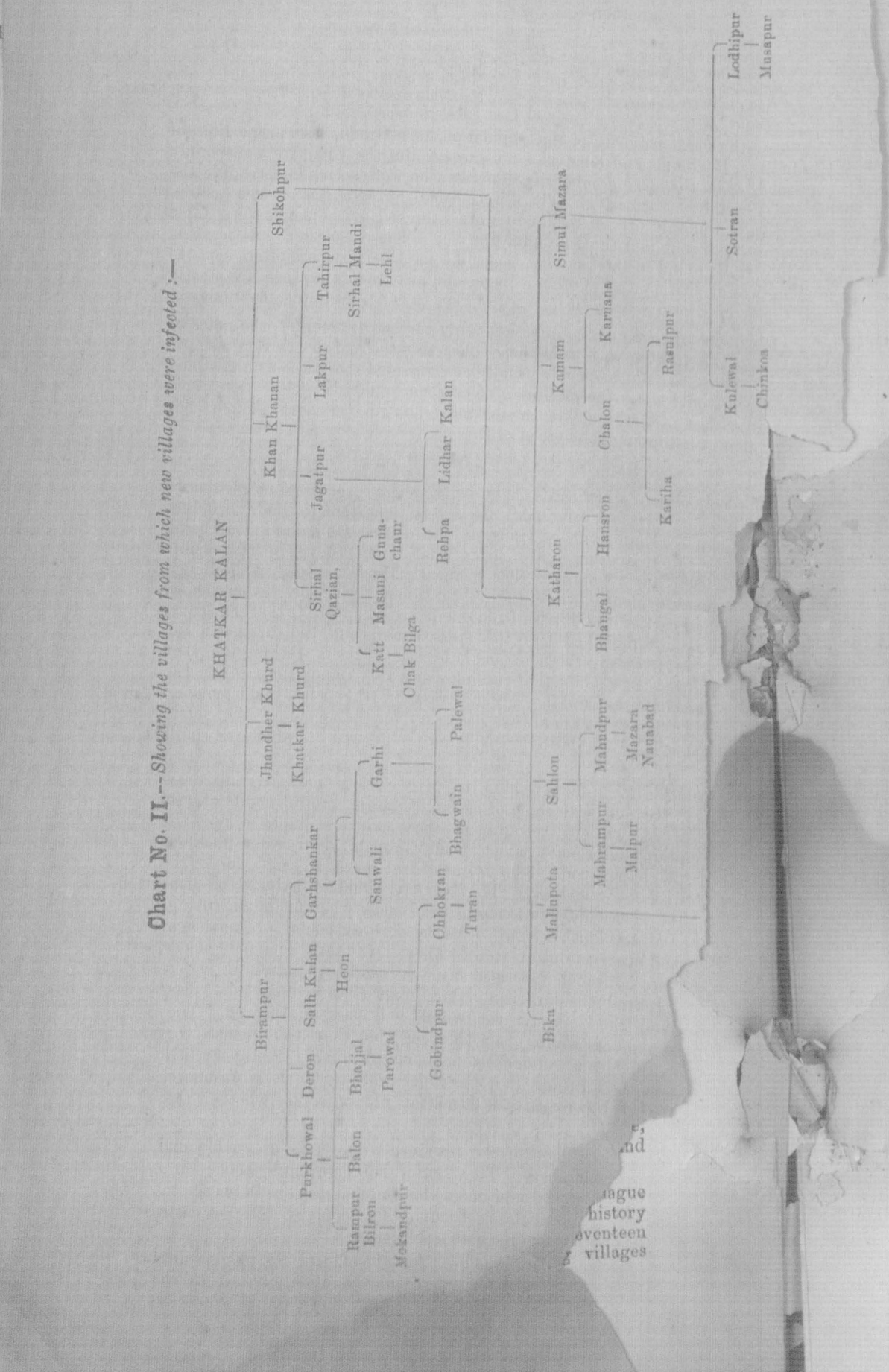
Chart No. II.—*Showing the villages from which new villages were infected.*—



Castes of those who transmitted the disease to new villages.

The following table gives the castes to which the persons belonged who carried the disease from one place to another—

Hindu Jats	22	Dhobis and Durzis	2
Chamars and Sweepers ...	14	Muhammadan Arains	2
Brahmins and Khatris ...	7	Gujars	2
Jhinwars	5	Hindu Rajputs	2
Lohars and Tarkhans... ...	4	Nai, Muhammadan Rajputs, Teli, Qazi, Sahnsi, each... ...	1
Faqirs	3		

As the great majority of the population was Hindu, the proportion of Hindu Jats, Brahmins and Khatris is not large. But the Chamars is certainly excessive, while the large number of Jhinwars who were active in spreading the disease is certainly surprising. There were usually only a few of this caste in each village, and only fifty of this caste were attacked with plague (see table Appendix B) throughout the Jullundur District. The reason for this result is probably to be found in the fact that they, like the Chamars, are often sent to give notice of deaths, &c., to other villages and also that they are frequently used to surreptitiously carry off infected clothes to relatives in distant villages.

Disease transmitted by clothes.

As to the question of the infection being carried by clothes, the notes of the various Medical Officers on the matter are very meagre. But as people usually accompanied the articles and as any means which would check the migration of persons would also check the transference of articles of clothing, &c., the matter is not of very great importance
fusease a point of stopping the spread of the disease.
that it v
that the

RATS IN CONNECTION WITH PLAGUE.

exists a'he connection which rats have with plague requires more than a
away beto. passing reference. It is very important to know whether
inadequacy ase from these animals transmit the disease from one human being
remarks to within the to another, and if so, to what extent they are responsible
for its spread. The medical officers working in the Banga

The many evidences where the only rational deduction to be drawn

Villages which several other villag had carried the disease from one house to another, that we came
it as an established fact that rats could, and did, transmit the
Mallupota, Sa ut since reading the notes made by other officers working
which infecte ey seem to doubt that rats play any very important part in the
infected Ram he contagion and lay great stress on the point that personal
Mehlgahla, Da n human beings is always necessary for the spread of the infec-
Jhikka, Sodhia at it is advisable to review again the ground on which we built
direct cause of
glance from wl going into the facts related to plague, it is necessary to draw
that the disease attention to some of the well-known natural habits of rats
it was under os of as without recognizing these we are likely to miss the
certain differences which these animals show when plague is
r neighbourhood. The form of rat here referred to is the
rat (*Mus Decumanus*). They are shy, timid animals, which come
iding places mostly at night or at times when no human beings
hen all is silent and still. At the slightest sound or movement
and are soon out of view. They love dark secluded places,
are not much observed by the ordinary native in whose
Indeed it is surprising what great changes may take place
ts of the domestic rat which will pass unobserved. They
e numbers where grain is stored; but they eat almost every
to offal, and under ordinary circumstances need very little
stenance. In fact they are often met with in store-houses,
id whatever, that it is a matter of conjecture whether they

no village in the province where rats are not found,
numbers. They gnaw holes through wood, *kacha*
material and make free communications between the
, which are occupied by people of different castes
tercourse with each other.

galow was built for the officers on plague duty
Banga and over a quarter of a mile from the
d necessary to keep a small quantity of *ata*, sago,

rice, &c., in stock, in one of the rooms for the use of the plague hospitals. The grain was brought in an *ekka* from Phagwara, a town thirteen miles away and unloaded and recarted at Behram, a village five miles away. It therefore seems unlikely that any rats should have come hidden away in so small a quantity of grain (about ten to twelve maunds altogether), and yet within a fortnight, the rats became a pest in the room in which the grain was placed on account of not only eating through the sacks, but also from burrowing in the floor and walls. It is therefore extremely likely that these rodents had migrated from one of the surrounding villages and that they came very soon after the house began to be inhabited. In fact it is pretty well recognized that rats have communication with other rats in neighbouring villages and that they are capable of travelling from one village to the next. This species is said to have been introduced into England and Europe from Asia by means of shipping, and in less than a century has spread all over the Continent and almost banished the indigenous black rat (*Mus Rattus*) out of England (*vide* Sterndale's "Indian Mammalia," page 323). Another peculiarity about these animals, which seems to be fairly well recognized, is that if poison be put down in their vicinity and a few of their number are killed by eating it, the rest of their community leave the locality in a body and the place becomes free of rats. Indeed, it does not seem necessary to even kill the rat to produce this result. If one of their number be caught and then tarred over, singed, or in some other way disfigured or tortured, and then allowed to go loose again, it is stated that a general emigration of rats takes place.

Now let us survey the facts connected with plague. That these animals get the disease with extreme ease is now generally admitted. In Bombay it was found that inoculating a rat with plague bacilli almost invariably produced the disease and the bacilli could afterwards be discovered in the blood, spleen and other organs, and could be transmitted to other rats; that placing healthy rats in company with the diseased ones caused them after a few days to take the illness and that sometimes they died when fed on "infected food." When a rat dies of plague, it dies in a peculiar way. It does not creep away into some secluded and out-of-the-way corner where it will be undisturbed and where it can die in peace as is usual with rats about to die. But it comes out into the open and ceases to notice its surroundings. The dog or the man, from whom it naturally flees away on ordinary occasions, is now quite unheeded. It wanders about in an aimless, tottering way, and the general manner of describing it, which we have heard both in Bombay and here, is that it looks "as if it were drunk or mad." It grows weaker and weaker and eventually falls on its side and dies, wherever it happens to fall, it may be the middle of the room, the courtyard, or even in the open street. If it can get near water it goes for it at once and drinks greedily as if it were suffering from unquenchable thirst. In its eagerness to do this, it often falls in, and then it makes very little attempt to get out again and is consequently drowned.

Rats affected with plague.

In the villages in the Jullundur District we have had many instances of large numbers of rats dying; in one case, at Mokundpur, Dr. Wilkinson reports, that nearly 200 dead rats were found in an infected house; in another house at Mehlgahla, as many as fifteen dead rats were found. Many instances are recorded in the previous section of this report of rats beings infected and dying before the occupants of the houses. The dead rats are not found always in the house where cases of plague have occurred, though this is frequent enough, but in the houses surrounding it. At Khatkar Kalan there seems to have been a special period—the beginning of August last year—when the mortality among rats was particularly noticed. The mortality must have been very heavy or the rats must have emigrated, for when we disinfected the village, not a single rat was seen, in spite of there being large quantities of grain lying about. But when we went to an outlying portion of the village, called the Pindora, where the Bharais lived, and which was separated from the rest of the village by a large pond, the place was found to swarm with these little animals. There had been no cases of plague among the Bharais, who are a caste of Muhammadan beggars. This difference between the two sections of the village with regard to the rats was so noticeable, that it was remarked on by the ignorant members of the disinfection gang as being something which required explanation.

Dead rats found in numbers in or near plague infected houses.

One fact which has been brought constantly before us in the present epidemic was the curious way the disease has spread from one house to the next, and has taken several houses in succession regardless of all apparent connection between these houses. Indeed, in many cases the houses have had their entrances in different streets and have been occupied by castes which have no intercourse with each other. At Khan Khanan one of the first houses to be attacked with plague was that belonging to a Khatri named Bhagwana. Adjoining his house, at the back, but having its entrance in another street, lived a Tarkhan or Sikh carpenter named Bhagwan Singh. These two families had nothing to do with each other. One day, soon after the Khatri's house had been infected, Bhagwan Singh and his family noticed a rat coming out of a hole in the wall. This hole we afterwards discovered led into the Khatri's house. The family noticed that the rat took no notice of their presence and that it was more or less *behosh* (unconscious) and after wandering about for a short time lay on its side and died. When this description was given us we at once recognized that the rat had died of plague. The following day several members of Bhagwan Singh's family were attacked with plague.

Another marked instance at Khan Khanan was in the case of a block of buildings near the gateway. The first person to be attacked here was a Jat girl aged twelve years. The only entrance to this house was by the road leading to the main gate of the village. The next house to be attacked in this neighbourhood was one which had its back to this one and opened into an alley which led from a street in the village. This alley was inhabited entirely by Ramdasis who had no dealing with the Jats next door. The infected Ramdasis' house touched by one corner a house belonging to the Chamars. Up to the time the Chamars left the village, which was about November 29th, no cases had occurred among them, but on going out into camp, Indi, the wife of Roora, was attacked. She must have been infected in the village. On going into the village we were surprised to find that her house was the one next to the Ramdasis' house. The Chamars' quarters had no direct communication with the Ramdasi's quarters, nor had the family attacked anything to do with the other two families.

This house to house infection has been so common in our villages that it would only be tedious to continue giving instances. But one more marked instance might be quoted. When we arrived at Ludhana Jhikka on May 21st we found only two families attacked, a Jat family belonging to Narain Singh's and a Muhammadan family belonging to Sain (five cases). It was afterwards ascertained that Salamat, wife of Sain, was the first to be attacked. These Muhammadans lived in a little courtyard just outside the village. To enter the Jats' quarters, one had to take a long tortuous course along lanes which apparently led to the middle of the village. But on mounting the roof of Narain Singh's house one at once perceived that the passage along which one had entered had gradually curved back again towards the Muhammadan's quarters, and though the roof of the latter was much below the Jats' houses, the two houses were only separated by a cattle-shed. The houses were close to each other; but there could not have been any direct communication.

The obvious criticism to these facts, produced to show that house to house infection in many cases takes place by rats, is that the people in the various houses spend much of their time on the house tops, and as these are chiefly flat with only a small ridge of mud to show the boundary between the different houses, free intercourse must take place and infection may after all be communicated directly from person to person. There are reasons for believing, this is not the case to any large extent, because as we shall show in another place, plague is very little infectious in the open air. It is this fact which has made the total evacuation of the villages so successful. But a stronger argument is that we have unfortunately had many instances where houses have become infected after the inhabitants have left them.

To refer again to Mehlgahla, the entire village was turned out on March 17th. Up to that date only the Chamars and sweepers had been affected, not including the one Jat girl who had brought the disease from another village. The rest of the village appeared perfectly free from infection.

Infection continues to spread in a village after the inhabitants have left it.

Even after the people got into camp, no one except Chamars and sweepers got infected. Eight days after the evacuation of the village the disease seemed to

have died out. At the end of March the disinfection of the village was commenced. The Chamars' quarters being first treated. More Chamars at once got infected from their homes. On April 6th a Jat who had been inside the village which had been uninhabited for twenty days was struck down with plague At the time we were very hard pressed for labour and were obliged to allow the villagers to do a great part of their own disinfecting, under the supervision of the Sanitary Inspector. They did not take the same care and precautions which our trained coolies did, and it was soon found that each time a new *mohulla* was commenced some of the people working in that *mohulla* were attacked with plague. Numerous dead rats were found all over the village. Nobody had noticed rats dying before the village was evacuated. Here we have two important facts before us. The village, except the kamins' quarters, was free from infection before the people left on March 17th; it was virulently ineffective when they began to return twenty days later. No disease had been noticed in the rats before the people left; they were found to have died in numbers when the people returned, and died in such a way that it was practically certain that they had died of plague. It is very difficult not to run to the conclusion that it was the rats which had spread the infection from the Chamars' quarters all over the village.

In Banga, the people who remained in their houses after dead rats were found in them got plague, those who evacuated their houses immediately on finding the rats escaped.

Again, in the case of Banga, as already described, the people when they left their *mohulla*, locked up their houses, and went into camp and remained under police supervision. The disease soon stopped among them. Their houses were afterwards disinfected. The gang of workmen who did this, being carefully looked after, did not get infected. But after a longer or shorter period the people living in the adjacent *mohullas* began to see rats affected with plague. On this occurring, those who were immediately ejected from their houses escaped, while those who remained became quickly attacked.

It is facts like these which in the end convinced us that though human intercourse is an important factor in the spread of plague in a village, still rats play an equally important part. It is because rats so readily carry the disease from house to house that all methods which try to deal with an epidemic of this disease by treating only those houses where cases of plague have occurred are bound to fail. We cannot control the movements of rats, whether diseased or healthy, and this consideration alone should force us to treat every village as a whole. What is the good of segregating and keeping under rigid police supervision a few infected people when rats are carrying the disease to almost every part of the village?

(2). Can rats carry infection from one village to another?

The next question which presents itself is—granting that rats spread the disease to every part of a village where the malady has already been introduced by some other agency, can rats convey the disease from one village to another, or from one locality to another some distance off?

This is a much more difficult question to settle and is beset with greater difficulties. Up to the present, in the Jullundur District, diseased rats, or indeed healthy rats have not been seen going from one village to the next; nor have dead rats been found any distance away from human habitations. Both these are occurrences which one would expect to find if migration of diseased rats took place on any large scale. Then, again, the introduction of the disease by human agency has been proved in so many of our villages, that one is inclined to believe that it was probably due to this cause even in the few villages where we were unable to find any direct or even indirect evidence of its introduction. This is a very fair inference to make. One cannot be expected to believe in any "theory" or "hypothesis" for which one has no facts in support. For a time we all more or less believed that man and man alone carried the disease from one place to another, till one or two villages got infected in a curious way, at the end of March, and this made us think over the matter in a new light.

At this time of year instead of having isolated villages situated some distance away from previously attacked villages we were getting new plague villages springing up all round our old villages and the disease seemed to be

spreading faster than we could hope to cope with it, if it continued at the rate it was then progressing. The increase began in February, when ten villages were discovered; was at its height in March and April, when twenty-three and twenty-nine infected villages, respectively, came to light, and then the spread ceased almost as quickly as it had started, there being only seven new villages discovered in the following months. The only general conditions which prevailed during March and April, which differed from the previous conditions, was that the weather was getting rapidly warmer, and the corn ripened, was cut, threshed and stored during this period.

There was heavy rain in the beginning of February, when the increase first started, but afterwards the weather was unusually dry. The meteorological conditions were those which in other districts (Karachi and Scind) have been found favourable to the early checking of the epidemic, and may therefore be discarded in the present argument. The conditions of the crops may have had some direct or indirect effect. The wide increase of the disease corresponded with the appearance of the ear in the corn, and its decline with the filling and closing of the granaries. This may have been accidental but the point will be referred to later.

At the beginning of March we noticed that three little villages, named Mehrampur, Chak Kalal and Batuli, were almost surrounded by plague infected villages, and from our previous experience we felt pretty certain that these villages would get infected sooner or later. It was therefore well worth our while to try and save them before they got infected. Mehrampur consisted mainly of Jats and was intimately connected with Khan Khanan, a village which had been infected, but had already been declared free again. Chak Kalal consisted of Aluwalian who had some caste-fellows in Banga, and Batuli consisted of Muhammadan Arains who had relatives in other villages but none near. With the people's consent Mr. Johnston put both Mehrampur and Chak Kalal out in camp. Batuli was not touched, and as the map shows was one of the few villages in the middle of our area which escaped the disease. Mehrampur also escaped. But of course it will always remain a doubtful point whether going into camp saved it or whether it escaped in the same way that Batuli did.

With reference to Chak Kalal the case is rather different. Up to the time the people went out into camp no one had been attacked; but it had been noticed that the rats in the village were dying in a curious manner. The people went out on April 7th. On April 15th, eight days later, the sky became clouded over with dense clouds and there was every appearance of heavy rain. The people got anxious as they thought their huts were not sufficiently well-built to keep out the wet. They therefore, without waiting for orders, returned to their village for shelter. Numerous dead rats were seen lying about the houses. After being there for one or two hours, the people returned to the camp. The next day the lambardars came to the Plague Officer's camp and reported that there were a number of dead rats in their village. They were ordered to bring some up for examination. This they did the following morning (17th). They brought a rat which had only just died. On microscopical examination it was found to contain typical plague bacilli in large numbers in its spleen, and the bacilli grew in a characteristic way on ordinary agar-agar. The same evening two persons of the village were attacked. After which followed a severe epidemic in which thirty-two persons were attacked and nineteen died.

In this case there seems little doubt that the people got the infection from the diseased rats, which had began to die ten days before the first human being was attacked. The question arises how did the rats become infected? It must either have been from diseased rats coming from one of the surrounding villages some of which were less than a mile away, or it is possible that "infected" articles, such as clothing, may have been brought from an infected village and the rats been infected from them. Indeed, on the 25th March, we turned a man named Sunder Singh and his family, out of this particular village into camp, because he was supposed to have been to see a man suffering from plague at Sotran some days previously. But as he and his family never contracted the disease, he was allowed after ten days to return. None of his family ever contracted the disease. It is therefore unlikely that he brought the disease.

In two other villages—Punian and Lalpur—the rats are said to have died before any one in the village was attacked with plague. In the case of Punian this was noticed eight days, and in Lalpur "a few days" before the first case. Next to Punian and only 110 yards distant is a small Muhammadan village called Hamirowal, although it had no direct communication with Punian, which was a Jat village, it was thought advisable to evacuate it at the same time that the other village was turned out. It consisted of only 28 houses. When it was disinfected it was found that rats had began to die in it. No less than thirty dead rats were found in this small hamlet.

In these four villages the following common conditions existed:—

(1). The people belonged to a different caste to the people in the surrounding villages and were therefore unlikely to have had very intimate dealings with them; Punian was an exception.

(2). When plague started in the village instead of having one or two primary dropping cases, we had a regular outburst in the first three or four days. Thus:

	1st day.	2nd day.	3rd day.	4th day.	
Chak Kalal	3	3	7	7	
Lalpur	3	1	2	3	All women.
Punian	3	1	...	3	Five women, two men.

Hamirowal—not attacked.

(3). All the villages named had their rats affected during the month of April.

Since writing the above, I have read Dr. Wilkinson's remarks about a fifth village (see page 60).

The village of Lehl is also one where there is no direct evidence of infection and where the rats are said to have died before any one was attacked. The epidemic also began in a sudden way. Two people were attacked on April 12th, one on the 13th, four on the 14th, and two on the 16th. The village is situated about a mile east of Sirhal Mundi, from which it was supposed to have got its infection. This village was also attacked in April.

From these facts we are inclined to think that though it is not a common mode of infection, rats may sometimes carry infection from one village to another. But all the links in the chain of evidence have not yet been produced. It has been a common experience with us to find that when we are doing the disinfection of villages all the rats which were known to have previously inhabited the place have then left it. Rat holes, covered up with wet mud (*garah*) by our disinfectors, remain untouched. What become of all these rats? Do they remain in the fields as appears to have happened at Mokandpur, or do they after a time return to their own or other villages? In April the corn was being cut. Did the clearing of the fields drive the rats which were then living in them and feeding on the standing corn back into the villages, and if so, did it drive infected rats into these five villages in which the people state that the rats began to die of the disease before human beings were attacked? These are all points which, with our present information, we are not in a position to answer definitely.

One more point before we close the section. Rats do not get ill immediately they are infected. Even in the case where they are inoculated with plague and where they show symptoms quickest, two or three days may elapse before they become ill, and if they get the infection in other ways, the period of incubation is longer. There is, therefore, ample time for them to migrate to neighbouring villages before they get ill.

A few rats dying is sufficient cause to make the others leave the locality. This was found to have happened in Khatkar Kalan, Mokandpur, Garhshankar, Haphowal, and several other villages. They would not remain out in the fields for very long, as this variety of rat is essentially a house variety. It seems to us extremely probable that many would migrate to other villages, as they have been known to do in health. If healthy rats migrate to other localities, nothing is more probable than that "infected" ones would do the same. We cannot, therefore, ignore the supposition that these animals convey the disease from one locality to another, though it may be to a much less extent than human agency.

SECTION II.

MEASURES TAKEN TO COMBAT THE EPIDEMIC.

As previously stated, the plague staff in the infected area was divided into two divisions.

1. *The Inspecting Staff*—whose sole duty was to find the existence of plague and to report it to the officers in charge of the other division. They had nothing to do with the cordoning of villages, segregating the people or treating the sick. Their one and only duty was to find plague. The details of this staff is described on page 124 and their methods criticised.

The Observation Staff.

2. *The Executive Staff.*—This consisted of a staff of European officers, including Assistant Commissioners, Medical Officers and District Superintendents of Police, with their appropriate subordinates.

The Executive Staff.

The *Assistant Commissioners* were in general charge of the operations, and were responsible for adequate arrangements being made for the hutting, feeding and general comfort of the people placed in camp. They also supplied huts for hospitals, police and the plague staff. All stores, lime, &c., were indented for through the Assistant Commissioners, except medicines and disinfectants, which were supplied direct by the Civil Surgeons of Jullundur and Hoshiarpur.

Duties of Assistant Commissioners.

All accounts were kept by these officers, and all payments made through them.

They also kept a record of all the operations; sent in a daily diary and reported to the authorities of other districts when persons escaped from infected areas.

The *Medical Officers* were in charge of the general medical arrangements and the subordinate medical staff. They diagnosed the cases of plague, and informed the Assistant Commissioner in charge. They also made immediate and adequate arrangements for the removal and segregation of the sick. The hospitals and all arrangements for the treatment of the sick were in their exclusive charge.

Duties of the Medical Officers.

They fixed the sites of the camps in consultation with the Assistant Commissioner. The disinfection of the villages was carried out under their supervision, and they inspected and passed as completed each house separately after disinfection. It rested with them to declare when a village might be considered free from disease. They were responsible for the daily inspection and roll-call by hospital assistants of all the persons placed in the healthy, segregation and hospital camps.

They carried out plague prophylactic inoculations. They had compiled in their office the daily sick return and kept the hospital and disinfection registers.

Under them were assistant surgeons, hospital assistants, compounders, hospital and disinfecting establishments.

The *Police Officers* were responsible for the police cordons round the various villages. At one time there were nearly 8,000 police on plague duty.

Duties of the Police Officers.

Measures carried out on the discovery of plague in a village.

On the discovery of a single case of plague the first thing done was always to place a police cordon round the infected village or area, and to prevent all ingress or egress. If people had gone temporarily to other villages, such as to the nearest shops for necessaries,

Cordoning the villages the first operation.

they had to appear before the police inspector in charge of the cordon, who, after having all the circumstances of their case written, allowed them to enter the cordoned area. But no person under any circumstances whatsoever was allowed outside this area without a written pass.

This cordon was not removed again till the village was declared free of plague.

The importance of placing an efficient cordon as early as possible can not be over-estimated. However important it may be to treat individuals and to protect the immediate neighbours of plague-stricken people, it cannot compare with the enormous importance of protecting other villages and other communities from being infected. In fact our first duty was to try to check the spread of the disease; our second, to try and exterminate the disease in the places where it had already got a footing. Our cordons were therefore our first line of defence, or at least they ought to have been so.

Nominal rolls made in all infected villages and afterwards of every village within the infected area.

Immediately after the cordon was established, a nominal roll of the whole village was made by the patwári or some other responsible person. After the inspecting staff had been properly organised nominal rolls of this kind were kept ready prepared in all the villages for miles round the infected area, and all that was necessary when plague was found was to have a muster-call of the people. In this way we had a ready means of inspecting everybody present in the village, and of telling whether any one had left the locality, and if so, enquiry from the neighbours rendered it easy to find out what had become of such people. The Assistant Commissioner made lists of all absentees, and communicated with the authorities of the districts to which they had gone. In this way they could be traced, watched or returned to their village, as circumstances allowed. This method rendered it possible to trace the disease at an early stage into other villages. From Mallupota alone the absentee list showed that one plague-stricken patient had fled to Jhandher Khurd and another infected one to Mehlgahla.

When, at a later stage of the operations, we got the people into the various camps, it was by reference to the village lists that we were enabled to determine whether we had every one under our observation. With the help of these lists the hospital assistants made out their lists for the roll-call and inspections of the individual camps.

Evacuation of the infected villages and forming of plague camps.

The next stage was the arrangements for the evacuation and hutting of the people. Usually on the receipt of the report of plague the Assistant Commissioner gave orders to the *mistri* in charge of the hut-building depôt to send off the number of huts required, and long lines of bullock-carts laden with grass and *sirki* huts would be seen wending their way towards the newly-found village within an hour or two of the information having been received. In one case, *viz.*, Shikohpur, the Medical Officer reported plague on the evening of February 1st, and by 3 P. M. the following day two hundred huts had reached the village, which was situated ten miles from the depôt.

It is recommended that Government huts should whenever possible be provided.

But often, especially during April and May, when plague-infected villages were springing up suddenly and daily round us like mushrooms, it was quite impossible to get huts made quick enough to keep pace with the demand. Fortunately the weather was dry, and we were able to turn out the people waiting for huts to arrive. In many cases they built themselves most excellent shelters. But strongly of opinion that this should not be allowed, Government huts are not procurable.

It very frequently happens that after people go out into camp, and in the so-called healthy camps, fresh cases of plague occur—in fact, this is the rule for the first few days after evacuation. This necessitates the being moved to hospital, his relatives and belongings being sent to disease hospital or segregation camp, and the hut being burned. If tent than

to be a Government hut no difficulty occurs; and as these are very cheap the loss is inconsiderable. But if, on the other hand, the man and his comrades have built the hut, they have usually used their *ballahs* or span *karias*, or even, at the time, unused ploughshares or other agricultural implements: often two or three families club together to make a common hut. In all these cases the difficulties which arise at the burning of the shelter tend to make the owners discontented and to harass the medical subordinates who have to carry out the requisite measures. The huts made by the villagers may be, and usually are, more comfortable than the Government ones; but they certainly do not let in the same amount of light and air, and are, therefore, not so serviceable for the present purpose.

The selection of sites for camps.

The formation of camps is also an important matter. The Assistant Commissioner and the Medical Officer ride round and select suitable sites. High ground near wells form the best situations. Trees are useful in winter, as they provide shelter for the cattle, and in the hot weather become necessary for shade. But camps should never be formed actually in groves, gardens or woods, as the people do not usually get the full benefit of the air and sun, they are more difficult to get hold of and inspect. Frequently when a camp is situated in a *bagh*, the headman or the owner takes possession of it for himself and his friends, and the rest of the people have to find shelter as best they can. In some cases so much room is taken up by the *maliks*, that there is not only no room for the others in which they can place their huts, but they have no shady place to sit in during the day. Another reason for not using these gardens is that, in the Jullundur District, they are often used as latrines.

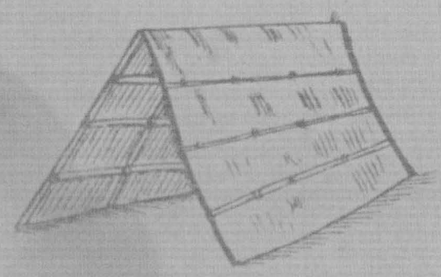
But some of the best sites for camps were selected *near* groves of trees and then there was plenty of room to everyone to sit under the shade during the hours when the sun's rays beat down with relentless force.

The division of camps into—1, Healthy, 2, Segregation and 3, Hospital Camps.

The camps were selected with due regard to the various castes and communities which were present. The general division into—(1) *Healthy Camps* for communities who had no illness among them, (2) *Segregated or Suspected Camps* for people who came from infected *mohallas*, and (3) *Hospital Camps* for the relatives of plague-stricken persons was observed. But often it was found necessary to split up some of these into smaller camps. For instance, there were usually three or four healthy camps—one for Hindus, another for Muhammadans and a third for Chamars and so forth. The huts were arranged in rows leaving wide thoroughfares, 50 to 100 feet wide between them, and each hut was situated 15 to 20 paces from its fellow. This gave ample room between them, and in the event of a hut catching fire, which was not an infrequent occurrence, there was little likelihood of others being implicated.

Construction of huts.

The huts themselves were of the nature called *jhonpri* by natives, that is to say, they consisted of two sloping planes like the roof of a house, each plane was 8 feet by 10 feet, and consisted of a bamboo frame with *sirki* or grass fastened to it as shown below:—



Cordoning the first operations.

The centre of the hut stood 6 feet above the ground, and gave a superficial area of 100 square feet inside.

In the cold weather triangular backs and fronts were provided. But in the warmer weather the people made their own arrangements about doorways, these usually took the form of cloth *purdahs*. Each hut accommodated on an average five persons, or one family.

They are light, cheap and very portable. When they became old and ragged they could be burned, or if they had been used for police, health camps or other purposes, which did not render them likely to carry infection, they could be taken to pieces and the material used a second time. They were made very easily and in large numbers by the sets of *gharamis*, who were always kept separate from the infected villagers.

The evacuation carried out by the Assistant Commissioner.

The evacuation of the village was usually carried out by the Assistant Commissioner. In most cases it was an extremely easy matter. The lambardars were informed of the situation of the various camps and what class of person was required to go to each. They were then told how long they would be allowed before a second cordon would be placed round the village from which they would be cut off. The former cordon, it will be remembered, was placed round the village area. Thus it will appear that the camps were situated between two sets of cordons. One outside the fields belonging to the village and preventing communication with the outside world, the other round the village site which cut the people off from the focus of infection. This second cordon, we regret to say, was often omitted on account of the small number of police in proportion to the area they had to cordon. We have many instances on record where people went back to the village to get little articles they required, and were promptly infected and subsequently attacked with plague. But we could not make bricks without straw, and if we had no police for the purpose we could not use them. Village chaukidars and hired watchmen were tried, but were found absolutely useless, as they were easily intimidated by threats or weedled round by the smallest bribes.

The formation of an inner police cordon to prevent access to the village.

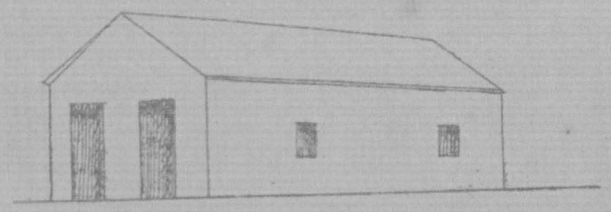
After the order for evacuation was given the people packed up their property and streamed out in lines like ants to their various camps. It usually takes a whole day for people to get out all they want, and we allowed them a second day to get articles which, in the hurry of packing up and getting out they may have forgotten. After this the village was out of bounds and the camps became their temporary homes. They usually remained in these from six weeks to two months—not a very long time, considering the virulence of the disease we were combatting.

Daily inspections and roll-calls held in the camps.

After the people had been brought out the hospital assistants were placed in charge of the various camps. Their duties consisted of holding a roll-call twice a day of all present, examining all cases of sickness and reporting daily all cases of plague or any absentees which may occur. The roll-call was usually held twice a day, but when hospital assistants were few compared to the people they had to examine, we were obliged to be content with one roll-call daily. We found that a hospital assistant could in this way look after from 800 to 1,000 people. These roll-calls were most important, and we draw especial attention to them here because some of the authorities who were not actually on the spot, seem, for a time, to have been absolutely ignorant of their existence. They never caused any inconvenience to the inhabitants, as the subordinates went from hut to hut, and therefore no one was obliged to leave his work or his food. By means of these inspections we were enabled to find every case of plague. In fact the rise in the number of "fresh cases" in Table IV, page 118, was mainly due to the fact that cases which remained hidden in the village were very soon brought to light when the roll-calls were in working order. Last, but not least, the roll-calls prevented persons from leaving the village area and wandering very far away. Several cases, where people habitually broke the cordon, have lately come to our notice, but they were unable to wander very far away as they had to return for the next roll-call. These inspections were therefore one of the means by which the disease was prevented from being spread to any distance. A very good instance of this is that of Hari Ram, Patwari, living at Mallupota. This man had his home at Shahpur, a village 15 miles away on the other side of Nawashahr. He wanted to get his property to his own village, but he was not able to get so far away with a bullock cart without missing a roll-call and being found out, though it was easy enough for him to break the cordon at night. He therefore sent his things temporarily to Bahrwal, an uninfected village just beyond the cordon round Mallupota. Thus, he most effectually infected not his own village, 15 miles away, but the one next to the village he was in. In the same way Moti Ram, who was patwari of Shahpur, but lived at Mallupota, is supposed to have brought the infection to Mazari. But, as already stated, on page 40, the chain of evidence is not so complete as in the last case. We, therefore, look upon these daily roll-calls as our second line of defence in preventing the spread of the disease.

Plague hospitals.

While the village was being evacuated all plague cases were sent to the hospital. For this purpose, sheds made chiefly of bamboo and *sarwar* grass or *sirki* were employed as in the case of the other huts. But as we required larger space with more accommodation for the sick, the huts were strengthened with wooden beams (*ballahs*). Each shed was 28 feet long and 16 broad. The side walls were 8 feet high, from which the roof sloped upwards to the centre of the shed; the central ridge being 10 feet to 12 feet high. These sheds contained ten patients with ease, and sometimes twelve without inconvenience. The inside superficial area was 448 square feet, and the cubical area 4,480 cubic feet. Each patient therefore had 448 cubic feet. This, considering the porous nature of the buildings which allowed of free interchange of air, was found ample. The following is a sketch of one of the hospital sheds:—



The number of such sheds erected depended on the number of patients. At Khatkar Kalan there were two, in Banga, Punian and Gunachaur, four. At Khankhanan, where we had our largest number of patients, *viz.*, seventy at one time, and at Sirhal Qazian we used a long shed, 108 feet long and 16 broad. These make excellent hospitals, but take longer to erect, and are not as easily moved about as the small ones are.

The ground was beaten down and plastered over with mud and allowed to dry. When it had become hard and dry, it was washed over with fresh lime-wash. This was renewed every morning when the weather allowed. The floor was thus kept clean and, if properly done, there was never any fine dust flying about. The inside of the sheds were also sprinkled with phenyle each morning. In this manner they were kept sweet and clean, and there was seldom any smell or oppressive feeling noticed in entering them even at night.

Smaller huts for cook-house, dispensary and establishment, &c.

Besides the main sheds for the occupation of patients there were small ones for other purposes. There were three (10 feet by 12 feet) with sloping roofs; 10 feet high in the centre and 6 feet at the sides.

1. One was used as a dispensary.
2. Another as a cook-house.
3. And a third for bathing patients on their admission to, or discharge from, hospital.

Besides these there were smaller huts of the usual "lean-to" pattern, already described, which were used for—

1. Hospital assistant and compounder's quarters.
2. Bhistie, ward orderlies and sweepers' quarters.
3. Observation shed for suspicious cases.
4. Mortuary.

Huts for European nurses.

The *dhais* used the same kinds of huts as the hospital assistants. But when European nurses were attached to the hospital we had larger and more comfortable erections. They were built of the same materials as the other huts, but were 24 feet by 10 feet. This allowed of a centre-room 10 by 12, a verandah in front 6 by 10 and a bath-room behind, of the same dimensions as the verandah. The roof sloped from 10 feet in the centre to 6 feet at the sides. They made very comfortable quarters in the cold weather, but were unbearably hot during the hot weather. In fact we were obliged to get most of our nurses into *pucca* buildings during June and July.

Mud plinths and surface draining.

In some cases the sheds were all raised on mud plinths about 6 inches high. This we consider an improvement. But time should not be wasted making them when sheds are urgently required.

All hospital buildings were surrounded by shallow trenches to carry off any rain which might fall.

Latrines.

Latrines made of *sirki* and without roofs were placed in convenient places near the hospitals.

Hospital establishment and necessaries.

In Appendix A will be found a list of establishment furniture, drugs and sundries which have been found useful.

In the Jullundur District we had 16 fully equipped hospitals as follows:—

1. Khatkar Kalan.
2. Jhandher Khurd.
3. Khankhanan.
4. Khatkar Khurd.
5. Sirhal Qazian.
6. Shikohpur.
7. Mallupota.
8. Gunachaur.
9. Mehlgahla.
10. Banga.
11. Katt.
12. Bisla.
13. Pharala.
14. Punian.
15. Jagatpur.
16. Chhokran.

In these places large numbers of patients were treated. But smaller hospitals with few drugs, &c., were established at almost every village. Only in the case of several villages lying close together was one hospital utilized for more than one village at a time. The reason of this was that the villagers, always suspicious of our motives, objected to having their relatives taken away.

Burial and burning grounds.

The Muhammadan burial grounds and the Hindu burning *ghâts* require consideration. These were selected as far away as possible from the camps, though within easy reach of the hospital. A hospital assistant or a compounder was always placed in charge. He was responsible that people carrying away plague corpses did not mix with other people, and was always present during the funeral ceremonies, and personally supervised the bathing in phenyle of all peasons attending the funeral before their return. Graves were dug to the depth of 6 feet; the official in charge being provided with a measuring stick for this purpose. In the Hoshiarpur District plague corpses were buried in quick-lime. But this was not done in the Jullundur District, as sufficient lime (four to eight maunds per person) could not be procured. If sufficient lime be not used the body instead of being quickly disintegrated is only preserved. However, if the body is buried sufficiently deep there are practically no chances of any ill-effects occurring. The plague germs cannot live in the absence of air, and therefore quickly die out in corpses which are buried deeply. It is stated that no ill effects have taken place from the opening up of any of the great plague pits of London.

But burning is certainly the most satisfactory way of dealing with plague corpses. The Hindus, therefore, in this respect, have a great advantage over all the other castes with whom we have had to deal. The hospital assistant was responsible that sufficient wood was always used to completely burn up the body. Many of the Jats in the Jullundur District used *gobar* (cow-dung made into cakes and dried in the sun), as well as wood. These gave great heat, and economised the wood which was scarce. In cases where the relatives or friends were unable to supply fuel, this was given by Government. The object was always to dispose of plague corpses as soon as possible.

The primary disinfection of camps.

The next point to attend to, after the people had got into camp, was the disinfection of the camps. This *primary* disinfection did not usually extend to the health camps, but was almost always carried out in the case of the segregation camps, and in any camp in which the disease showed signs of not quickly stopping.

The plan was as follows:—The people were first made to entirely empty out their huts and spread out everything on the ground. Every box had to be opened and every sack undone. The hospital assistants then came round with garden syringes, and thoroughly soaked everything with strong phenyle solution. All earthernware articles, as well as all cooking utensils; small iron and copper implements, &c., were dipped in a vessel containing the same solution. Beds, boxes, almirahs, &c., were squirted with the same. Articles such as grain, seeds, flour, &c., were simply exposed to the sun. But a special point was always made of turning them out of the receptacles in which they were kept. Cotton, hemp, bundles of string (*ban*) were merely sprinkled with phenyle. The subsequent placing them in the sun to dry them probably amply "disinfected" them. In fact one is strongly of opinion that the unexpected success which always followed on the disinfecting of the camps was as much due to the purifying effects of the sun's rays which was resorted to to dry everything, as to the amount of phenyle which we sprinkled about.

The people themselves were also made to take phenyle baths. Men, women and babes were all treated. The European nurses supervised the bathing of the women. The large iron vessels in which the people of these districts boil the sugar-cane juice for making sugar, and which are called *karahas* made excellent baths. They were also used for boiling the clothes of plague patients.

Exposing property to the sun's rays.

In addition to this disinfection the people in all the camps were made to put out all their property in the sun for four hours daily for ten days after getting into camp.

The Disinfection of the Village.

After the people had been comfortably hutted in camp, the cordons fixed, and the various camps disinfected, the source or rather the chief focus of infection had still to be dealt with;—we refer to the infected houses. It is astonishing how long infection remains in and about the rooms and buildings where cases of plague have occurred—that is when nothing has been done to kill the contagion. In Mehlgahla people returning to the village 40 days after evacuation were attacked; at Khankhanan 38 days; at Kariha 30 days; at Mallupota 31 days, and at Bahrwal 24 days after the village had been emptied. We remember a case in Bombay where a Parsee family on getting one of its members attacked promptly locked up the house and left the island. Seven months afterwards these people heard that plague had practically ceased in Bombay, and they returned to their house. Although they had been free from the disease for seven months, the day after their return, another member was attacked. It is most probable that he was infected from his own house. These instances show that the infection can remain a long time in buildings. Another point of interest and importance which the present epidemic has illustrated is the fact that the infection spreads, and may spread to every part of a village, after the inhabitants have left their houses. This has already been referred to. It is only mentioned here to emphasize the importance of the disinfection of the whole village.

The houses remain infective sometime after the occupants have left them.

The infection spreads in a village after it has been totally evacuated.

The method of disinfection as carried out in the Jullundur and Hoshiarpur Districts consisted of four stages or divisions, each having a special object. The stages were as follows:—(1) Disinfecting with antiseptic solutions; (2) Cleaning, (3) Ventilating; and (4) Whitewashing. Possibly one or other of these processes may have been sufficient, but on account of the difficulty of making sure, or indeed guessing the position of the infection, and also being sure that every part of the building and every article contained in it had been thoroughly disinfected, made it necessary to go through the whole process wherever practicable. For instance, strong antiseptics might have been played on to every wall, floor and ceiling in every room; but when the inspecting officer came round a few hours later not a sign of the antiseptic would be seen, as the earthern walls take up the moisture and dry quickly. Thus another time, a room, which had never been touched, might pass as one disinfected. In the processes carried out by us, there was no possibility of any room remaining unfinished as long as proper care was taken in the inspecting. Thus, even if a room remained untouched by the antiseptic, the subsequent opening up of the roofs, lime-washing of the walls, &c., which all could be seen by the inspecting officer, even days afterwards, left little chance for the plague germs to remain alive.

The disinfecting operations consisted of four stages.

Establishment on disinfection work.

The following is the establishment usually employed:—

1. A hospital assistant was usually placed in charge of the operations. These men are certainly the best persons for this work. We tried four European Sanitary Inspectors. But, on the whole, the hospital assistants were more satisfactory. They have sufficient medical knowledge to grasp the essentials of disinfection, they are hard-working, and most of them fairly reliable. Being natives they can stay in the streets and houses in the villages during the whole day in the hottest weather, which few Europeans could possibly do. The disinfection of the villages is one of the most important stages of the plague combatting operations. If it is badly done and plague makes its appearance again when the people return to the village the whole of the operations have to be gone through a second time; a contingency, not at all pleasing either to the people treated or to the staff who have to cary out the work. It is therefore very essential that the man in charge of the disinfecting gang should be thoroughly reliable. Drs. Wilkinson, Smith and Walton adhere to the opinion that hospital assistants are the best men for this work, while Dr. Clark would like to have European subordinates; but has not tried them, and Dr. Coleman found kanungos made very satisfactory disinfecting overseers. This latter class was tried and found quite useless in the Banga Circle.
2. A police sepoy of good character was usually associated with the hospital assistant. He was useful in keeping the disinfecting gang in order in the temporary absence of the hospital assistant; he prevented, in most cases, the occurrence of thefts. He was also available for making lists of property before the Magistrate when owners were absent, and could be trusted with keys of houses, &c.
3. Water-carriers.—Usually two were required for each gang of 50 coolies.
4. Coolies.—These consisted of three kinds—
   (*a*) Coolies for using the pumps and syringes for playing a stream of antiseptic on the interior of the houses. We were obliged to place each pump in the hands of some particular coolie who was responsible for the instrument, otherwise, if used indiscriminately by everybody, it soon got roughly handled and out of order.
   (*b*) Coolies for lime-washing.

   (*c*) Sweepers for general cleaning up and burning of old rags, rubbish, &c.

The coolies were usually the Chamars of the village. Some, who showed themselves particularly smart, were taken on for other villages besides their own.

The disinfecting work, even when carefully done, is very dangerous, and a large number of the men employed throughout the operations have been attacked. Dr. Clark does not agree with this statement (*vide* notes, page 157). But his experience was gained during the hot weather when the infectiousness of the disease was at its lowest ebb. It was very different in the cold weather, when in spite of all our precautions persons became attacked. But we agree with him that the more carefully the precautionary measures are carried out, the less likely are any of the workers to contract the disease. In fact under the supervision of some of our best hospital assistants very few attacks have occurred.

Disinfection of houses is dangerous work.

Precautionary measures taken to prevent workers on disinfection becoming attacked with plague.

The following are the most important directions to be observed by the disinfecting staff:—

1. All persons working in the gang must wear shoes, and no person should be allowed to enter any house or building with bare feet.
2. The gang should be inspected daily before beginning work, and all persons with cuts, scratches or sore places on their hands or legs should not be allowed to work till these abrasions have healed.
3. The disinfecting gang should be particularly warned of the danger of raising the dust. When roofs are being opened, or floors dug up, coolies with pumps should always be at hand and spray water or phenyle solution over the dry earth as it is being removed. Men on this work should tie their *pugris* over their mouths.
4. When the gang takes its midday meal, all should wash their hands outside the village, and the persons who bring the food should not be allowed to mix with the gang who should be kept separated in an open field while having their food.
5. The gang should be given a phenyle bath, or at least have the phenyle spray from the hand-pump played on them before leaving the village in the evening.
6. No person whatever should be allowed to smoke a *hukka*, or eat his food inside an infected village.
7. No person should be allowed in the village, unless brought in by the hospital assistant to open his house or watch his property while it is being disinfected. He should always be placed in a position of safety.
8. The disinfecting gang should all, if possible, be inoculated with Haffkine's prophylactic medium.

Materials used in disinfection.

The materials used in disinfection for an ordinary village were as follows:—

1. Antiseptics (see below).
2. Continuous action hand-pumps, or large garden syringes.
3. Buckets.—Excellent iron-buckets were made out of old phenyle tins, or lighter, but less substantial ones out of old kerosine tins. The village *tarkhan* or *lohar* fitted handles to these at a very small cost.
4. One or two iron vessels, called *karahas*, for mixing the fresh lime for lime-washing.
5. Spades for opening up mud roofs, digging floors, &c.

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4. One or two iron vessels, called *karahas*, for mixing the fresh lime for lime-washing.
5. Spades for opening up mud roofs, digging floors, &c.

6. Baskets for carrying away earth, rubbish, &c.

7. Ladders.

8. The iron-buckets with rope attached (*dôl* and *laj*) used for drawing water from wells.

9. Two *mashaks*.

10. Lime.—This was always unslaked (see below), called among natives *anbuja chuna*, and great care was taken to see that it did not get affected by damp before it was used. The usual estimate was half maund for each house in villages. But in small towns, such as Banga, where the houses were larger and had more rooms, a larger quantity was required.

11. Country brushes for lime-washing.—These were made by the *gharamis*, who make the *chappar* huts from a kind of grass called *munj*.

12. Some sort of colouring matter for marking infected houses, &c.—The red earth called *hurmachi*, which can be procured in almost every village, mixed with a little mustard oil makes an excellent paint for this purpose. Every house, known to have had plague cases, was marked with a circle and cross as has been done in other plague areas. A horizontal line drawn below the circle and cross indicated that the house belonged to a plague infected family, but that the persons had been attacked in camp. Two or more circles and crosses represented two or more cases. In the Hoshiarpur District a rather different mark was used to designate plague houses; a circle was drawn with a vertical line down the middle, on the left was a number, representing the serial number of the house, on the right the space was divided by a horizontal line into two, the upper one had a figure representing the number of people attacked in the house, and the lower space contained the initial or some distinctive sign made by the inspecting medical officer, and was only filled in when the disinfection of the house had been completed.

Stage I.—Spraying with disinfectants. When houses had to be disinfected the following procedure, which applied to all the buildings in the village, whether actually known to be infected or not, was carried out. The disinfecting gang was collected in the street near the house, and all the materials required were placed in readiness in some convenient open space, if possible near the centre of the area to be dealt with. The owner of the house was brought in by the hospital assistant, or the constable from the camp where he was living and allowed to open the lock of his door, and then made to sit down in the street, somewhere where he would not be in the way, and where he could watch all that was being done to his house and property. But he was not allowed to take any active part in the disinfecting or to enter any of the rooms till they had been disinfected.

Spraying with antiseptic the interior of the houses.

With pumps and syringes a stream of antiseptic solution was made to play on the closed doorway till the wood-work was thoroughly wet. It may seem unnecessary to begin using the antiseptic so soon. But the object was to impress the workers that they had to deal with infected places, and it was necessary to teach them thoroughness from the very commencement and to insure the good work, without which the object, for which they strove, would not be obtained. The door was then thrown wide open, and before anyone was allowed to enter a stream of antiseptic was made to play over as much of the interior of the room as was visible from outside. Thus the dust inside was layed, and it was fairly safe for persons to enter. The pump men then went inside, and from the centre of the room continued the [illegible] till every part of the ceiling, walls and floor were wet and running with septic solution.

Other coolies now entered and carried out into the open every piece of furniture, or movable property, while they were still wet with the lotion, and placed them either in the roof in one corner, or in some convenient place in the yard or even in the street where they could get the full benefit of the direct rays of the sun. All rubbish, rags or articles of no value to the owner were taken out into the open and burned. Small articles, such as *datis*, *rumbis*, *dewas*, &c., were dipped bodily in vessels containing antiseptic fluids which were kept in readiness near the doorway. The owners were encouraged to take as much as possible of their property away into their camps after it had thus been thoroughly disinfected.

The removal of all movable property which was placed in the sun.

Corn, seeds, flour, *haldi* and such articles which would be spoiled by placing in water were spread out in the sun for a day; the vessels which had contained them were disinfected *secundum artem*, and, when dry, the various materials were returned. Books and manuscripts were also exposed to the sun's rays.

The dry places, left by removing articles from the rooms, were at once tackled by the pump-men, who directed a jet of antiseptic towards every space thus left undone. In the same way, articles removed were subjected to a thorough drenching with antiseptic, when they got outside.

Antiseptic.

A word or two about the antiseptic used is necessary.

Of all the drugs which kill germs, perchloride of mercury is the strongest and most effectual. It is used in laboratories and for delicate surgical operations, on this account—Dr. Watkins-Pitchford and others have shown, in a series of careful investigations, that a solution of 1 in 5,000 destroyed the plague bacillus in five minutes with certainty.

Perchloride of mercury solution though the best germicide has certain drawbacks.

When we began the plague operations in the Jullundur District we used perchloride of mercury, or sublimate solution, as it is often called, 1 in 2,000. But we very soon found that there were disadvantages connected with this form of antiseptics. The water in the district contained a large quantity of lime salts which precipitated the mercury salt as a fine powder, and rendered the solution we were using inert. This defect could be overcome by adding sulphuric acid to the solution. But then the acid and salt attacked our metal pumps and syringes. It is true, we could have sent to Lahore or elsewhere, and had wooden pumps made. But this would have taken time and our work was urgent. But another and more serious drawback to perchloride was that it is a virulent poison, and, even with the weak solutions we were using, there were likely to be accidents; especially as our disinfecting gang were at that time perfectly uncultured and did not seem to realize that the solution they were using was likely to do them harm.

We therefore decided to try another antiseptic, which though not so powerful as perchloride, still would be powerful enough to kill the bacillus, and would have the additional advantage of not being so poisonous to human beings, and would not corrode our pumps or spoil the metal articles with which it would come in contact. Phenyle was the antiseptic fixed on. It does not form a true solution in water, but mixes freely as a very fine emulsion, looking very like milk. It has a distinctive odour, is quite easy to manage, and has the additional advantage of not spoiling clothes and other articles which are disinfected. It kills plague bacilli in five minutes in solutions of 1 in 400 (*vide* Dr. Watkins-Pitchford's report from the Petit Laboratory, April 23rd, 1898). The direction given to our workmen was to pour enough phenyle into the vessels of water to make a dense white fluid looking like milk. On testing our samples of phenyle we found that 1 in 400 made a thin bluish white fluid which on pouring into the palm of the hand was transparent. But that when made, as directed above, to the consistence of milk, we were using solutions of the strength of at least 1 in 200. [illegible] therefore, was amply strong enough for our purpose, was easily and quickly [illegible] from the crude phenyle in tins, and was not likely to cause toxic [illegible]ose who had to use it on a large scale, and did no damage to clothes, [illegible] implements. After nearly ten months' experience of this antiseptic we [illegible]as answered every purpose for which we required it. In some of the

Phenyle solution used and gave satisfactory results.

larger, double-storied infected houses in Banga, where we could not get direct sun-light through many of the rooms, and where the walls were made of rough brick, which did not take the lime-washing, we had to trust entirely to phenyle lotion made as here described. The result was quite satisfactory.

As an extra precaution, plague patients' clothes, when not burned, were subjected to a bath of boiling phenyle of the above strength. We now feel that the boiling was quite superfluous.

To return to the disinfecting.

Large ventilation holes made in the roofs of all houses and the entire roof removed in the case of infected houses.

When the hospital assistant or other inspecting officer was satisfied that the room had been thoroughly saturated with the antiseptic, he had the doors of the room shut, and coolies went on to the flat roofs and made a hole in it, large enough to admit plenty of sun-light and air into the room below. An opening of less than 6 feet by 4 was not allowed, and often much larger ones were made in every house of the village. In the case of infected houses the entire roof was removed. In making the openings, called *moga* by the people, it was always necessary to bear in mind the position of the larger beams (*shahtir*) below. For, it is awkward and spoils much of the benefit of the *moga* to have a large beam running through the middle of it. If the opening is not made in the middle of the roof, it should be made on the south side of the centre, as this position allows the direct rays to act on the largest portion of the room. The surface mud of the roof was dug up and placed neatly all round the opening to make a ledge which prevented rain-water from running off the rest of the roof into the room through the *moga*. The *phoos* or grass and matting which lay below the mud was next removed and always burned as it has a tendency to make a litter and to blow about. The rafters (*karian*) were finally taken out and placed neatly on one side.

During the whole of this process dust which was very apt to rise was laid by continually playing a jet of water from a hand-pump through the opening.

The house was then left till the following morning to allow the antiseptic to act and the place to dry. The free ventilation enabled the latter to take place very quickly.

Lime-washing of houses done with fresh unslaked lime.

The next day the house was again entered and the rubbish, &c., which had fallen during the making of the various ventilation holes in the roof, was sprayed with phenyle and removed in baskets and buried outside the village.

The walls, pillars, doors, corn-receptacles and all fixtures were afterwards lime-washed by the gang of whitewashers. This coating was prepared in a special way to get the best antiseptic properties. That is to say, the unslaked lime was gradually shaken into the iron vessels before referred to, which contained water, and stirred till a homogeneous mixture was obtained which was quite hot. This was used immediately and was strongly and powerfully caustic. The paper, above referred to, shows that it is germicidal at the strength of 1 in 1,000.

The workmen had to be careful to protect their hands when using this material, as it was apt to blister the skin.

Houses left open after disinfection.

After the lime-washing the disinfecting arrangements were complete, and the house remained open to allow of thorough drying till the people were ready to re-occupy it, or till the whole village had been completed.

Modifications in disinfection.

But frequently modifications had to be made in the manner of disinfection to suit circumstances.

The following are some of the instances :—

Opening in roofs not always practicable.

1. If the rooms were so dark that it was impossible to see clearly whether the stream of phenyle was reaching every part of the apartment, we found it necessary to make the hole in the roof before using the antiseptic spray. It was particularly the case with inner

rooms. The process was a more dangerous one, as the rubbish falling from the roof often raised the dust lying about the room, and which is particularly dangerous. If there is one point of more importance than another in disinfection work, we should consider it the prevention of causing dust to blow about in infected houses.

Dealing with large quantities of perishable stores.

2. Many houses contained large quantities of stores, such as wheat, sugar, treacle, &c., which could not be left out in the open, or in rooms in which large portions of the roof had been removed, for fear that they might be spoiled by rain or damp. In these cases the opening in the roof was made well to one side, and the articles, after having been exposed to the sun for the requisite time, were arranged in the sheltered portions of the apartment. They thus benefited by the free percolation of the outside air, without being liable to get wet.

Ventilating holes could not always be made.

3. Many *pucca*-built houses, and especially double-storied ones, had their rooms built in such a way that making an opening in the ceilings of the lower rooms gave very little inlet to the sun's rays, or making such openings would render the house unsafe. In these cases we had to depend more on the disinfecting with phenyle and the white-washing.

Small shops.

4. In many shops which were little more than cupboards with one side open to the road it was often unnecessary to make an opening in the roof. In other cases better ventilation was obtained by making an opening in the side wall instead of the roof.

Openings sometimes made in side walls for ventilation.

The digging up of floors.

5. Houses known to be infected were treated with greater care than the others. Besides removing the whole roof as already mentioned, the floor, if made of mud, was dug up to the depth of three inches, and the earth carried outside the village and buried. This was a dangerous process, and entailed much labour. We have since seen some reports from Bombay, in which it is stated that this process has now been given up as being quite unnecessary.* The floor is most likely the most infected portion of the room. But as it is usually quite hard and the germs are probably only on the surface, the antiseptic which is always washed all over it, during disinfection, ought to destroy effectually whatever germs may happen to be present.

Destroying articles and giving compensation.

All articles such as old string beds, old clothes, old wooden furniture, *muhras*, *pihis*, *binnris*, all earthen vessels and articles, which from their porous nature are difficult to treat with antiseptics, should be burnt or destroyed, and compensation given. Many of the articles mentioned above will be found cheaper to pay for than to disinfect.

The treatment of mud corn-receptacles.

6. In many of the houses we found corn-receptacles, made of mud and called *pharolis* or *kothis*, according to their size and shape. These were always emptied, phenyled inside and out, and finally entirely white-washed. In order to do this thoroughly, they were moved into the middle of the room and sometimes turned over on their sides. In a few cases it was found necessary to break them up altogether.

Cattle sheds and out-houses.

7. Out-houses, cattle sheds, stables, &c., which were often very roughly built, and had walls so irregular that it was almost impossible to white-wash them, were often left without this coating. But more attention had to be paid to the phenyle spray. Care was always taken to have them properly cleaned out. It was a common practice to try and hide articles in these places, in order to avoid having them disinfected.

The question of leaving infected houses till last and beginning disinfection in uninfected quarters.

When we started the plague operations, we were rather inclined to treat infected houses on rather a different footing to uninfected ones. But experience soon showed us that the infection was not confined to the houses with the red circle and cross on the doorway. In the great majority of cases, where we were able to determine the house from which the disinfectors were attacked, we found that it was from a house which had been free from infection when the village was evacuated. As already stated this late infection seems to have been due to rats coming into and dying in these houses. We

* Bombay Medical and Physical Society's Reports, 1898.

therefore thought that by unroofing and opening out the infected houses first, we might possibly be driving diseased rats out of their own quarters into other parts of the village. With a view to testing this point, latterly, we took the village as a whole and began at one end and went steadily through to the other. This plan, theoretically, allowed time for the rats to die in their own localities, and moreover left no dark secluded corners in the uninfected houses, already, done for them to go to. We had certainly very few attacks after this date. But the disease had then shown a marked tendency to diminish with the onset of the hot weather, and this may account for fewer disinfectors being attacked. The test was therefore not conclusive.

Not beginning disinfection of villages till ten days after evacuation of the village.

In May an order was issued that ten days should elapse after the village had been evacuated before disinfection should be commenced. The idea was to allow the rats to die in the infected houses before these were disturbed by opening up the rooms, and thus driving the diseased animals to other localities. This caused a good deal of delay in the work, which was often very irksome, and tended to prolong the time the people were in camp. None of the medical officers on plague duty seem to see much advantage in the rule, as of course plague-stricken rats have a natural tendency to wander about in an aimless way, and were found to have reached other localties, and to have died there even after this rule was carried out. There were fewer people attacked. But, as mentioned above, this may have been due to the weather and not to the measures adopted.

Re-occupying the village after disinfection.

After the village had been thoroughly cleaned, disinfected and whitewashed, the question arose,—when would it be safe to re-occupy it? We are of opinion that a village can be re-inhabited the day following the completion of the disinfection. But we must make certain that all infection has ceased in the camps. It is therefore essential that a certain time should elapse after the "last case" in order to see that all the other people remain well. The usual time allowed was three weeks, and this was found quite satisfactory. But in the middle of the cold weather and in February when the disease did not die out so quickly, after people went into camp, we allowed a month to elapse after the last case, before permitting the return to the village. We are of opinion that the fortnight allowed in Medical Circular published last year, is too short a time, as in two or three instances (Khatkar Kalan, Khankhanan, &c.), we have had a dropping case in the camps after an interval of two weeks' freedom from the disease.

Final disinfection of all the camps.

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After the people returned to the village, they were still kept under observation for ten days, in order to make sure that no infection remained in the houses, which would probably show itself within this time. The hospital assistants made daily house to house visitations, and the medical officer in charge had a final muster and roll-call of the whole village at the end of the period; after which the cordon was removed and the village declared free of plague.

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The re-appearance of the disease in six villages.

The details were as follows:—

1. *Jhandher Khurd* was declared free on 28th December 1898. A carpenter was traced from Mallupota, from where he had run away, and found at Jhandher Khurd on 19th February 1898 with plague on him. He and the family with whom he lodged were placed in camp, and the house disinfected. The disease did not spread. This was, therefore, a case of re-infection.

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These few recurrences of the disease, when examined, only tend to confirm the proof that our disinfecting measures were effective in stamping out plague in the villages. They also tend to show another point which should not be overlooked. *If plague is introduced into a village, recently disinfected, it shows little or no tendency to spread, and the evacuation of one or two houses is usually quite sufficient to check the second outbreak.* This is very different from our experience of villages before disinfection. We have at present no data to show

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how long the benefit of the disinfection lasts. But it is probably two or three months. Nor can we say to what particular detail in the disinfection this immunity is due. But we have a strong suspicion that it is due to the absence of rats in the village.

THE EFFICACY OF EVACUATION.

The total evacuation of villages has been carried out on a very large scale in the Jullundur and Hoshiarpur Districts, and we are now in a position to review the records of the cases of plague occurring in these villages, both before and after evacuation, and to draw deductions as to the result of our measures in regard to the epidemic.

Normal length of an epidemic in a given locality.

We may preface our remarks by stating that, as far as we know, no epidemic of plague, however mild, has ever been known to die out naturally in any locality under four or five months, and in most records it is very much longer than this. Therefore, if, after we have carried out any measures for the suppression of this disease, we find that the epidemic stops in a shorter time than this, we may fairly assume that this beneficial result has taken place as a consequence of these measures. Moreover, if we find that the disease treated in this manner, in a number of villages taken in sequence, stops in each village in which we adopt these measures, regardless of the time it has been present previously in the village and also in spite of adverse circumstances, such as the cold weather, when the disease has a tendency to become worse, the benefit of the measures becomes practically proved.

Description of Table IV.

We have taken all the villages in the Jullundur District which have been attacked by plague, and of which we have very accurate records, and, without any discrimination whatever, have placed them in sequence in the accompanying table. (See Table IV on pages 118-19.)

It will be seen that between October 21st, 1897, to July 23rd, 1898—a period of nine months—75 villages in all were evacuated. These include Jhandher Khurd, Khatkar Khurd, Karnana, Aur and Barhwal, where there was a re-appearance of the disease, which have already been discussed on page 114. Karnána and Aur were not totally evacuated on the first occurrence of the disease, but were subsequently turned out, and Khatkar Khurd, Jhandher Khurd and Barhwal were totally evacuated when the disease was first found, but not subsequently when a re-infection took place. It was then found quite sufficient to only evacuate the infected houses. Naura is therefore the only infected village in this area which has not been, sometime or other, totally evacuated.

In the table, columns C and D give the probable date of the first case, corresponding to the date of onset of the epidemic, and the date of total evacuation of the village. The difference of these two dates gives the period which elapsed while the epidemic existed within the village. Column E gives the number of cases which occurred during this period. But it is probably not a full list, especially in the case of the earlier villages attacked. It will be noticed that, as the staff for the inspection of villages was increased, and the machinery for the early detection of cases improved, fewer attacks occurred in the villages before they were evacuated.

Increase of cases reported on the first few days after evacuation.

Under the heading "F" are 20 columns which give the daily record of cases found in each infected village for the first twenty days after evacuation. It will be noticed that for the first four days after evacuation the total number of cases occurring, instead of diminishing, actually increased. Thus at the bottom of the table, we see that, in the 75 villages under consideration, there were 155 new cases on the day following the evacuation; on the second day 165; on the third 183; and on the fourth day 189 cases were recorded. The reason for this is obvious. The effect of the evacuation would not show itself at once, because a certain period exists between the time the people caught the infection and

the time the first symptoms showed themselves. This period varies, according to the statements made by the medical officers in Bombay, from one to ten days. So that a community being infected in the village and then leaving would show cases from one to ten days afterwards. The present table tends to show that in the vast majority of cases the symptoms develop within five days after the infection has been contracted.

There is another reason for this large increase. As long as the people remained in the villages, it was very easy for them to hide their cases. As a matter of fact, they often did so. Thus, in a large number of our villages after their evacuation, the hospital assistants in making their roll-calls and inspections in the camps came upon cases which had obviously been ill some time. These discovered cases were entered in the registers on the days they were discovered, as it was often impossible to determine, at once, how long the person had been ill, and besides, entering them in the registers according to the date of their attack, would necessitate the altering and confusing of previously prepared records.

Rapid decrease of cases after fifth day in camp.

From the fifth to the twentieth day, a rapid and almost continuous decrease will be noticed, in the table, in the number of new cases admitted to the hospitals; and in 37 villages out of 75, or in 42 per cent. of our villages, the disease had entirely ceased within this period, and instead of having a total varying between one and two hundred cases a day, as in the first few days after evacuation, we had only 9 cases in our 75 villages. Had we continued the daily columns for some further period, as, for instance, till the thirtieth or fortieth day after evacuation, the decrease would have continued. But, as in a great many instances we found that cases occurring after the twentieth day were due to other causes, such as people surreptitiously entering the village, or from people on disinfection work being attacked, &c., &c., we have contented ourselves by merely giving the total number of attacked after the twentieth day in column H.

Effects of evacuation in the Hoshiarpur District.

Table V drawn up by Dr. Hunter gives the result for the 16 villages in the Hoshiarpur District. The same remarks apply to this table as have been made concerning the Jullundur villages,—except that there is no rise of cases in the first three days after evacuation. There is an almost continuous fall from the date of evacuation to the twentieth day.

Date of "last case" after evacuation.

Table VI gives the time, in days, which elapsed between the total evacuation of the village and the date of the last case, regardless of how people contracted the malady, whether from the village or not;—that is to say, not taking into consideration any of the causes which tended to prolong the epidemic after evacuation.

Table No. IV.

Showing the effect of Evacuation on the Epidemic.

A.	B.	C.	D.	E.	F.																	G.	H.	J.	K.
Serial No.	NAME OF VILLAGE.	Probable date of outbreak (*i.e.*, first case).	Date of evacuation of village.	Total number of cases before evacuation.	Columns showing the number of attacks, day by day, for the first twenty days after evacuation.																	Total of last 20 columns.	Total number of cases which occurred after the twentieth day of evacuation.	Total number of cases up to date.	REMARKS.
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
1	Khatkar Kalan ...	28th April 1897 ...	28th Octr. 1897 ...	68	2	2	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	8		3	79	
2	Jhandher Khurd ...	Unknown ...	11th Novr. „ ...	9	1	...	4	2	3	...	...	...	2	...	...	3	...	1	1	...	1	...	...	...	18		2	29	
3	Khankhana ...	„ ...	6th Decr. „ ...	115	5	8	8	6	1	6	1	...	2	1	...	1	3	...	1	...	...	...	...	...	45		*15	175	* Due to re-infection from the village.
4	Khatkar Khurd ...	23rd Decr. 1897 ...	29th „ „ ...	4	...	1	1	1	1	1	...	...	...	...	1	...	...	...	1	...	...	1	1		6	...		10	
5	Shikohpur ...	Early in „ „ ...	2nd Feby. 1898 ...	23	6	6	5	6	6	5	3	1	5	1	4	...	...	...	1	...	...	1	...	...	50		2	75	
6	Sirhal Qazian ...	25th Jany. 1898 ...	13th „ „ ...	25	1	4	1	3	2	1	2	...	...	2	1	3	2	1	2	...	3	2	1	...	31		26	82	Very inclement weather when these people were turned out.
7	Mallupota ...	28th „ „ ...	21st „ „ ...	43	1	5	4	8	4	3	2	2	...	...	...	...	...	...	1	...	3	2	1	3	41		7	91	
8	Gunachaur ...	2nd Feby. „ ...	1st March „ ...	92	9	6	11	1	4	2	3	2	2	3	2	1	1	...	1	...	2	...	1	...	51		4	147	
9	Jhandher Khurd ...	12th „ „ ...	Not evacuated ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		1	Only one family evacuated.
10	Sahlon ...	During Jany. „ ...	4th March 1898 ...	46	2	...	7	8	4	8	6	6	1	2	2	3	1	2	2	1	2	...	1	...	58		3	107	
11	Mehlgahla ...	22nd Feby. 1898 ...	17th „ „ ...	16	1	2	1	1	2	1	2	...	...	...	...	...	...	...	...	2	2	4	8	...	26		59	101	Due to infection from village.
12	Kamam ...	20th „ „ ...	6th „ „ ...	†1	3	7	4	3	...	6	2	4	3	...	1	...	1	1	...	1	...	1	...	1	38		22	61	† There were 4 cases before evacuation which were not previously recorded.
13	Jagatpur ...	21st „ „ ...	10th „ „ ...	32	4	2	3	4	3	1	...	...	...	...	...	3	...	1	2	3	...	...	...	...	26		5	63	
14	Khatkar Khurd ...	27th „ „ ...	28th Feby. „ ...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2	...		2	Only two families evacuated.
15	Kathsron ...	During Jany. „ ...	10th March „ ...	10	1	...	...	1	...	...	...	4	...	...	...	1	...	...	4	...	2	1	...	...	14		14	38	
16	Karnana ...	28th Feby. „ ...	Not evacuated „ ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		1	See also No. 45. Not at first evacuated.
17	Balon ...	16th „ „ ...	4th March 1898 ...	2	1	1	2	2	4	1	...	1	...	2	...	...	...	1	...	1	3	1	2	...	23		4	28	
18	Lakhpur ...	1st March „ ...	14th „ „ ...	6	1	7	2	5	1	1	...	3	1	1	1	2	...	...	...	...	...	...	...	...	25		...	31	
19	Nurpur ...	28th Feby. „ ...	9th „ „ ...	12	2	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	4		3	15	
20	Lodhipur ...	14th „ „ ...	10th „ „ ...	11	2	4	8	2	3	2	5	2	2	1	1	...	1	2	...	...	...	...	...	...	35		3	49	
21	Sath Kalan ...	26th „ „ ...	15th „ „ ...	6	...	...	1	1	2	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	6		...	12	
22	Mahrampur ...	7th March „ ...	14th „ „ ...	15	3	4	3	4	3	2	3	2	1	1	1	...	...	2	1	...	...	1	...	...	32		9	56	
23	Naura ...	5th „ „ ...	10th „ „ ...	1	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	1	...	3		29	33	The whole village was not evacuated till March 29th.
24	Masani ...	8th „ „ ...	10th „ „ ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	21		1	103	See details in description of Banga.
25	Banga ...	7th „ „ ...	30th April „ ...	81	6	...	2	8	...	2	...	...	...	...	...	1	...	...	1	1	...	...	...	...	17		3	29	
26	Katt ...	24th Feby. „ ...	16th March „ ...	9	4	2	6	2	...	...	...	...	...	1	...	1	...	...	...	1	...	...	...	...	4		‡8	13	‡ Due to people going into village.
27	Haphowal ...	12th March „ ...	12th „ „ ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	1	...	...	...	...	29		3	33	
28	Chakbiliga ...	10th „ „ ...	15th „ „ ...	1	4	1	2	3	3	6	2	1	...	1	...	1	...	2	...	1	...	1	1	...					

29	Dhan	7th March 1898 ...	15th March 1898 ...	12	3	4	5	9	2	...	2	3	...	...	1	...	...	...	1	2	1	1	...	...	34		1	47	
30	Tahirpur	15th „ „ ...	24th „ „ ...	7	11	...	...	2	1	5	2	1	...	...	...	...	...	...	...	2	...	...	...	...	24		...	31	
31	Mazara Nauabad ...	20th „ „ ...	21st „ „ ...	1	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	3	
32	Mahmudpur	4th „ „ ...	24th „ „ ...	9	1	4	2	1	1	...	1	...	...	...	...	...	...	2	...	1	1	...	...	1	15		...	24	
33	Sotran	19th „ „ ...	24th „ „ ...	3	2	2	3	1	...	2	...	...	...	...	1	...	...	...	...	...	...	...	...	...	11		3	17	
34	Musapur	18th „ „ ...	25th „ „ ...	4	...	4	8	4	5	2	...	1	...	1	1	...	...	...	...	...	...	...	...	...	26		2	32	
35	Sodhian	26th „ „ ...	29th „ „ ...	1	1	2	4	2	1	1	2	...	3	3	...	...	...	...	...	...	...	...	...	...	19		1	21	
36	Lidhar Kalan	25th „ „ ...	30th „ „ ...	6	6	2	...	1	1	1	2	...	1	1	...	1	...	...	...	2	...	...	...	...	18		2	26	
37	Khaspur	27th „ „ ...	1st April „ ...	9	1	1	2	3	2	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	11		2	22	
38	Bahrwal	23rd „ „ ...	2nd „ „ ...	8	2	3	1	...	1	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	11		3	22	
39	Mazari	1st April „ ...	3rd „ „ ...	2	...	...	1	4	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...		8	
40	Salh Khurd	29th March „ ...	6th „ „ ...	11	...	3	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...		16	
41	Heon	30th „ „ ...	4th „ „ ...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		2	
42	Langeri	1st April „ ...	5th „ „ ...	4	1	3	3	1	4	...	...	2	...	1	3	...	...	...	...	...	...	...	...	...	18		2	24	
43	Lalpur	2nd „ „ ...	5th „ „ ...	8	1	2	9	1	3	...	2	...	...	1	...	...	1	...	...	...	...	1	...	...	21		...	29	
44	Chahlan	31st March „ ...	6th „ „ ...	6	...	...	3	1	3	2	5	3	1	3	...	...	...	1	...	...	...	...	...	...	22		1	29	
45	Karnana	28th Feby. „ ...	6th „ „ ...	6	10	2	3	4	...	5	1	...	3	...	1	1	...	3	1	...	...	...	1	...	35		1	42	
46	Bisla	1st April „ ...	6th „ „ ...	3	1	...	1	...	7	3	2	...	1	1	1	1	...	1	1	1	...	...	1	...	21		4	28	
47	Aur	5th „ „ ...	Not evacuated ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		1	Not evacuated. See No. 75.
48	Malpur	Unknown ...	9th April 1898 ...	4	...	2	...	...	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...		9	
49	Bika	9th April „ ...	10th „ „ ...	1	...	...	...	...	8	...	...	1	...	...	...	...	...	...	...	1	...	...	...	...	10		5	16	
50	Hansaron	14th „ „ ...	13th „ „ ...	9	1	3	11	3	6	1	5	1	...	...	...	...	...	...	...	...	...	...	...	...	31	...		40	
51	Sirbal Mandi	13th „ „ ...	21st „ „ ...	19	7	2	3	7	8	...	...	...	...	1	3	1	1	3	1	...	...	...	...	...	37	...		56	
52	Dhandhna	10th „ „ ...	15th „ „ ...	1	...	3	3	...	...	2	1	2	2	1	...	...	...	1	4	...	...	1	...	...	20		2	23	
53	Mokandpur	9th „ „ ...	11th May „ ...	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15	
54	Gobindpur	8th March „ ...	25th April „ ...	16	1	...	...	...	...	1	1	...	...	2	1	1	...	...	...	...	1	...	...	...	8	...		24	
55	Lehl	12th April „ ...	18th „ „ ...	11	4	2	...	4	2	...	1	1	2	1	...	...	...	1	1	2	...	...	1	...	22		1	34	
56	Chak Kalal	17th „ „ ...	7th „ „ ...	3	3	7	7	1	2	2	...	3	2	2	...	...	...	...	...	...	...	...	...	...	29		...	32	Evacuated previous to being attacked. They were infected by rats on return to village.
57	Punian	14th „ „ ...	25th „ „ ...	38	4	3	5	4	1	...	...	2	...	...	1	...	...	...	...	...	...	...	...	...	20		...	58	
58	Karina	5th „ „ ...	4th May „ ...	126	...	10	9	35	3	5	2	...	2	...	...	...	...	...	...	...	...	...	1	...	67		2	195	At first refused to come out. Suffered severely in the village.
59	Piragpur	Unknown ...	1st „ „ ...	47	11	9	2	5	4	2	1	1	...	1	...	...	...	...	...	...	...	...	...	...	36		...	83	
60	Rasulpur	10th April „ ...	29th April „ ...	12	3	4	8	5	2	3	3	2	...	...	...	...	...	...	...	...	...	...	...	...	30		...	42	
61	Rehpa	16th „ „ ...	22nd „ „ ...	3	1	5	...	3	2	...	2	2	2	...	...	...	...	...	...	...	1	...	...	...	18		...	21	
62	Gosal	21st „ „ ...	25th „ „ ...	3	...	4	1	...	...	...	...	1	1	1	...	...	...	...	...	...	...	...	...	...	8		...	11	
63	Bhangal	10th „ „ ...	27th „ „ ...	8	9	3	9	3	4	1	2	2	1	...	3	...	...	...	...	...	...	...	...	...	37		...	45	
64	Bajon	20th „ „ ...	29th „ „ ...	10	2	2	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	6		...	16	
65	Mallah	21st „ „ ...	26th „ „ ...	4	...	3	1	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7		...	11	
66	Anjla	21st „ „ ...	13th May „ ...	4	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1		...	5	
67	Chhokran	16th „ „ ...	13th „ „ ...	4	1	1	1	...	1	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	6		...	10	
68	Laroya	21st „ „ ...	18th „ „ ...	4	3	...	1	...	1	...	...	3	...	...	...	...	...	...	1	...	...	...	...	...	9		...	13	
69	Pharala	12th June „ ...	20th „ „ ...	4	...	...	...	1	...	2	4	1	...	...	...	...	...	...	...	...	...	...	...	1	9		5	18	
70	Ludhana Jhika	1st „ „ ...	22nd „ „ ...	5	...	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...		9	
71	Phaura	1st „ „ ...	26th „ „ ...	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...		4	
72	Toran	5th May „ ...	25th „ „ ...	3	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...		4	
73	Jhingar	28th April „ ...	26th „ „ ...	2	3	...	1	2	...	1	3	1	...	...	...	...	...	...	...	...	...	...	...	...	11	...		13	
74	Bahrwal	22nd July „ ...	Not evacuated ...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		1	
75	Aur	5th April „ ...	23rd July 1898 ...	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...		4	The whole village was not evacuated till August 11th. But there were no more cases.
			Total ...	1,099	155	165	183	189	120	94	77	61	49	28	32	29	11	26	27	26	26	17	21	9	1,345	262	2,706	

Table No. V.

Showing the effect of Evacuation on the Epidemic in the Hoshiarpur District.

A. Serial No.	B. Name of village.	C. Probable date of outbreak (*i.e.*, 1st case).	D. Date of evacuation of village.	E. Total number of cases before evacuation.	F. Columns showing the number of attacks day by day for the first twenty days after evacuation. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	G. Total of last 20 columns.	H. Total number of cases which occurred after the twentieth day of evacuation.	I. Total number of cases up to date.	J. Remarks.
1	Birampur	5th Novr. 1897 ...	26th Decr. 1897 ...	24	1	2	1	...	2	...	...	...	1	1	2	..	..	1	..	...	...	...	..	2	13	12	49	
2	Purkhowal	27th Jany. 1898 ...	3rd Feby. 1898 ...	8	Thirteen cases.																				13	2	23	Thirteen cases occurred during the first 20 days, but it cannot be ascertained on which days they occurred.
3	Rampur-Bilron ...	31st Jany. „ ...	6th May „ ...	23	6	3	...	...	...	...	...	...	...	...	...	...	...	1	...	..	..	...	...	10	*10	43	
4	Simul Mazara ..	28th Jany. „ ...	5th March „ ...	8	...	4	2	3	2	1	3	1	1	1	2	..	2	1	4	2	1	1	3	...	34	9	51	
5	Dheron	27th Jany. „ ...	20th Feby. „ ...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	*Seven of these cases occurred really before the evacuation of the village during the month of April, but they were not shewn in the report till the 7th June 1898.
6	Bhajjal	6th Feby. „ ...	24th Feby. „ ...	10	4	3	4	4	7	5	3	3	..	4	...	1	...	...	...	...	..	1	...	...	39	3	52	
7	Sadhowal	Unknown	6th March „ ...	...	3	...	2	...	2	2	6	1	..	...	1	1	...	...	...	...	...	..	...	...	18	4	22	
8	Hajipur	6th March 1898 ...	2nd April „ ...	45	8	12	2	6	4	7	...	...	...	1	3	...	...	...	...	...	...	...	...	...	43	2	90	
9	Parowal	18th „ „ ...	24th March „ ...	10	...	4	2	3	...	4	1	2	...	...	1	1	...	...	...	...	...	...	...	...	18	2	30	
10	Garhshankar ...	23rd „ „ ...	2nd May „ ...	94	13	13	10	8	8	4	1	1	1	3	..	..	..	..	..	..	..	..	..	..	62	1	157	
11	Sanwali	Unknown	5th April „ ...	16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16	
12	Kulewal	„	30th „ „ ...	17	2	...	...	...	1	..	1	...	...	...	...	...	...	...	...	†5	...	...	...	...	9	1	27	† These 5 cases which should have been previously entered were omitted by mistake.
13	Garhi	„	30th „ „ ...	19	On 1st and 2nd days. 56		13	5	8	1	2	...	..	1	..	1	1	...	...	...	..	1	1	..	90	1	110	
14	Chinkoá	21st April 1898 ...	1st May „ ...	4	1	...	1	...	...	...	1	...	...	1	1	1	...	...	...	...	..	1	...	...	7	3	14	
15	Bhagwain	12th May „ ...	20th „ „ ...	5	...	2	1	2	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	6	...	11	
16	Palewal	Not stated	13th June „ ...	1	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	4	
			Total ...	288	95	45	38	31	34	24	18	8	4	12	10	5	3	2	5	2	7	4	3	2	365	50	703	

Table No. VI.

Table showing the period which elapsed between the date of the total evacuation of the Village and the date of the last case of Plague.

Jullundur District. Serial No.	Name of village.	Last case. Number of days after evacuation.	Serial No.	Name of village.	Last case. Number of days after evacuation.	Serial No.	Name of village.	Last case. Number of days after evacuation.	Hoshiarpur District. Serial No.	Name of village.	Last case. Number of days after evacuation.	Remarks.
1	Khatkar Kalan ...	36	26	Katt	40	51	Sirhal Mandi	24	H 1	Birampur	42	
2	Jhandher Khurd ...	37	27	Haphowal	52	52	Dhandhua	22	2	Purkhowal	35	
3	Khankhana	53	28	Chak Bilga	30	53	Mokandpur	None.	3	Rampur Bilron ...	42	
4	Khatkar Khurd ...	12	29	Dhahan	18	54	Gobindpur	18	4	Simul Mazara	27	
5	Shikohpur	31	30	Tahirpur	16	55	Lehl	25	5	Dheron	None.	
6	Sirhal Qazian	54	31	Mazara Nanabad ...	6	56	Chak Kalal	20	6	Bhajjal	33	
7	Mallupota	31	32	Mahmudpur	20	57	Punian	11	7	Sadhowal	21	
8	Gunachaur	27	33	Sotran	37	58	Kariha	31	8	Hajipur	25	
9	Jhandher Khurd ...	None.	34	Musapur	45	59	Piragpur	10	9	Parowal	36	
10	Sahlon	27	35	Sodhian	26	60	Rasulpur	8	10	Garhshankar	52	
11	Mehlgahla	47	36	Lidhar Kalan	29	61	Rehpa	17	11	Sanwali	5	
12	Kamam	25	37	Khanpur	25	62	Gosal	10	12	Kulewal	33	
13	Jagatpur	34	38	Bahrwal	24	63	Bhangal	11	13	Garhi	22	
14	Khatkar Khurd ...	19	39	Mazari	7	64	Bajon	8	14	Chinkoa	36	
15	Katharon	37	40	Salh Khurd	4	65	Mallah	4	15	Bhagwain	8	
16	Karnana	Not evacuated.	41	Heon	None.	66	Aujla	5	16	Palewal	None.	
17	Balon	29	42	Langeri	29	67	Chhokran	12				
18	Lakhpur	12	43	Lalpur	18	68	Laroya	16				
19	Nurpur	37	44	Chahlon	24	69	Pharala	31				
20	Lodhipur	34	45	Karnana	26	70	Ludhana Jhika ...	2				
21	Salh Kalan	11	46	Bisla	33	71	Bhaura	2				
22	Mahrampur	46	47	Aur	None.	72	Turan	2				
23	Naura	None.	48	Malpur	8	73	Jhingar	8				
24	Masani	38	49	Bika	37	74	Bahrwal	None.				
25	Banga	51	50	Hansaron	8	75	Aur	1				

NOTE.—Average in the Jullundur District ... ... 21 days.
„ Hoshiarpur „ ... ... 26 „

The time it takes to stop the disease by evacuation of villages.

It will be seen from these figures that the longest period which it took to eradicate the disease was fifty-four days in the case of Sirhal Qazian in the Jullundur District, and fifty-two days in the case of Garhshankar in the Hoshiarpur District. But, on the other hand, in several instances, no new cases occurred after evacuation. The average time for the disease to stop was twenty-one days in the Jullundur District and twenty-six days in the Hoshiarpur District. It is impossible to suppose that this quick termination of the epidemic, after evacuation, was due to any other cause except the beneficial ones directly due to the evacuation. If any further proof were required, it would be found in the fact that, as the weather got warmer and the people huddled less together in the camps, the effects of the evacuation became more and more marked. Thus in December, January and February it took thirty-seven, fifty-three, twelve, thirty-one, fifty-four and thirty-one days to eradicate the disease from each of the 6 villages, while in June and July of the 11 new villages treated, with the exception of Pharala, which gave an unexpected case thirty days after evacuation, no village produced cases after sixteen days.

The villages of Sirhal Qazian, Mallupota and Gunachaur were got out into camps during the inclement cold and damp weather of February when the conditions of camp life were unfavourable to stopping the disease. The effect was marked on the returns as shown in the table.

Disinfection of camps hastens the end of the epidemic.

In connection with these evacuations, we ought to mention the "primary" disinfection of the camps, as on it also depends part of the success of the operations. It was always carried out in the segregation camps, and in certain villages in which the disease did not stop quickly after evacuation such as Khankhanan, Shikohpur and Mehlgabla, it did so immediately we disinfected all the camps. If this disinfection be looked upon as one of the necessary details of the evacuation and, if it were carried out systematically in all the camps and not in a few, as has been done in most of our villages, then, there is little doubt that, we should greatly diminish the time it would take to eradicate the disease. Instead of the average being over twenty-two days after evacuation, it would probably be under twenty days.

Comparing the number of cases, before and after evacuation, is not a fair test.

On looking into the figures before us, one is very inclined to compare the number of cases occurring in the village before evacuation with the numbers attacked after evacuation. But, for several reasons, this is not a very useful comparison. In the first place, it is almost impossible to get information about all the cases which have occurred in the village previous to our arriving. In fact, months afterwards information concerning cases and deaths previously quite unsuspected by us have been brought to light. While it is practically certain that we got hold of all the cases occurring in the camps after the evacuation, as well as many cases attacked in the village, but not found till they were in camp. The consequence is that the figures after evacuation would tend to be larger than those before evacuation. Then again, in many of our villages, we were able to get hold of the first person attacked while he was still ill, and to evacuate the *mohulla* or the village as circumstances permitted. In these cases the epidemic practically began after the people got into camp. Here again, the figures after evacuation would be larger than those before the operation. It is due to these facts that the figures in both the districts under consideration are larger for the first twenty days after evacuation than during the whole period before evacuation. They probably indicate that we had got the epidemic at its height, or while still increasing in most of our villages. But the fall is so considerable after this first period in camp that the figures are worth quoting. Thus, in Jullundur, we have records of 1,099 cases occurri in 75 villages before evacuation. But during the interval, from the 20th in camp up to the end of the epidemic, there were only 262 cases in the villages. In like manner the figures fell from 288 to 50 in the District.

Long standing epidemics.

If we consider villages in which the disease had existed some where a large number of cases (say over 50) ha before evacuation we find the following results:

TABLE No. VII.

Village.	Before evacuation.	For the whole period after evacuation.	Remarks.
Khatkar Kalan	68	11	
Khankhanan...	115	60	In this case there was a recrudescence due to the disinfecting villagers being attacked.
Gunachaur	92	55	
Banga	81	22	
Kariha	126	69	Including 35 cases entered on fourth day after evacuation which were old cases.
Garhshankar...	94	63	Nearly all the cases occurred within the first five days after evacuation.

To this list may be added Shikohpur, which is stated to have had at least 30 deaths beyond the 23 cases, of which we have records. Thus the attacks before evacuation were 53, after 52.

To these instances, the argument might be put forward that we got the disease at a stage when the epidemic was naturally beginning to abate. This is always a hard assertion to refute. But it cannot be brought against the 56 villages in which evacuation was carried out before 10 cases had been attacked in the village. In these cases in which the epidemic could only be said to be beginning the disease in almost every instance was quickly banished from the locality.

Evacuation of villages successful at all times of the year and in large villages.

It is therefore fairly well established that, in evacuation of villages, we have a method of quickly and certainly stamping out plague. In not a single village in the areas under consideration can it be said to have failed. It was successful in every season of the year, though it took longer in the winter than in the summer. It was equally successful in large villages of from 3,000 to 6,000 people as in little hamlets.

Partial Evacuation.

Ten villages in which partial evacuation was tried.

The question which now naturally arises is, whether partial evacuation would not have been quite as effectual as total evacuation of the villages. It would certainly have been cheaper, and given less trouble to all concerned. The method was attempted in the following instances:—

I. *Mehlgabla* (*No.* 11).—The first case was an "imported" one; it was found early,—the day after attack. Only one house was evacuated on the 23rd February, and subsequently disinfected. But the disease spread, and the whole village had to go into camp on March 17th.

II. *Karnana* (*Nos.* 16 *and* 45).—The man attacked lived really in Kamam, but had his shop in Karnana where he was attacked. He was removed to Kamam hospital and his house locked up and subsequently disinfected; but the disease spread to the adjoining houses, and the whole village had to be evacuated on 6th April.

III. *Naura* (*No.* 23).—Only one case occurred in this village. Three houses were evacuated, and no further cases occurred.

IV. *Masani* (*No.* 24).—Only one case was found on March 10th. Two families living in one courtyard were put into camp. Their houses were disinfected. But the disease spread, and the whole village was evacuated on the 29th of the same month.

V. *Banga* (*No.* 25).—The system of evacuation by *mohullas* was given a long trial. Even removing 200 people for one case did not check the spread. For details see Banga, page 30.

Haphowal (*No.* 27).—One case discovered on March 12th. It had only just been attacked. The family was segregated and the house disinfected. But the disease spread, and the whole village had to be turned out on the 29th of the same month.

Table

VII. *Aur* (*Nos.* 47 *and* 75).—In this case a partial evacuation on April 7th seemed successful. But the village had eventually to be evacuated in July on account of 4 cases which were found at that time.

VIII. *Mokandpur* (*No.* 53).—Partial evacuation of an outlying portion of the village was attempted on 15th April. But the disease spread and the whole village had to go cut into camp on the 11th of the following month, after which the epidemic stopped.

IX. *Gobindpur* (*No.* 54).—Only the infected *mohulla* was evacuated, but failed to stop the epidemic. The whole village went out into camp ten days later.

X. *Rampur Bilron* (*No.* 3—H).—Partial evacuation was attempted in January and was apparently successful. But the village was re-infected in April, and the disease spread rapidly, and the place had eventually to be entirely evacuated and disinfected.

Partial evacuation entirely failed in 7 villages, and only entirely successful in one case.

Thus it appears that in 10 villages in which partial evacuation was attempted it only entirely succeeded in one case—Naura. There was partial success in two cases—Aur and Rampur Bilron. But these villages got re-infected, and had eventually to be evacuated, while it will be remembered that in the case of the villages of Jhandher Khurd, Khatkar Khurd and Bahrwal, which were re-infected after complete disinfection, the disease did not show any tendency to spread, and partial evacuation was then successful.

It is therefore our strong opinion that, as far as villages are concerned, partial evacuation is only feasible when we have simply one family to deal with, and that only in the hot weather. If more than one family be attacked the whole village should be evacuated with the utmost celerity. The only exceptions being made are villages in which disinfection has lately been carried out, when the partial evacuation usually succeeds.

In Section III it will be seen that Dr. Clark (page 153) does not agree with us in this matter. He believes that partial evacuation could be more extensively resorted to, and instances the methods adopted in England to check small-pox. In answer to this, we may state that his experience of plague was gained in the hot weather, when the disease showed little tendency to spread, and when therefore the conditions for checking the spread were more favourable than at other times of the year. Besides, small-pox, as far as we know, is not spread by rats, while plague is eminently so. It is probably this fact which has made partial evacuation fail, not only with us, but in other parts of India where it has been tried. The diseased people are removed, but the diseased rats are left behind to spread the infection to the neighbouring houses.

INSPECTING STAFF.

Inspecting officers.

When plague was first discovered in the Jullundur District, Dr. Nicholson was deputed to travel about in the Nawashahr and Banga division of the district and Dr. Datta in the adjoining portion of the Hoshiarpur District, and to carefully examine every village with a view to getting early information about the disease. By this means several plague infected villages were discovered. Dr. Davidson relieved Dr. Nicholson in December, but otherwise there was no change in the staff. When, on February 1st, Shikohpur was discovered and it was found that the inhabitants had been able to hide the existence of the disease for at least a month, if not two months, and had probably already communicated the disease to other villages, it was felt that something more must be done to ensure early information. It was of vital importance that we should get news directly the disease appeared in any new village. Colonel Massy, the Commissioner, instituted a system

Rewards and punishments.

of rewards to persons giving the first reliable information, as well as insisting on the punishment of the headmen of villages where the occurrence of the disease was wilfully kept secret. The plan worked admirably. Before the people were very reticent, and even when giving information, often refused to give names and details; so that after getting to the village we were sometimes unable to find the cases.

Afterwards, zaildars, lambardars, police, chaukidars,—in fact everybody—showed an eager desire to obtain the fifty rupees reward which was offered for reliable information concerning every new village. This desire was intensified by the prosecution and imprisonment of some lambardars who had hidden cases of plague in their villages. Arguments have been brought forward against the reward system, and it is affirmed that it would cause the "native gentry" to stand aloof from us, instead of trying to help us; and also that it would cause ill-feeling among the various villages which gave information. We never found that the first ever happened. In fact, the "native gentry," such as we had in the district, showed quite as much keenness to get the reward as the poor chaukidar, and in at least two cases did not scruple to appropriate the money which should have gone to the poorer official. That the system would cause ill-feeling, we think most probable. But any form of information given against the will of those who have an interest in hiding it, causes ill-feeling. It is certainly better that this should take place than that the disease should exist, as it did in Shikohpur, and cause a mortality the amount of which we have up to this day never accurately gauged. Besides, the villagers seem quite capable of settling disputes of this kind among themselves, and as a matter of fact, we had no trouble on this score. In March, a further development of the "Inspecting Staff" took place. The eastern portion of the Jullundur District and the southern portion of the Hoshiarpur district were each divided into circles as follows:—

Increase of inspecting staff with nine inspecting circles.

Jullundur—Phagwara, Banga, Nawashahr, Rahon and Aur.

Hoshiarpur—Garhshankar, Saiba, Malpur and Balachor.

Each had a European officer in charge, and one or more naib-tahsildars, hospital assistants, kanungos and patwaris. They were made responsible for a given defined area, and weekly inspections were made of every village in their *ilaqa*. Carefully prepared nominal rolls were made of every village and kept by the patwari. When the inspecting officer came round, the whole village was paraded in front of him, and the hospital assistant examined the pulse and tongue of each person. In the case of purdah-women, European nurses and *dhais* were used. The system seemed perfect on paper, and indeed gave excellent results. But there were one or two small defects in it. There were very few medical officers on this work, and the detection and diagnosis of single isolated cases of plague is often very difficult. Very few of the hospital assistants placed on this work had ever seen a case of plague before they came on duty. The consequence was that the executive staff were often unnecessarily troubled. In one case the inspecting officer reported plague in three new villages. Police cordons were immediately got ready, huts and carts were ordered and one of the plague medical officers, who was already very hard worked, had to go off to make arrangements. On arriving at each village in turn he found the cases reported were not plague. We should, therefore, advise, if in future we have again to carry out inspection work and medical officers are not available, that the hospital assistants placed on this duty be men who have had practical experience of the disease. The young and new hands could be put on to executive work, such as hospital duties till they had mastered the rudiments of the diagnosis of plague.

Defects in inspection work.

Roll-calls and inspection work.

Another fact which was prominently brought forward in several instances was the ease with which cases could be hidden in the village even when that village was being thoroughly inspected. In the case of Punnian we ourselves attended the roll-call and inspected the people. Yet a woman actually down with the disease was never discovered, as her sister, from another village, personated her at the muster. Sotran was inspected one evening by the inspecting staff and no illness found; yet two cases of plague were found the following morning which must have existed over night. In Haphowal the whole village was turned out in the morning without avail, but four cases were found by the executive staff on the same afternoon. All this tends to show that merely turning out the people and reading out their names is not sufficient to detect the disease. We must have the co-operation of the headmen of the village, and the only way of getting this is by paying for it, or punishing heavily

those who oppose us. Dr. Walton's views on this matter do not entirely agree with ours. But as he has done inspection work and knows the difficulties to be contended with, his opinion we consider most valuable, and his notes on the subject are given in full on page 164, Section IV of this report. Dr. Clark's views on this matter are given on page 155. It will be seen that he practically agrees with us. We do not, however, believe that plague cases would often or even ever be imported for the sake of the reward. The people are much too afraid of the disease to allow this. They fear the disease everywhere, and if we do not get early information, it is because they fear our treatment more than the disease. This, in most cases, we were able to satisfy ourselves, was due to false reports as to our methods and to the natural superstition of the natives.

POLICE CORDONS.

Importance of cordons.

This is not purely a medical question. But from the fact that the cordons were the chief measure used to prevent the spread of the disease they require to be considered from the medical side. It will be remembered that in every locality where we found plague we immediately placed a cordon of police round the boundary of the fields belonging to the village. This prevented communication with the outside world, while it allowed the zemindars to carry on their ordinary agricultural pursuits. As more than three-quarters of the people with whom we had to deal earned their livelihood by the tilling of the soil, very little hardship was experienced, and, as other things were favourable in the spring, the people thus imprisoned were able to reap an exceptionally good harvest. Besides this outside cordon, there was another inner one placed close round the village to guard all its entrances, and thus keep the people who were out in camp from entering the village where infection lingered till the disinfection of the houses had been completed. As already stated, this cordon had often to be dispensed with for want of sufficient men. In these cases we nearly always got people infected from going into the village and the disease in consequence took longer to stamp out. This cordon, if constituted, was removed when the people returned to the village. The outer cordon was not removed till the village was declared free, that is ten days later; after the people had been under observation for this period in their homes. In May and June, the cordon was sometimes removed six days after the return of the village, the village not being finally inspected and declared free till the tenth day.

There cannot be any doubt in any one's mind that the cordons were most essential. They prevented the very large emigration from village to village which the fear of the disease naturally engenders, and were, therefore, very material in checking its spread, which has been shown to be chiefly caused by human agency. We have therefore placed our chief reliance on the efficiency of these police sentries placed all round the various infected areas.

Cases of persons transmitting plague in spite of the cordon.

On looking back on the history of the spread of the epidemic (see first section of this report), we find that there is a record of human agency in the case of 67 villages, and on further analyzing these cases we find that in 45* cases the people carrying the infection must have broken through the cordon. Thus had our cordons been perfect we should have had 45 fewer villages to deal with, and as these were the means of infecting other villages, it is not saying much to affirm that our work would have been, at least, halved had our cordons been absolutely reliable.

Cordons in some cases too weak.

In what way did the cordons fail, and how was it that people were able to pass through our living barrier? There are two possible sources of failure. One is, that our cordons may have been too weak, the other that possibly the police sentries were open to corruption, as all low paid native officials in India are liable to be. That the first was one of the causes is pretty evident, when we remember that eight sentries to the mile was the strongest cordon employed, and sometimes they were much less. Such a

* In the cases of Garhi, Sirhal Mandi and Malpur the medium of transference of the disease is unknown though the infection took place after the village giving the disease had been cordoned.

cordon would be inefficient to stop people in broad daylight especially if there were any crops lying between them. But they must have been practically useless when nightfall arrived. It is true that at the height of the epidemic there were no more police available; but, long before this time, our cordons were weak, and hence the increase in the number of our villages affected.

As to the second suggestion that the police may have allowed people to pass on receipt of some illegal gratification, which was frequently hinted at, we have no definite grounds to go upon.

In fact, to our mind the weakness of the cordon is sufficient to account for the inefficiency to stop communications. But, if the authorities think that the other suggestion was a possible source of weakness, it might be possible to substitute a military for a constabulary cordon. The former are under more strict discipline, and, as they have a much larger proportion of European officers, are more closely supervised.

A suggestion of a double cordon.

A suggestion worth considering, if again next cold weather we are unfortunate enough to have a recurrence of the epidemic, would be to have a double cordon. Thus it might be possible to have a police cordon just inside the village boundary, and a hundred yards outside this a military cordon. In this way there would be a double barrier and a certain amount of rivalry between the two sections. Any person coming from within even if he happen to pass the police cordon, would be pretty certainly stopped by the outer military cordon, and *vice versâ* in the case of people trying to get in from outside. This plan would only be practicable if we had to deal with a few villages. In suggesting this plan one has in mind the case of Astrakan, which some years ago suffered from an extremely virulent form of plague. The Russian authorities did little or nothing to stamp out the epidemic. They certainly sent four doctors to treat cases. But three of these succumbed to the disease. But those in charge of the operations spent all their time and energy in making an efficient cordon. Military only were employed, and these were all armed with shot. They made three cordons in three circles—one outside the other—and these were so effectual that the disease never spread; but, after devastating the locality, died out.

It is not necessary to go to this extreme to get an efficient cordon. On service, it is usually possible to have a sufficient number of sentries placed round a camp extending for miles to keep out the enemy. Surely, it is possible for us to have enough men placed round a village area to keep in an enemy far more terrible than any foreign foe. It seems to us to be only a question of the number and efficiency of men available.

When we remember that it is man or man and his clothes which carries infection from one locality to another, in at least 93 per cent. of the cases recorded, it behoves us to pay every attention to our cordons, which are the only means we have for preventing persons moving from place to place.

In the case of the remaining 7 per cent. in which the disease may be carried by rats. These will never carry it very far: possibly to the next village a mile away. But we can easily deal with these localized areas.

Passes.

Intimately connected with the question of cordons comes the question of passes. Great care has to be exercised in the supervising, granting and checking the egress and ingress of officials connected with the plague operations.

The method adopted during the cold weather was that each of the European officers in charge of the various sections—civil, police and medical—was able to write passes for those working under him. These passes were collected by the police at the head-quarters of each cordon and sent in daily to the Assistant Commissioner in charge of the plague operations of the circle, who scrutinised them and referred them to the officers concerned, when any doubt existed as to their genuineness or regularity. The

plan, we believe, acted admirably, and the only improvement necessary was that the forms might have been printed on various coloured cards to indicate whether they were temporary or permanent passes, or only passes to allow certain persons to pass some particular cordon, such as people being allowed to go to the general quarantine camp, or stores being carried in carts along the main road from Phagwara to the plague officers, or police camps. This was attempted and eventually carried out in May. But the order which accompanied it, that all passes must be signed by the Assistant Commissioner in charge, almost nullified their efficiency. He was pestered for passes morning, noon and night, and had to give something like a hundred a day. It was impossible for him to investigate each case, and the interruption to his ordinary work must have been considerable. The old plan of allowing each European Officer to be responsible for the passes issued to his subordinates was therefore reverted to and answered admirably. There is no instance, in the present epidemic of the disease having been transmitted by any abuse of passes or even by officials. But, it appears, that the disease was introduced into Garhshankar from Birampur, by persons pretending to be cartmen bringing hut-making materials and lime across the cordon.

The orders concerning cordons and passes were as follows:—

Cordon Rules issued by Major Inglis, May 2nd, 1898.

1. The Assistant Commissioner in charge of each group of villages (at present the groups are the Banga, Nawashahr, and Garhshankar groups) is responsible for ordering a cordon to be put on or taken off a village, and no other officer is to give directions in this respect.

2. The police officer posted to each group, on receiving instructions from the Assistant Commissioner, will at once proceed to obey them, first obtaining detailed instructions from the Assistant Commissioner on all necessary points, especially in the case of cordoning a village as to whether the whole village area or only some portion of it is to be cordoned.

3. The police officer in charge of the whole police in the plague area is requested to issue detailed instructions as to duties of his assistants, of the inspectors, deputy inspectors and sergeants in respect to this cordon duty, laying down especially the periods within which the cordons are to be inspected by each officer or sergeant.

4. No one but European officers will be allowed to pass the cordon without a written pass.

5. Passes will be of three kinds—

(1). Permanent,

(2). Temporary,

(3). To go into quarantine camp,

and no pass of any kind can be given by any official other than the Assistant Commissioner in charge of a group of villages.

6. Permanent passes may be given only to tahsildars, naib-tahsildars and assistant surgeons whose duties must take them continually in and out of the cordon.

Temporary passes may be given to officials of all other ranks whose duties take them across the cordon and returned by the police to the Assistant Commissioner who issued them.

Passes to go into quarantine camp at Bahram may be given to every one wishing to go into quarantine. The police will arrange to escort these persons from the cordon line to the quarantine camp.

A list of all *temporary* and *quarantine* passes must be sent by the Assistant Commissioner issuing the passes to Major Inglis on special duty at Phagwara the evening of the day of issue.

Passes to leave the quarantine camps can only be given by the medical commissioned officer in charge of the camp and must state that the bearer has been under observation for ten days and is free from infection.

7. Supplies, stores, &c., can only be brought into the cordon by being transhipped at places appointed for this purpose. The Assistant Commissioner in charge of groups of villages will arrange for this and report to Major Inglis the places fixed on. The fewer number of these transhipping stations, the better.

REVISED RULES FOR PASSES.

Copy of a letter No. 643, dated 19th May 1898, from Major E. Inglis, Deputy Commissioner on Special Duty, Phagwara, to the Assistant Commissioner, Banga.

With reference to the Cordon Rules issued on 2nd instant, I have the honour to sanction the following rules regarding passes:—

1. A permanent pass granted by one Assistant Commissioner will enable the holder to cross the cordon line of any group of villages.

2. Civil, medical and police officers may be provided with some of the printed passes which in cases of necessity they can give to persons whom they have during their day's work to send on urgent business across the cordon line.

3. The hospital assistants in charge of village hospitals may be provided with printed passes which they can give to messengers whom they have to send across the cordon line either to the head-quarters of their group or elsewhere on urgent messages. These passes should be marked "Hospital Assistants' Passes," and the hospital assistants must report to you the number of passes issued by them.

4. The list of passes sent to me may be discontinued, but the lists of passes to enter the quarantine camp must be sent to the medical officer in charge.

I shall be obliged if you will give the necessary orders to the police and will let all officers in your group know of these revised rules.

Quarantine Camps.

Quarantine camps were formed from time to time to allow persons leaving the district to undergo ten days' observation and a final disinfection before departing. The people who usually underwent this were (1) officials ordered to fresh districts, (2) prisoners being taken to the head-quarters or to jail, and (3) persons who would suffer heavy loss if not present in some other locality by a certain date. These people on leaving were provided with special medical certificates stating that they had undergone the necessary precautions. The largest of these camps was formed near Bahram, a village nearly half-way between Phagwara and Banga. Railway observation posts were also formed at the Sutlej near Ludhiana and at the Beas, which are the two rivers which bound the Jullundur District on the west and east. These posts were of the ordinary kind which have been organized in various places on the line of railway throughout India during the past eighteen months and need no detailed description in the present report.

NOTES ON THE PROPHYLACTIC INOCULATION AGAINST PLAGUE IN THE JULLUNDUR AND HOSHIARPUR DISTRICTS, 1897-98.

PROPHYLACTIC INOCULATIONS.

Nature of plague prophylactic.

Before commencing the account of the inoculations in the Jullundur District, a word as to the nature of the prophylactic is necessary. It is usually spoken of as the "Prophylactic serum"; but it is not a serum in the true sense of the word. Serum is the watery portion of blood, while the material supplied is *bouillon* or broth prepared, filtered and sterilized in a special way. In this are grown plague bacilli until the solution becomes sufficiently impregnated with the cultivation. The bacilli are then killed by being kept at a temperature of 140° F. for a given period. The fluid is then placed in suitable bottles and hermetically sealed. The phials received by us have usually had the capacity of about 4 oz. and have contained about 3 oz. of the fluid. Smaller phials have lately been sent; but they are not so handy as the larger ones, as they necessitate the delay in opening a larger number of bottles when many inoculations have to be done. The medium, when it reaches us is a light brown slightly turbid fluid. It is the *bouillon*, containing the dead bacilli with their toxins which is inoculated under the skin. It is very favourable for the growth of many kinds of bacteria besides plague, and consequently special precautions have to be taken to prevent the germs of putrefaction, &c., getting into it during manufacture and at the time of using it, when the results would be disastrous if inoculated into persons. The details of the process of inoculation have already been given in a former report.

There is no objection to using the general term "serum" as long as it is clearly understood that the preparation is not made from the blood of animals as all true serums are. A better term would be the anti-plague prophylactic medium, and this, we believe, is the term Professor Haffkine himself uses.

Dose to be given. Symptoms which follow inoculation.

From 2 to 3 *c. c.* of the medium of standard strength is the dose recommended by Professor Haffkine for an adult and proportionally smaller doses for children. The serum received here has been of half strength and sometimes even weaker. Consequently double or treble doses have been given. In the accompanying tables the actual doses are not named, but are corrected to the standard dose for the sake of uniformity and to allow of comparisons being made. The actual amount of fluid inoculated is immaterial, while the amount of toxin used is the important point. In all cases, where the inoculations have been successfully carried out the patient has had fever varying from 100° to 103° F. which passes off in a couple of days. There is usually swelling and pain at the seat of puncture which often lasts several days and may last over a week. Headache and a feeling of general malaise is common. In a large number of cases there was drowsiness which lasted one or two days. This symptom we have not seen mentioned elsewhere. But it is so marked in some cases that we cannot believe it has passed unnoticed. In no case have we seen any permanent discomfort arise from the inoculations, though a slight hardening, at the place of insertion of the fluid, often remains for several months.

The severity of the symptoms are proportionate to the dose given. If no symptoms arise after the first inoculation, the dose should be increased for the second, while severe symptoms after one inoculation are indications for reducing the dose in the second operation. It is a matter of regret that only a small proportion of those inoculated come again for the second dose which is usually given from eight to ten days later, but which can be given at any later period.

Officers performing the inoculations.

The operations have been carried out by Surgeons-Captain Wilkinson, Buist and James, and Dr. Fatteh Chand in the Jullundur District and by Surgeons-Captain Clark, Hunter and Heard in the Hoshiarpur District.

When plague was discovered in the Jullundur District in October last, one of the first things done was to wire to Professor Haffkine for 1,000 doses of his prophylactic injections. In the course of a fortnight 200 doses arrived with a note stating that more would be sent if required.

Inoculations at Khatkar Kalan.

In the meantime, the inhabitants of Khatkar Kalan, the village where the disease existed, had been got out into camp, and the disease had diminished to such an extent that it was felt that even if inoculations were carried out, very little opportunity would present itself for testing the efficacy of the new prophylactic. However, between November 5th and 8th, 209 people in the largest camp, called the Jhandaji Camp, and containing altogether 600 people, were inoculated. With the exception of one man who had fever at the time of his inoculation and took to his bed the following morning no cases occurred in this camp after the inoculations. The case mentioned was a very mild one and for some time it was difficult to decide whether it was plague or not. As the man must have been infected before the inoculation took place and was ill when inoculated, he is not included in the statistics given later on.

Inoculations at Banga.

We unfortunately had a better opportunity in the case of Banga town. This place is situated on the high road half-way between Phagwara and Nawashahr. It contains 4,917 people (actual census taken in March last), and as it is the central market place for all the villages in this part of the Jullundur District, it was felt that if plague increased it was pretty sure to get into Banga. In fact, a little village called Khatkar Khurd, only half a mile from the town, had already got attacked. It was therefore decided not to wait for actual cases, but to start prophylactic inoculations. Accordingly more prophylactic medium was indented for, and March 11th was fixed for the first day of inoculations. Curiously enough, the first case of plague was discovered on the same day. Only eight people presented themselves; but one of them was the zaildar of Banga, and another the President of the Municipal Committee. No uneasiness was, therefore, felt as to the possibility of inducing people to come forward. It was, however, thought advisable to wait a day after the first day of inoculations, in order to allow the rest of the people to see the effect of the treatment on those first inoculated. On the 13th, 24 people came up for treatment, and after this date whenever we had spare time we went into Banga and did inoculations. But as new plague villages were springing up on all sides it was often difficult to get time to do all who wished to be done. In spite of this 2,408 people have been inoculated in this district, over 1,000 inoculations have been done in Banga town, but only 865 people actually lived in the town.

Table VIII gives the details according to villages, castes and sex. It will be seen that the largest number of people were done in Banga town and the villages of Dasanjh* and Thandian. But in the two villages no plague occurred, and we have therefore not been able to draw any deductions from the inoculations done in them.

One fatal case of plague after inoculation at Karnana.

The actual villages in which the operations were performed were Khatkar Kalan, Banga, Katt, Chak Bilga, Thandian, Dasanjh, Pharala, Raipur, Punian and Ganachaur. The inhabitants of the other villages named in the table came chiefly to Banga for inoculation. It will be noticed that 134 people came from Karnana and were inoculated at Banga. Among them was a woman named Khemi, the wife of Ram Singh, a Hindu Rajput; she was forty years old and in good health. A dose of 2 cubic centimetres of the half strength prophylactic, which corresponds to 1 c c. of the standard strength, was administered to her on April 5th; she went home, and subsequent enquiries showed that she had no fever, pain or redness in the site of inoculation following the operation. In fact she showed none of the signs of reaction which usually follow a successful insertion of the prophylactic. The dose was an extremely small one, and was purposely made so with the object of inducing more women from the village to come up for treatment It was intended to give her a second dose at a later date, but she did not come again, and must, therefo e, be looked on as a person insufficiently protected. A case of plague had been discovered at Karnana on March 2nd; but as it was proved to be an imported one, only a few houses were evacuated. However, on April 6th, the disease was found in an epidemic form and the village was accordingly cordoned and entirely evacuated; 42 cases of plague occurred in this village with 24 deaths, among a population of 1,357 people. The only one of the

* This is not the Dasanjh Kalan, where plague cases have lately been found.

Table No. VII.

List showing Sex and Caste of People inoculated in the Jullundar District.

Serial No.	Villages.	Sex.			Hindus.										Muhammadans.										Other castes.				Europeans.	
		Number of males inoculated.	Number of females inoculated.	Total.	Brahmins and Khatris.	Jats.	Tarkhan, Lohar and Chhimbas.	Jhiwars.	Nais.	Kumhars.	Acharajs.	Faqirs.	Rajputs.	Total.	Rajputs.	Moghals and Pathans.	Kassis.	Bharais.	Lohar, Turkhan Teli, Dhobi and Sunnars.	Jats.	Rewals.	Sayad and Sheikhs.	Arains.	Total.	Chamar and Ramdasis.	Chuhras.	Sahnsis.	Total.	Europeans.	Eurasians.
1	Dhahan	12	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11	1	...	12	...	...
2	Katt	30	...	30	...	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	29	...	...	29	...	...
3	Chak Bilga	67	2	69	9	35	21	1	2	...	...	...	...	68	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...
4	Nurpur	12	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12	...	...	12	...	...
5	Sirhal Qazian	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...
6	Khatkar Kalan	127	82	209	41	120	35	1	2	3	...	5	...	207	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...
7	Banga	688	177	865	546	64	82	21	13	3	...	4	25	758	4	2	3	...	23	...	3	15	14	64	38	5	...	43	...	...
		4	1	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	1
8	Gobindpur	2	...	2	...	2	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	Thandian	220	24	244	23	134	13	5	1	1	...	...	..	177	...	...	...	5	13	5	...	...	...	23	36	4	4	44	...	...
10	Pharala	88	...	88	1	2	1	1	...	3	...	2	...	10	...	...	...	...	...	...	...	1	...	1	74	...	3	77	...	...
11	Dasanjh	209	163	372	12	192	61	10	7	16	..	3	...	301	...	...	...	...	2	9	19	...	7	37	28	6	...	34	...	...
12	Karnana	118	16	134	16	10	12	7	...	...	...	...	89	134	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	Raipur	56	4	60	2	25	19	4	...	...	...	...	...	50	...	...	...	...	...	4	...	5	1	10	...	...	...	...	...	...
14	Bhokery	38	4	42	6	26	5	...	1	...	...	...	...	38	...	...	...	...	...	...	...	...	...	...	4	...	...	4	...	...
15	Bika	1	...	1	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	Chimah	1	...	1	...	1	...	...	...	...	...	...	...	1	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
17	Khatkar	6	...	6	...	6	...	...	...	...	...	...	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18	Mukandpur	2	...	2	2	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19	Chhokran	10	...	10	9	...	...	1	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20	Punian	68	22	90	10	58	16	1	3	...	...	...	1	89	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...
21	Mungowal	1	...	1	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	B. Mazari	4	14	18	2	13	...	...	...	...	...	1	...	16	...	...	...	...	...	...	...	...	...	...	2	...	...	2	...	...
23	Herian	3	...	3	2	1	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	Rasulpur	3	...	3	1	...	2	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25	Jhingar	2	...	2	...	1	1	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26	Jadlah	2	...	2	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...
27	Jindwal	1	...	1	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	Heon	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	Hamirowal	2	...	2	...	...	2	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	Salab	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
31	Nawashahr	3	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2	3	...	...	...	...	...	...
32	Jullundur	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...
33	Nagara	1	...	1	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	Dabwal	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	...	...	...	...	...	...
35	B. Mazara	39	...	39	3	27	9	...	...	...	...	...	...	39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	J. Ladhana	2	...	2	...	1	...	...	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...
37	Bahrwal	6	...	6	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38	Bans	2	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
39	Kajhai	2	...	2	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	Gunachaur	61	...	61	8	...	...	...	3	2	...	...	...	...	...	...	...	...	10	...	...	...	5	33	4	12	...	16	...	...
	Total	1,892	516	2,408	695	729	280	53	31	28	...	16	...	1,832	3	6	49	19	22	24	32	181	240	28	7	275	4	1		

inoculated people attacked was Khemi, who succumbed to the disease. She was attacked on 15th April and died on the 21st. We now know that dropping cases were occurring in Karnana between March 2nd when the first case occurred and April 7th when the village was evacuated. It may have been the knowledge of this which induced the people to go all the way to Banga to be inoculated.

On the whole, the experience in this village is in favour of the inoculations. Out of 1,357 people 42 were attacked, making a percentage of 3·094 of the population attacked. From among the 134 persons inoculated only one was attacked, making a percentage of ·74. The one case attacked had an extremely small dose, in fact so small that no reaction followed the operation. The people of the village themselves were the first to notice this fact, as nearly all the others operated on had suffered severely, and they consequently readily gave the information about the absence of reaction in this woman. Of course the experience of one village by itself is not any proof of efficacy. These figures are too small for definite deductions, and the results may be due to other causes.

To return to Banga.

Details of inoculations at Banga.

In this town the inoculations were carried on on a larger scale, and consequently the results are of more value.

The conditions were these: on the day the first inoculations were done, the first *mohulla*, containing 87 people, was evacuated. On subsequent dates more cases were discovered, and more people were turned out in the following manner:—

March 28th, 203 people were placed in camp.
April 7th, 249 " "
" 16th, 64 " "
" 18th, 56 " "
" 19th, 56 " "
" 20th, 28 " "
" 23rd, 28 " "
" 25th, 14 " "

April 27th the commencement of the evacuation of the whole town took place. This was completed on the 29th. Besides this about 150 people left the village and went into camp of their own accord in the various *baghs* round the town before the 27th. Up to the 29th there had been 70 cases with 36 deaths in Banga.

While the *mohulla* system was being carried out, each time a section of the town was evacuated a small cessation in the cases took place. The disease soon ceased to spread in the camps, but re-appeared in the town in portions still inhabited, but usually somewhere near the last *mohulla* evacuated. The general tendency of the disease was to increase. After the whole town was evacuated, plague soon stopped, and, not counting a hidden case found on June 26th and which had been ill several weeks when found, the last case occurred on May 17th, *i.e.*, eighteen days after evacuation. Thirty-three cases and 29 deaths took place after the town came out.

Inoculations were performed between March 11th until the people came out into camp on April 30th.

Altogether, 103 cases of plague occurred with 65 deaths, making a percentage of 2·18 of the whole population attacked, with a mortality of 63 per cent. Taking the inoculated people, 865 in number, 6 were attacked with plague, all had the disease very mildly and none died, making a percentage of ·693 attacked with a mortality of 0 per cent.

Still these figures are open to the objection that the people inoculated may have chiefly come from uninfected streets and *mohullas*, and therefore would naturally have a better percentage of escape from the disease. In order to prove that there is any good in the inoculations it is necessary to show that the people operated on were living in the same conditions as the

Table No. IX.

Table showing the number of persons inoculated and uninoculated in each of the houses attacked with Plague in Banga town.

Serial No. of family.	Inoculated persons in the family.				Uninoculated persons in the family.				Remarks.
	Unattacked.	Attacked but recovered.	Attacked and died.	Total.	Unattacked.	Attacked but recovered.	Attacked and died.	Total.	
1	2	1	...	3	...	...	2	2	
2	2	...	...	2	4	...	4	8	
3	1	...	...	1	..	...	3	3	
4	...	...	...	...	...	...	1	1	
5	2	...	...	2	1	...	1	2	
6	5	...	...	5	6	...	1	7	
7	...	...	..	...	3	1	1	5	
8	2	1	..	3	...	...	...	...	
9	1	...	...	1	3	1	1	5	
10	...	...	..	...	1	1	...	2	
11	...	1	...	1	1	...	2	3	
12	...	1	...	1	2	...	1	3	
13	...	...	...	...	1	1	1	3	
14	1	...	...	1	3	1	...	4	
15	...	...	...	...	2	1	...	3	
16	4	1	...	5	3	1	1	5	
17	1	1	...	2	1	1	1	3	
18	...	...	...	...	3	1	...	4	
19	...	...	...	...	1	1	1	3	
20	...	...	...	...	1	1	...	2	
21	...	...	...	...	...	3	1	4	
22	3	...	...	3	2	1	...	3	
23	2	...	...	2	2	1	...	3	
24	...	...	...	...	1	1	...	2	
25	...	...	...	...	...	...	2	2	
26	...	...	...	...	4	1	...	5	
27	1	...	...	1	2	2	...	4	
28	...	...	...	...	6	1	...	7	
29	...	...	...	...	...	1	...	1	
30	6	...	...	6	1	1	...	2	
31	3	...	...	3	3	...	1	4	
32	...	...	...	...	1	1	3	5	
33	3	...	...	3	3	...	1	4	
34	1	...	...	1	8	1	1	10	
35	...	...	...	...	5	...	...	5	
36	...	...	...	...	...	1	...	1	
37	1	...	...	1	1	...	3	4	
38	1	...	...	1	1	...	1	2	
39	2	...	...	2	..	1	1	2	
40	...	...	...	...	...	...	1	1	
41	1	...	...	1	9	...	1	10	
42	...	...	...	...	7	...	1	8	
43	1	...	...	1	4	...	...	4	
44	2	...	...	2	5	...	...	5	
45	1	...	...	1	4	...	...	4	
46	1	...	...	1	3	...	...	3	
47	...	...	...	...	2	...	1	3	
48	1	...	...	1	1	...	1	2	
49	...	...	...	...	5	...	1	6	
50	1	...	...	1	...	...	...	...	
51	...	...	...	...	6	...	1	7	
52	...	...	...	...	5	...	1	6	
53	...	...	...	...	1	...	1	2	
54	...	...	...	...	3	...	2	5	
55	...	...	...	...	1	...	1	2	
56	...	...	...	...	1	...	1	2	
57	1	...	...	1	...	...	1	1	
58	...	...	...	...	3	...	1	4	
59	...	...	...	...	5	...	1	6	
60	...	...	...	...	2	...	1	3	
61	2	...	...	2	7	...	1	8	
62	...	...	...	...	7	...	...	7	
63	2	...	...	2	1	1	1	3	
64	1	...	...	1	1	...	...	1	
65	3	...	...	3	1	...	...	1	
66	6	...	...	6	...	...	...	...	
67	1	...	...	1	1	...	...	1	
68	...	...	...	...	2	...	1	3	
69	...	...	...	...	...	1	...	1	
70	...	...	...	...	...	...	1	1	
71	...	...	...	...	...	...	1	1	
72	...	...	...	...	...	...	1	1	
73	...	...	...	...	...	...	1	1	
74	...	...	...	...	6	1	...	7	
75	...	...	...	...	6	1	...	7	
76	...	...	...	...	...	...	1	1	
77	...	...	...	...	...	...	1	1	
78	...	...	...	...	3	...	1	4	
79	...	...	...	...	1	1	1	3	
80	...	...	...	...	1	...	1	2	
81	...	...	...	...	4	...	1	5	
Total	68	6	...	74	184	32	65	281	Total in camp—355

people in whose houses plague occurred and were also liable to infection. In order to test this side of the question, we had a complete list made of the segregation and hospital camps at Banga. Here we had 81 families containing 355 souls, who had been placed in these camps because they had cases of plague in their families or because they ran some particular risk of getting the disease, either from the position of their houses or the nature of their work and connections with those already attacked. As a proof that the infection was severe, it may be noted that only 11 out of the 81 families escaped having some member attacked.

On making a separate list of those inoculated and those uninoculated (Table No. IX) and comparing the results, the following interesting figures were obtained:—

Seventy-four people, or a little over 20 per cent. of the two camps had been inoculated. Among these 6 were attacked with plague, but they all had the disease very mildly, and all recovered. Of the rest, that is to say, the uninoculated people 97 out of 281 were attacked, and of these 65 died. Comparing the results by percentages, we get the following figures:—

(1) Inoculated 8·108 per cent. attacked, mortality 0 per cent.

(2) Uninoculated 34·51 per cent. attacked, mortality 67 per cent.

In this instance the difference of the figures is very large, and as the inoculated people were living, and had lived throughout the epidemic, in exactly the same conditions as the uninoculated ones,—first in their houses and afterwards in the camps, and with the same sources and chances of infection, the difference appears to be due to something more than accident. In fact it points to the efficacy of the inoculations.

To draw the net still closer round the people who were unfortunate enough to contract the disease after submitting themselves to inoculation, we find the following results (See Table No. X).

Details of persons attacked after inoculation at Banga.

In the houses picked out, 10 people were inoculated, of which 6 contracted the disease, while in the same houses there were 17 uninoculated persons, 9 of whom contracted the disease. This certainly does not compare well for inoculations. It shows that 60 per cent. of the inoculated were attacked, while only 52·9 per cent. of the uninoculated contracted the disease. But it must be borne in mind that the figures are very small, and that we are here making selections of houses, in that we are picking out only houses where inoculated people had contracted plague and that these people had very few relatives living with them, and also that when plague was discovered in any of their houses they were immediately evacuated, and consequently came under the beneficial influence of going out into camp, and that the disease was thus prevented from spreading to all the members of the household. When, however, we compare the mortality of the inoculated cases with the mortality of the uninoculated cases, occurring in the same houses, the difference is very marked. All the 6 protected cases recovered, while only one out of the 9 unprotected people recovered. The difference in the nature of the disease was also most marked in hospital among the inoculated persons. The symptoms set in in the usual way with sudden fever, headache, vomiting and early prostration, and the disease looked like an ordinary case of plague. But after a day or two the symptoms suddenly ceased, the temperature fell to normal, the mind cleared and the patient became convalescent much earlier than usual. The gland, in those people, in every case except one, reabsorbed without suppuration. Bishen Das, who had a large axillary bubo, was the worst case. He had 11 days' fever, Ganga Ram 8, Nathu 4, Ahmad Faruq, who had been inoculated twice, 3, Lachman Das 2, and Pala only 1 day's fever.

The doses of prophylactic given to these persons were—

	Age in years.			Number of days' fever.
Bishen Das	12	1¼	*c. c.* of the standard strength	11
Lachman Das	14	¾	*c. c.* „ „ „	2
Pala	35	2½	*c. c.* „ „ „	1
Ahmad Faruq	12	1¼	*c. c.* in two doses	3
Ganga Ram	22	1½	*c. c.* „ „ „	8
Nathu Ram	19	2	*c. c.* „ „ „	4

Table No. X.

A full list of all the occurrences of Plague in houses inhabited by persons inoculated against the Plague in Banga Town.

Full address.	Names, sexes and ages of the *inoculated* persons who were living in the house on the date of attack, with the dates of their inoculation. Name, sex, and age of the attacked, if he is amongst the *inoculated*; date of onset of disease, symptoms, issue.	Names, sexes, and ages of the *uninoculated* persons who were living in the same house on the date of attack. Name, sex, and age of the attacked, if he is amongst the *uninoculated*; date of onset of disease, symptoms, issue.
1. *Banga, Chabutra ka mohulla.* The household consisting of five persons was moved out into camp on March 29th, 1898. (No. 1 in Table No. IX).	*Unattacked.*—Nathu, son of Ralla Ram, M., *æt.* 25 years, Brahmin. Inoculated on March 20th with 1¼ *c. c.* standard strength (Reg. No. 364), nursed Surtu during his illness, escaped. *Attacked.*—Surtu (called Bishen Das), son of Ralla Ram, M., *æt.* 12 years. Inoculated on March 25th with 1¼ *c. c.* standard strength (Reg. No. 6181), attacked with plague 10 P. M., March 31st (six days after inoculation), gland in left axilla. Delirium. Mild attack. Discharged April 20th (twenty days illness).	*Unattacked*—1. Rama, son of Ralla, M., *æt.* 20 years, Brahmin. This man was inoculated after coming out into camp. *Attacked*—1. Ralla, son of Khema, M., *æt.* 53 years, Brahmin. Attacked at noon, March 31st. Died April 1st, 3 P. M., severe fever, delirium, no glands. 2. Rukam Dai, wife of Ralla, F., *æt.* 40 years, Brahmin, attacked at 6 P. M., April 1st, died April 6th. High fever, collapse, gland left inguinal.
2. *Banga, Mohulla Chabutra.* (No. 8 in Table No. IX).	*Unattacked.*—Birja, son of Nihal Chand, M., *æt.* 38 years, Brahmin. Inoculated with 2½ *c. c.* on April 14th (Reg. No. 842) standard. 2. Mamon, wife of Eidu, F., *æt.* 40 years, Muhammadan. Inoculated with 2 *c. c.* on April 14th (Reg. No. 855) standard. *Attacked*—1. Lachman Das, son of Birja Mal, M., *æt.* 14 years, Brahmin. Inoculated with ¾ *c. c.* on March 20th (Reg. No. 385), attacked on April 21st (after one month); mild attack. Gland left inguinal. Discharged May 21st (one month's illness).	*Nil.*
3. *Banga.* This water-carrier lived by himself in the town; but with a family (No. 6, Table No. IX) in camp.	*Unattacked.*—Nil. *Attacked*—1. Pala, son of Chhajju, M., *æt.* 35 years, Jhinwar. Inoculated on April 16th with 2½ *c. c.* (standard), Reg. No. 916, attacked on April 24th (eight days after inoculation), an extremely mild attack.—Gland in left inguinal region. Discharged on May 10th (sixteen days in hospital).	*Nil.*
4. *Banga, Nawa Bazar.* (No. 11, Table No. IX).	*Unattacked.*—Nil. *Attacked.*—Ahmad Faruk, son of Imam Din, Kashmiri, *æt.* 12 years, Inoculated twice— March 22nd 1 *c. c.* standard Reg. No. 401, March 25th 1¼ *c. c.* Reg. No. 401. Attacked on April 25th (one month after last inoculation), very mild attack, gland right femoral. Discharged 23rd June (twenty-eight days in hospital).	*Unattacked.*—Nur Muhammad, son of Ramzan, M., *æt.* 20 years, Kashmiri. *Attacked.*—Nur Bibi, wife of Ramzan, F., *æt.* years, Kashmiri, attacked April 23rd and died April 29th, 1898. 2. Ramzan, son of Samander, M., *æt.* 60 years, attacked April 23rd. Died June 3rd, 1898.
5. *Banga, Chimba Mohulla.* This man corresponds to No. 12 in Table No. IX. He had a separate hut in camp, but lived in the same house as No. 54 in the town.	*Unattacked.*—Nil. *Attacked* I.—Ganga Ram, son of Labhu, M., *æt.* 22 years, Chimba. Inoculated on March 20th, with 1¼ *c. c.* standard (Reg. No. 361), attacked April 25th (thirty-five days after inoculation), mild case, gland in right inguinal region. Discharged May 25th (till one month).	*Unattacked*—1. Punan, wife of Ganga Ram, F., *æt.* 22 years, Chimba. 2. Gulab Dai, wife of Dittu, F., *æt.* 10 years, Chimba. 3. Thakur, son of Radha, M., *æt.* 27 years, Chimba. 4. Nikka, son of Jeon, M., *æt.* 27 years, Chimba. 5. Matan, wife of Thakur, F., *æt.* 10 years, Chimba. *Attacked*—1. Dia Banti, daughter of Ganga Ram, F., *æt.* 2 years; attacked on April 28th. Died on May 5th. 2. Radha, son of Nikka, M., *æt.* 45 years; attacked April 22nd. Died April 28th. 3. Naraini, wife of Radha, F., *æt.* 40 years; attacked April 27th. Died May 3rd.
6. *Banga.* Family attacked in Segregation Camp. (No. 17 in Table No. IX).	*Unattacked.*—Ghasita Ram, son of Sain Das, M., Brahmin Acharaj *æt.* 25 years. Inoculated March 22nd with 2 *c. c.* standard (Reg. No. 456). *Attacked*—1. Nathu Ram, son of Urjan Das, M., Brahmin Acharaj, *æt.* 19 years. Inoculated 24th March with 2 *c. c.* standard. (Reg. No. 573.) Attacked May 3rd (forty days after inoculation) and was discharged June 6th (thirty-five days in hospital) mild attack, glands right inguinal.	*Unattacked.*—Pala Ram, son of Gobind Ram, M., *æt.* 48 years, Acharaj. *Attacked.*—1. Matab Kaur, wife of Urjan Das, F., *æt.* 60 years, Acharaj. Attacked Died May 1st. 2. Jatto, wife of Sain Das, F., *æt.* 40 years, Acharaj. Attacked May 13th. Recovered June 6th.

The only other case of plague among inoculated persons occurred at Pharala in a coolie on disinfecting work. There were 99 men on this work. They had all been inoculated and only this man was attacked. He had the disease in a mild form and recovered rapidly. He seems to have been infected while on work in the village. He lived with his two daughters in a hut in camp. They had not been inoculated. But, as the man was removed immediately on getting ill to hospital and the hut changed, it is not surprising that neither of the girls got affected.

One case attacked at Pharala.

To sum up, there have been 2,408 people inoculated, 193 people were inoculated twice. There have been 8 cases of plague among the inoculated, with one death. In the fatal case, the dose was a small one, and no re-action followed the operation.

Below will be seen Surgeon-Captain Clark's report on the inoculations performed in the Hoshiarpur District. He and Surgeon-Captain Hunter performed 1,510 operations among infected villages, and had no cases of plague among those inoculated. The results obtained, like those in the Jullundur District, though not by any means conclusive, are so far encouraging that they favour the continuation of the experiment in future epidemics. It is only when the prophylactic has been tried in a large number of cases, all over the country and under varying conditions that a definite decision as to its efficacy in protecting against plague will be arrived at. It will never be the sole remedy against the progress of the malady, but it may possibly become one of the chief measures. Small-pox is not nearly so infectious as this disease, and yet we have a more perfect protective serum to combat it, namely vaccine lymph. This remedy has now been tried for a hundred years and tried on a very extensive scale. It has considerably diminished the amount of small-pox in existence, but it has not banished it. In the same way, it is impossible to believe that any form of protective inoculation can ever be effective if used as the only means of preventing infection. It is extremely difficult to inoculate large communities, and a few will always escape, and these few have the power of keeping the disease in existence, ready to break out again when favourable conditions arise. If, on the other hand, we look upon the inoculations as one, but only one, of the excellent sanitary measures which Science has given us to combat this malady, then there is every hope of its becoming a powerful weapon in our hands.

Prophylactic inoculations are only one of the measures against plague.

NOTES ON CASES INOCULATED AT GARHSHANKAR BY SURGEON-CAPTAIN R. CLARK, I.M.S.

No cases of plague have occurred among inoculated persons, although they have, in the majority of instances, been exposed to infection. Thus almost all of the 708 males inoculated in Garhshankar, 64 males inoculated at Garhi, 49 of the males in Palewal, 9 males inoculated at Bilron, 68 males at Bagwain and 66 at Ibrahimpur were employed at the disinfection of houses. In Palewal all the people who went into segregation camp, numbering 43, were inoculated. No cases occurred amongst them after the evacuation of the village. In Bagwain, where the segregation camp was not inoculated, 6 cases occurred after evacuation, but of these 5 were infected in the village. One, however, was acquired in the segregation camp. Individual instances might be quoted in several instances of the uninoculated members of an inoculated family being picked out by the disease. Thus in Garhshankar the last case which has occurred was in an uninoculated disinfecting coolie, who worked in the same gang with his brother at the same work, and was apparently subject to exactly the same conditions as his brother who was inoculated. The former got plague and died, his brother who accompanied him to hospital and nursed him till he died remains well. In Bilron the case of 26th May was an exactly similar one. This man objected to being inoculated, but was a worker in the disinfecting gang. His brother was in the same gang, had worked on the same houses, was inoculated and did not suffer from the disease, nor did his wife who was inoculated and came into hospital to attend on him. The last case which has occurred at Palewal has an interesting history. It was that of an old woman whose grandson, an inoculated man, lived with her. She was almost bed-ridden and had not left the courtyard for months, but she was in the habit of sending her grandson daily over to the house of Nathu *Baid*, in which the first case occurred, to ask after the health of the sick members of his family. The grandson escaped, but the old woman, who was uninoculated, took the disease and died. Facts like these of course prove nothing, but they are interesting and ought I think to encourage us to give a more extended trial to inoculation. In the 1,500 cases which have been inoculated by us here we have had no case in which any serious consequences followed from inoculation. One old man who was inoculated had a temperature of 105° on the evening of the second day and fell very ill. His pulse became weak, and for a time I was somewhat anxious about him as he was a *hakim* who had offered himself as one of the first cases for inoculation in Garhshankar; but, with rest in bed and nursing, he speedily recovered, and within a week was as well as ever. In the majority of the other inoculation cases the temperature did not go above 102° and the patients were as well as ever 48 hours after inoculation, although the local reaction caused them some trouble for about five days longer. In 5 cases, after inoculation, severe urticaria occurred. This appeared in all the cases within two hours after the operation and disappeared within 24 hours. The urticaria was similar to that which occurs after inoculation with the diphtheria anti-toxin, and no treatment was given for it beyond a mild purgative. In one case after inoculation a small abscess appeared at the side of the operation. It was opened, dressed antiseptically and healed up in a few days. I have no other notes of general interest with regard to the cases we inoculated here.

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Table No. XI.

Showing the Sex and Caste of the People inoculated in the Garhshankar Tahsil.

Serial No.	Name of village.	Total number inoculated.	Sex.			Hindu.	Muhammadan.	Others.
			Male.	Female.	Child.			
1	Hajipur	33	20	12	1	...	...	33
2	Parowal	26	21	4	1	9	6	11
3	Sadhowal	26	24	...	2	...	10	16
4	Sanwali	18	17	1	...	...	4	14
5	Garhshankar	801	708	90	3	85	659	57
6	Garhi	81	64	13	4	40	11	30
7	Palewal	280	218	62	...	212	2	66
8	Bilron	49	9	32	8	1	1	47
9	Bagwain	100	68	23	9	64	5	31
10	Ibrahimpur	94	66	25	3	64	1	29
	European or Eurasian	2	...	2	...	...	...	2
	Total	1,510	1,215	264	31	475	699	336

GARHSHANKAR,
The 10th July 1898.

(Sd.) CLARK,
Surgeon-Captain, I. M. S.,
Plague Medical Officer.

Note by Surgeon-Captain James.—It should be mentioned that the prophylactic inoculations were commenced in the Garhshankar Tahsil by Surgeon-Captain Heard on 1st April 1898, at the village of Parowal, and carried on by Dr. Clark on May 5th at Garhshankar itself.

In the two infected areas, there were 3,918 people inoculated. Among these, there were eight attacked with plague, all in the Jullundur District, and only one died, and that a woman who was proved to have had an insufficient dose of the prophylatic. The result of the inoculations, as a whole, is therefore most encouraging.

SECTION III.

THE CHARACTER OF THE DISEASE, TREATMENT, &c.

The character of the plague, as experienced in the Punjab during the past few months, is very like that seen in other parts of the country. There were the usual symptoms of sudden onset, high fever, vomiting with the early appearance of enlarged glands in one or other of the ordinary situations, the rapid development of delirium or the apathetic semi-comatous condition so characteristic of the malady. A few cases, every now and then, gave difficulty in diagnosis. But, usually, it was difficult to mistake the disease, especially as malarial fever, the disease with which it would most frequently be mistaken in the early stages, was conspicuously absent from the district during the time plague was prevalent. We have little to add to the signs and symptoms described last year in the Plague Report as seen by us in Bombay, Karachi and Sukkur. The disease was identical in most of its characters. But a few statistics of cases which we were able to collect this year are of interest as testing the accuracy of some of the statements made previously.

Incubation.—It is notoriously difficult to fix the incubation period of various diseases. We can seldom be sure that the infection took place at any particular moment or hour, and, even if it did, it is difficult to be sure that there were not any other causes of infection acting at some other time. But the following instances are instructive.

The best example we have to give is that of Chak Kalal. Here the people had been out in camp ten days, and there had been no attacks of plague in the village or camp up to the 15th April. On this date the people returned to the village for one hour, while a storm was impending. Numerous rats dead of plague were found. It is therefore pretty certain these people were infected at this time, about 10 a.m. Symptoms of plague developed in those attacked on the following days as here shown—

After			
1	day	none.	
,,	2	days	... 3.
,,	3	,,	... 7.
,,	4	,,	... 7.
,,	5	,,	... 1.
,,	6	,,	... 2.
,,	7	,,	... 2.
,,	8	,,	... 0.
,,	9	,,	... 3.
,,	10	,,	... 2.
,,	11	,,	... 2.

After which the disease stopped. It will be seen that the great majority of the people were attacked between the 2nd and 5th days.

Again, if we look at tables Nos. IV and V, pages 118—20, we find that nearly all the cases of attacks took place within the first eleven days after evacuation in both the districts within this period. When they were attacked at a later period there was nearly always either suspicion or actual proof that they had obtained their infection at some later date.

It is therefore pretty certain that the incubation period of plague is between two to eleven days. In the case of workmen attacked during the disinfection of the village we found the incubation period from two to five days. It would naturally vary according to the mode of inoculation, of which, we regret to say, we have not sufficient facts before us to be able to make any general statements.

The onset of the disease is ushered in with shivering and a general feeling of being ill, and with the rapid onset of fever. In Khankhanan out of 175 persons attacked there was a record of vomiting in 53 cases at this stage of the illness. In 82 cases, severe frontal headache was complained of, and there was subsequently marked delirium in 50 cases. Coma or rather a semi-conscious apathetic condition existed in most of the cases.

Fever.—This was always present in the early stages of the disease, and usually ranged between 102 and 105. A temperature of 106 was several times recorded during the epidemic.

The following chart is given to show the average curve of the temperature during the disease as taken from the temperature charts of 50 cases treated at the Banga Plague Hospital. It shows very clearly the manner in which the temperature runs up several degrees soon after the onset of the disease, reaches its height on the second day, remains up till the fourth or fifth day, and then gradually falls to normal, which is reached about the 10th or 11th day. It also shows the daily tendency for the temperature to fall in the morning and rise in the evening. But it does not show the sudden ending by crisis which often takes place between the 3rd and 5th days.

CHART No. II.

An average Temperature Chart made from 50 cases of plague at Banga, April 1898—

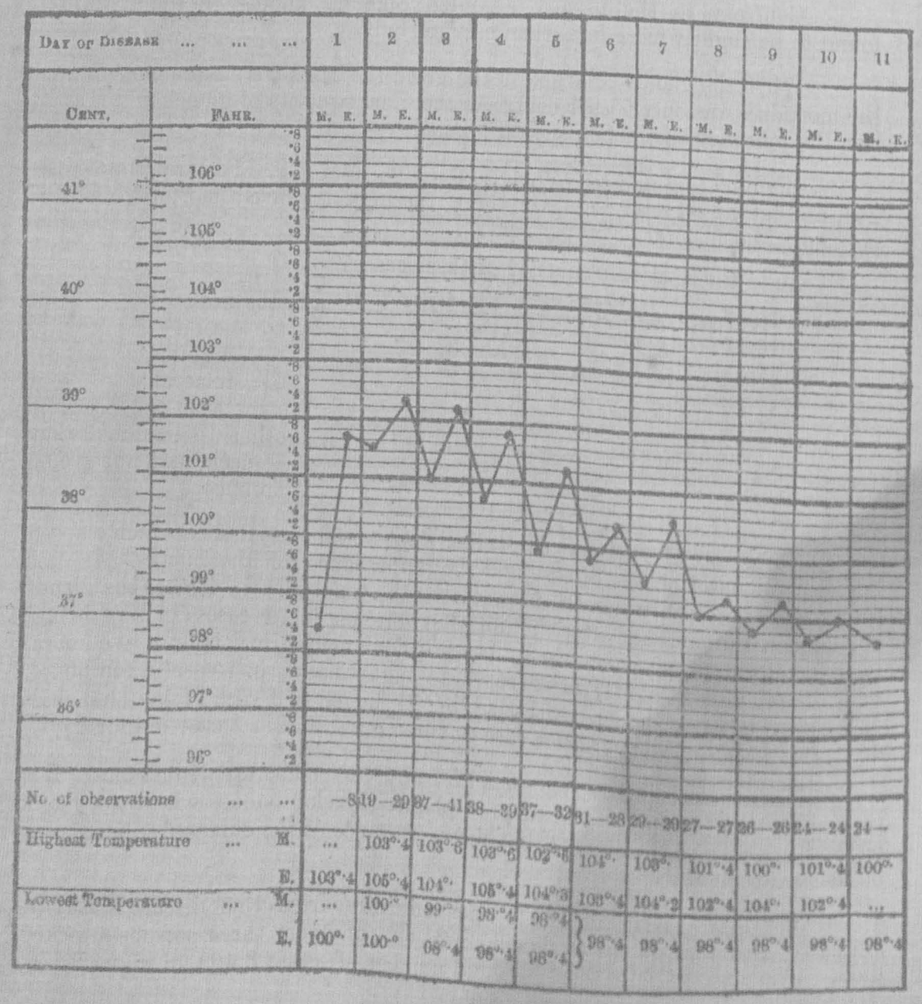

TABLE No. XII.

The position of the buboes in 3,128 cases is given in the following table:—

	Neck.		Axilla.		Groin.		More than one situation.		Other situations.		No glands including pneumonic cases.		Total.	
	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.
Jullundur	163	98	175	100	784	617	67	47	26	10	296	110	1,511	932
Hoshiarpur	49	30	43	25	173	161	19	6	10	6	70	44	363	272
Total ...	212	128	218	125	957	778	86	53	36	16	366	154	1,874	1,254
Total number of cases under each head.	340		343		1,735		139		52		520		3,128	
Percentage of deaths under each head.	62·35		63·27		55·46		61·86		69·23		70·04		59·91	

From these figures it will be seen that cases of plague which do not develop buboes are the most fatal forms. They include primary pneumonic cases, which are almost invariably fatal.

Contrary to the usually accepted opinion, buboes in the axilla were found to be slightly more fatal than cervical buboes.

When the glands enlarged in the groin the cases were more hopeful, and the mortality was only 55 per cent. As there are two sets of glands in this situation the following distinction should be made:—

Inguinal: fatal cases 540, non-fatal 408, total 948. Femoral: fatal cases 244, non-fatal 209, total 453. Of these the inguinal gave a mortality of 55·67 per cent., and femoral 53·80 per cent.

As to the relative frequency of these cases—

10·87 per cent. of the cases had the buboes in the neck
10·97 „ „ „ „ „ „ axilla
37·45 „ „ „ „ „ „ inguinal
15·98 „ „ „ „ „ „ femoral
4·44 „ „ „ „ „ „ more than one situation
1·66 „ „ „ „ „ „ other situations than neck, axilla or groin.
16·63 „ „ „ „ „ „ no buboes

Notes were also taken to determine what was the usual time which elapsed between the onset of the disease and the appearance of the buboes. It was found in 47 cases, in which the notes stated the time, that in 4 cases the glands appeared within an hour after the initial symptoms, in 5 cases in two hours, in 8 cases in three hours, in 12 cases in four hours, in 1 case in five hours, in 7 cases in six hours, in 2 cases in eight hours, in 1 case in ten hours, in 2 cases in twelve hours, in 1 case in 24 hours, in 1 case in one and half days, in 1 case in two days, in 1 case in three days, and in 1 case in four days.

These numbers are too small for any very elaborate deductions. But they show that the majority of cases of plague develop buboes within six hours of the beginning of the attack; but the appearance of the enlarged glands may be delayed several days.

Mortality.—With regard to the mortality from this disease it may be stated roughly that, in the epidemic, two out of every three persons attacked died. The actual figures were:—Total number of cases 3,469, of whom 2,176,

or a percentage of 62·73, died. The mortality varied in the three circles, and was as follows :—

TABLE No. XIII.

	Cases.	Deaths.	Percentage of deaths to cases.
Banga Circle	1,710	1,048	61·21
Nawashahr	996	660	66·27
Garhshankar	763	468	61·34

It may be noted in passing that the mortality was smallest in the districts where the people came willingly for treatment. It should also be mentioned that the deaths include persons who died in their houses and therefore had no treatment. The hospital results would in most cases be better than the above record.

The following table is interesting in showing on what "day of the disease" the mortality was highest :—

TABLE No. XIV.

MORTALITY, FROM DAY TO DAY, OF THE DISEASE IN THE JULLUNDUR DISTRICT.

Total deaths.	Day of disease.																									Date of attack unknown.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1,708	207	266	221	209	136	139	107	54	31	21	17	9	7	2	2	4	2	4	1	...	3	1	...	3	...	1	261

It will be noticed that 14·30 per cent., or nearly one-seventh of the cases died within 24 hours of the attack ; 18·38 per cent., or nearly one-fifth, died in the next 24 hours; 15·27, or one-sixth, on the 3rd day ; 14·44, or about one-seventh, on the 4th day ; 9·40, or about one-eleventh, on the 5th day. The figures were nearly the same on the 6th day. After this there is a great drop in the mortality. In fact 62 per cent. of the cases, or roughly two-thirds of the patients, died within four days of the commencement of the attack. If the patient lived a week (8 days) his chances of recovery were very great, as only 7·47 per cent. of the cases died after this date.

In no case did a person suffer from a second attack of plague.

The disease does not seem to be more fatal in one class than another. The sturdy Sikh died as easily as the weakly Brahmin ; but stout people seem to bear the brunt of the malady especially badly. The corpulent *banias*, whose habits are entirely sedentary, are particularly bad subjects. At the present moment we cannot recall to mind a single instance of one of these recovering. The disease spares neither young nor old, the "infant mewling and puking in the nurse's arms," and he in "second childishness and mere oblivion" are equally prone. The male as much as the female. Nor is there any caste which can boast of immunity. Surely the dread Muse has few agents more effective than this in cutting the silver thread of life. Cholera is more potent and perhaps quicker in destroying life, but its sojourn among us in any particular locality is much shorter : while the *matta* (small-pox), which is looked upon by the natives as the personified fiend of destruction, is left far behind.

Complications and Sequelæ.—These were surprisingly few. Acute pneumonia was perhaps the commonest. There was diarrhœa in some cases instead of constipation. Hæmorrhages were few. Ophthalmia, followed by complete destruction of the eye, was seen in one or two cases. The commonest sequela was aphasia which lasted some time. In two cases under the writer's notice the power of speech has not yet completely returned. There were two cases of paraplegia. Acute mania during the disease in one case was followed by melancholia, but the patient, a young woman, ultimately recovered.

Post mortems.—No *post mortems* were performed. This was chiefly due to the fact that the community we were working among were very adverse to any of their members being subjected to any form of examination which entailed opening the body. But we frequently obtained permission to open glands after death for the purposes of bacteriological examination, and the plague bacillus was obtained and cultivated on artificial *media* frequently enough to satisfy the purposes for which the investigations were made.

It is to be regretted that none of us had any time for laboratory or investigation work. The time of "a plague medical officer" is far too much occupied for leisure for scientific research.

TREATMENT.

The plague cases were treated in hospital wherever possible. Those who refused European treatment were allowed to be treated by their own Hakims, or to treat themselves. But all cases of plague and their families were segregated in camps away from other healthy communities.

On admission to hospital the patients had a phenyle bath, or if too ill for this, were sponged down with warm phenyle lotion. Blankets were then given them and their own beds, washed down also with phenyle lotion, allowed them if they preferred it; otherwise string charpoys were provided for them at Government expense. Clothes were also kept in readiness. But in most cases they preferred to wear no clothes while the fever lasted, but used to wrap themselves up in their blankets.

In most cases, food was provided at Government expense, and milk formed an important item of diet, a seer of which was allowed per head for the cases in the acute stages of the illness, and was diminished as convalescence set in. If vomiting was persistent soup, either vegetable or made from goat's meat, was substituted. A thin soup called *pichh* which was recommended by Dr. Fatteh Chand, and was simply the water from boiled rice, was often found most useful. The usual diet consisted of :—

Sago or rice, 2 chittaks, and sugar, 1 chittak. These were given boiled with water, and milk afterwards added. They were much appreciated if properly cooked.

Convalescent diet :—

Ata, ½ to 1 seer.

Ghee ¼ chittak.

Salt, ¼ ,,

Dhannia, *mirch* and *haldi*, of each ⅛ chittak.

In a few cases meat was also ordered.

The great secret in the treatment was keeping the patients constantly lying down. This was often difficult to accomplish, especially at night, when delirious patients were always at their worst, and sometimes attempted to leave the hospital altogether. Stimulants were freely administered in the form of country rum. But in order to prevent waste the spirit was added to the plague mixture.

Various drugs were tried. But the following prescription seems to have been most generally used, *viz.* :—

Re—Liq. Hydrarg Perchloride	...	...	..	...	...	...	...	...	3j
Liq. Strychniæ	...	...	...	...	...	...	...	...	mIII
Tinct. Digitalis	...	...	...	...	...	...	...	...	mV
Rum	...	...	...	...	...	...	...	...	3ii
Aq. Ad.	...	...	...	...	...	...	...	...	3i

This was labelled "the Plague Mixture," and was given every four to six hours.

In a few cases great benefit was obtained by hypodermic injections of rum; 20-30m were injected with an equal quantity of Liq. Hydrarg Perchlor. There was always a temporary improvement, even in those cases where the patient eventually died, and in several instances where the case seemed hopeless, the patient ultimately recovered after several of these injections, especially in cases which refused all food. It will thus be seen that we had no specific against the disease. But there is no doubt that the patients benefitted by the means we employed to keep up the system, and guard against the depressing action on the heart which the toxins exert in such a powerful manner. We have to stimulate the heart and keep it working for four to six days while the disease is at its height. After this if the patient survived so long, convalescence sets in, and the usual nutritious diet and tonics, &c., restored the patient to health.

The treatment of the buboes was always carried out with a view to relieve pain and to lessen the inflammation. Poultices usually were avoided, as they tended to increase the inflammatory processes and bring on suppuration. Glands in which this took place were always opened, but it must be confessed that they healed much more slowly, and the patient recovered his strength much more tardily than when re-absorption took place without suppuration. With this aim in view, hot lead lotion and extract of belladonna and glycerine were the most favourite local applications. The natives in these parts almost invariably performed a modified form of cupping. This consisted of scarifying the skin over the inflamed area either with a razor or with the sharpened finger nail. They then applied a conical shaped hollow horn, which was open at the base and had a small perforation at the apex. The base was applied to the scarified surface, and by means of applying his mouth to the apex of the horn the operator sucked until he got out a certain amount of blood. The process was a dangerous one, and most of the people who performed this operation, as a profession, were attacked with plague, sooner or later.

Leeches were also largely resorted to by the native Hakims. The result of this local blood-letting always relieved the pain of the swelling; but it is doubtful whether the patients, already very low and depressed, could stand the extra strain of losing blood.

Complications were treated, as they arose, according to the ordinary rules in medicine. Hyoscyamus and bromide of potassium were the chief narcotics used to allay delirium and produce sleep. But opium in its various forms was well tolerated. There is a prejudice against the use of chloral in large doses in this disease.

Quinine also was found too depressing. Strophanthus was tried in the early part of the epidemic, but did not give better results than digitalis, which is an excellent heart tonic in this disease.

TREATMENT BY HAKIMS.

Hakims were always encouraged to help us in the treatment of the cases. They almost invariably adopted our methods of treatment, with the exception that they preferred the local blood-letting to our sedative and anodyne applications.

SECTION IV.

GENERAL VIEWS EXPRESSED BY CERTAIN MEDICAL OFFICERS.

When commencing this report we wrote to several of the medical officers on plague duty, and asked them to kindly send us any views concerning the disease which, from their experience, they thought would be important. Surgeon-Captain Ronaldson Clark, working in the Hoshiarpur district, and Surgeon-Captain H. Smith, and Surgeon-Lieutenant Walton, in the Nawashahr Circle, have sent us the following notes, which we originally intended to incorporate in the general report. But after due consideration, we have decided to send up the remarks in their entirety, as it is only fair on the officers concerned that their views should have the same consideration as our own, and, moreover, in some points they differ from the general deductions already expressed. By giving, as fully as possible, the two sides of every debateable subject, we feel we are carrying out one of the main objects of this report, namely, the collection of views, as well as facts, which may be useful in combating any further epidemics which may unfortunately again visit our Province.

A.—REMARKS BY SURGEON-CAPTAIN W. RONALDSON CLARK, I.M.S.,

Plague Medical Officer, Hoshiarpur District.

REMARKS BY SURGEON-CAPTAIN W. RONALDSON CLARK, I M.S.

Spread of plague by rats.

As to the question of the spread of the disease from village to village by means of infected rats, no evidence is obtainable in any of the villages. I have enquired carefully into this question in all the villages, and in only two of them have I been able to obtain any clear history at all as to the rats having become affected. These two villages are Parowal and Garhshankar, and in them the onset of the disease in the rats occurred some days after the first human cases. In Parowal on the day that the second death occurred in the village from plague the villagers began to notice an unusual number of deaths among the rats, and in Garhshankar I am told that in the affected *pattis*, about the middle of April, after the disease was well established, the people began to notice that the rats were dying "in hundreds," and that they used to come out of their holes in a semi-dazed condition, and die in the streets. At the same time the people say that when they left the town there were lots of rats in it, apparently quite healthy, and that there had been no disease amongst them except in the infected *pattis*. Subsequently to the evacuation of the town the rats also seem to have left it, for during the cleaning we saw none except dead ones, of which we found only a few. Thus in the first seven houses cleaned we found eleven dead rats, and in no subsequent part of the cleaning did we find many in any of the houses, whether infected or non-infected. Before the people returned to Garhshankar, and after cleaning operations were finished, I began to notice that the rats were again finding their way into the town, and that those I saw were plump, lively and healthy looking.

In none of the other villages that were cleaned while I was in medical charge of plague operations were rats found dead in any great numbers, and in most of them, indeed, I was told that, although rats had been plentiful in the villages before evacuation, yet evacuation and cleaning seemed to have banished them altogether.

The people in the health camps at Garhshankar had a large number of rats in their *chappars*, while they were in camp, but these were, they told me, field rats, and of quite a different species to the ones that formerly had infested their houses.

Spread of plague by clothing.

With regard to the spread of the disease by means of clothing I have already—*vide* my account of the origin and spread of the disease in Hoshiarpur*—detailed several instances in which this was apparently the means by which villages became infected. In Palewal, too, one of the cases which occurred, *viz.*, that of Radho, in whom the disease appeared on the 11th June, may have got infected from the clothing of her grandson. She was an old Rajput woman, and bed-ridden, who lived in a part of the village quite separate from the original cases. Her grandson, a youth whom I had inoculated, lived with her, and she was in the habit of sending this boy daily to the house of Nathu, before they were segregated, to ask after the health of Nathu's family. The old woman got plague on the 11th June and died on the 12th, while her grandson, who had apparently carried the disease to her, escaped.

Disinfection of houses.

The details of disinfection of houses adopted by me were essentially those carried out by Dr. James also, so I need not go into them in detail. One thing, however, I would like to mention, *viz.*, that in all cases in which Dr. Hunter and I had anything to do with the disinfection of villages we insisted on the infected houses being cleaned first, and I think it is of importance that this should be done. Our reasons for this step are as follows:—(1) As long as houses which are known to be infected are allowed to remain uncleaned, they are a distinct source of danger to all who may happen to come into them; (2) if the rat theory is a valid one, the sooner these foci of infection for rats are got rid of the better; (3) since if from any reason the cleaning has to be completed in a hurry and the people allowed to re-occupy the village, they at any rate will have been dealt with in a thoroughly satisfactory fashion. I am aware that Dr. James prefers to clean the village from end to end, making no distinction

* Parowal, Chinkoa, pages 88 and 91.

of infected from non-infected houses, and that he says the danger in cleaning the infected houses first lies in the difficulty of obtaining a complete list of them, and in the fact that if infected houses are first cleaned subordinates may be inclined to scamp the cleaning of the so-called uninfected ones; but, on the other hand, I do not think we are justified in putting off the disinfection of known foci of infection because there may be others unknown, and with careful supervision I do not think it at all necessary that the cleaning should be scamped even after the infected houses have been completed. Our ideas in the matter of cleaning were that we should be as careful in the cleaning of all the houses as if they were all infected, but that at the same time we should begin by getting rid of all the known points of danger.*

Another point on which I would lay stress is the fact that Dr. James uses no solution of known strength as a disinfectant. This is, I think, unsatisfactory. Our aim in disinfection should be to make it on all points as complete as possible, and although solutions of phenyle (1—200 or less) may have been found by him to yield good results in the instances he has met with, yet laboratory experiments have proved such a strength to be insufficient in dealing with many pathogenic organisms, and our practice, in all points, ought, I think, to be at least what has been found in accurate experiments to be sufficient, not what our own limited experience has found to be in a general way satisfactory in the instances that have occurred to us. †

Disinfection of persons and personal property.

The disinfection of the persons and personal property of the inhabitants of infected villages has been, in all its details so far as known to us, carried out as in the Banga Circle. I have no further observations to make on this, except to say that it will be necessary, should these operations have to be continued or extended in the Punjab, to obtain some form of portable steam steriliser which can be used for this purpose. Disinfection done in the present fashion by plunging articles into boiling phenyle ruins many things, and consequently villagers try to escape it by burying or concealing their things before the time comes for disinfecting them. Such a course is most dangerous, but will be persisted in till they find that apparatus are provided which do not ruin their household goods. If plague operations are continued, I think it absolutely necessary that some apparatus, such as either Recks or Threshe's portable disinfector, be provided in infected areas. The initial cost of such apparatus would be, of course, considerable (£136 in the case of the former), but, after all, the money spent on phenyle for disinfecting the personal property of a small town like Garhshankar comes to about one-fourth of that amount, so that a portable apparatus would shortly pay for itself.

Isolation and segregation. Necessity for total evacuation.

With regard to isolation and segregation of the people in infected towns I am not aware that any special remarks are necessary for the Hoshiarpur district. As to the necessity or otherwise for the complete evacuation of villages, my experience is, of course, limited, as it was only for a period of a little over two months that I was on plague duty, but my former experience in England of work in small-pox—a disease much more infectious to the unprotected than is bubonic plague—conjoined with what I know of the primary partial evacuation of Bilron, leads me to doubt whether wholesale evacuation is always necessary in villages and small towns, provided that sufficiently early notification is obtained. In Leicester small-pox has been treated, and hitherto successfully, in a practically unvaccinated community by means of isolation of the sick, segregation of their families, and early disinfection of their houses and property; and I fail to see why this should not be done with regard to plague also, provided that sufficiently early notification is obtained. In Rampur Bilron this was the case. Information was early received; what were absolutely the first two cases were isolated along with all the families living in the infected quarter of the village within six days of the occurrence of these two cases: the disease did not spread, only one other case (a separate infection from another quarter) occurred 23 days after the one first discovered; disinfection of the infected quarter was early

* See page 113.
† See page 111.

carried out; the isolated people returned to their homes, the village was declared free and the cordon removed. Thereafter a second infection occurred, wherein, as this was not so early intimated and the infection was received in two quarters almost simultaneously, the whole village had to be evacuated. This second infection had, however, *nothing to do with the first one*, in which the partial evacuation was completely successful.*

Bachwan, too, is another instance where early isolation, conjoined perhaps with partial evacuation, was the means of staving off an outbreak. This is a village 12 miles from Simul Mazara, and the residence of Albela and his son, Maula, who brought the infection to Simul Mazara itself. These men, on the 26th January, came from Shikohpur in the Jullundur district; they stayed the night with Albela's daughter, Risi, at Simul Mazara, and on the 27th pushed on home to Buchwan. On the way Maula became ill, had headache, diarrhœa, vomitting, cough and pain in the chest, and he died that night on reaching his own village. Fortunately, he was not taken into his own house where the whole family was, but to a detached *haveli* on the outskirts of the village. Thirteen days afterwards the occurrence of this case was discovered; Albela's family was placed in sheds outside the village, and kept in quarantine for 10 days; the *haveli* in which Maula died was disinfected and unroofed, and all suspicious property was burnt. No further cases occurred: a result attributable, I think, entirely to the accidental isolation of the first case in this *haveli*. If this as well as the partial evacuation that was carried out in Bilron on the 5th February could be successful as it was, there is, I think, nothing to prevent a similar result being obtained in other villages and small towns, provided that sufficiently early notification is received, the cases and their friends are early isolated, and disinfection of the affected houses is early carried out before the disease has had time to spread either among the human beings or the rats of the village.†

Having regard, therefore, to the particular advantages of this method, I think the results at Bilron and Bachwan are sufficiently encouraging to lead us to try and extend it, especially as it is applicable to the larger towns; and to strain every nerve to obtain by every possible means early notification of the occurrence of cases of plague. Small difficulties only exist with regard to the last two of my recommendations, *viz.*, early isolation of the sick and their friends, and early disinfection of infected houses, but it is around the first one, *viz.*, early notification, that all the difficulty centres. I have already, in my report to the civil authorities, mentioned what I think must be done before we can have any hope of obtaining this; and although the matter is not strictly a medical one, yet it seems of such vital importance that I may repeat here what I said in my former report:—"The one method which offers the most difficulties among all these is, I think, early notification, as that is dependent on the good will of the people themselves, and I think their good will must in this case be stimulated by some system of rewards and punishments. I do not advocate the indiscriminate giving of rewards to people who notify the disease, this would in all probability lead to the importation of cases, but I think a really handsome reward should be paid to lambardars who give early intimation of the occurrence of cases in their villages and a severe punishment meted out to those who neglect to do this. At the same time very handsome terms in the way of compensation for loss of employment and for damage done by disinfection should be given to those people who are unfortunate enough to have the disease among them."

If early notification is obtained, early isolation and early disinfection may be practised; and in this connection I may mention that the results we got from the rigid carrying out of the rule ordering us to let 10 days lapse between total evacuation and the commencement of disinfection do not seem to have been sufficiently encouraging to lead us to continue this in the future. The point of the rule, as I understand it, was to let 10 days lapse wherein the village should be quite undisturbed, the rats allowed to wander from house to

* See page 123.

† Bachwan was not given in the Hoshiarpur Plague Returns.

house, become infected and die in as great numbers as possible. Such a result was not, however, obtained even when the rule was rigidly carried out. In Bilron and Bhagwain full ten days were allowed to elapse before disinfection was begun; there had been no previous history of any excessive mortality among rats, but the cleaning of the village did not reveal any great number of dead rats in any of the houses. In both these villages I had given strict orders that the discovery of dead rats should be reported to me, and their bodies preserved for examination, but in neither of them did I have any great numbers presented for my inspection. It is therefore my opinion that, having regard to the positive danger of allowing infected houses to remain in a village and the possible danger of rats becoming infected as well as human beings, we should, in all cases, at any rate where early notification is obtained, disinfect the infected houses as soon as evacuation is accomplished.

Hospitals.

The hospitals which we used for plague cases were, as far as possible, modelled on those used by Dr. James in the Jullundur District. The hospital camps should be strictly cordoned off from the others, and provision must be made in them—(1) for the plague cases; (2) for the hospital establishment; (3) for the medical subordinates; (4) for the temporary isolation of doubtful cases. Such cases are bound to occur in every epidemic, and the people will certainly be more satisfied if doubtful cases are treated in separate huts than if they are removed to the general plague hospital. In the case of a small village with few cases affected the large hospital huts need not be employed. It will be found that the people are better pleased to be isolated in small huts about 10 by 10 by 7 feet, and when there are few cases this does not entail much extra work on the hospital establishment.

Employment of Hakims.

The employment of Hakims offers no great obstacles in the administration of plague hospitals when the people are desirous to be treated by them. These men will, of course, have to submit to the same rules as to isolation, disinfection and quarantine as are binding on our own medical subordinates, and in cases where I have had to deal with them, I have found them very amenable to such. Arrangements must, of course, be made to give them a certain number of huts for the reception of their sick, and that they shall be able to obtain the drugs they require from the camp shopkeeper. When the people wish to employ Hakims, it is fair, I think, that the Hakims' hospital should be placed on the same footing as the Government one, with regard to the gratuitous supply of medicines and the dieting of those who are too poor to supply their own. The Hakims should be made to understand thoroughly that, as regards the discharge of their patients and in all questions of isolation and disinfection, they have no power to do anything without the advice of the medical officer, and all their bills should go through the medical officer's office for countersignature. The Hakims at Garhshankar were a most intelligent set of men, and by the end of my time there, I found that they had become so impressed with the superiority of antiseptics in the dressing of wounds that all the open buboes in their hospital were cleaned with antiseptic lotion and dressed with Iodoform.

Hospital establishment. Observation staff.

With regard to the medical establishment and observation staff, I have little to say, as I expect Dr. James will have gone very fully into this question. I would only remark that the employment of civil officers on observation duty seems to me of doubtful utility. They cannot be expected to diagnose doubtful cases of plague, in such they have at once to send for a medical officer. I fancy the point wherein they are supposed to have the advantage of the medical officers is in their magisterial functions, but these are, it seems to me, very seldom called into requisition in observation work, and even if magisterial powers are required, a tahsíldár is usually available who will do all that is required. Medical officers and subordinates who are employed on observation work should unquestionably have had some previous experience in plague work. It is absurd to have an observation staff like that which it was proposed to employ in Garhshankar tahsil, consisting of two hospital assistants and one *dhai*, only one of whom had ever seen a case of plague at all.

The economisation of medical or trained agency.

I have already in my report to the Deputy Commissioner gone into this question at length, and will now merely quote what I said there :—"I do not think that in future outbreaks so many medical officers need be employed. If young, active, healthy men are selected it will be much more satisfactory to have one man in charge of plague operations in the case of an outbreak like the Hoshiarpur one, than two men who may have entirely different ideas, and who will be continually at variance with one another as to the best methods of combatting the epidemic. I do not bring this matter to your notice because of any hitch in the relations that existed between Dr. Hunter and myself. Nothing could have exceeded the cordiality of these, but he and I are at one in saying that either of us could have, with adequate assistance, done the work just as well had the other not been here, and that it was quite unnecessary to send the two men. It is, we think, a waste of skilled labour for a medical officer to be employed in inspecting the cleaning of every house in a village and passing it as satisfactory or not, or for him to have to sit all day in the sun, and watch the disinfection of villagers before re-admitting them to their village, and yet these have constituted the most laborious part of our work. Such duties could be done just as well by assistant surgeons, or even, I think, by non-medical European supervisors. The whole epidemic in the Hoshiarpur district could have been managed most satisfactorily, and the medical officers, who were sent in the beginning, would not have been overworked, as they undoubtedly were, if they had been relieved of the more laborious and less important portions of their routine work either by assistant surgeons or by European supervisors. I am aware that in expounding the view that non-medical European supervisors could do the routine work of disinfection we are running counter to the ideas of both Drs. James and Wilkinson, but at the same time we cannot see why with a little training a European non-commissioned officer should not be trusted with this work under the medical officer. The chief objections urged by the Banga medical officers seem to be that a European supervisor could not remain all day at the work, which would then necessarily be left to the care of the hospital assistant. This, however, is what occurs at present. The medical officer has other duties, and cannot always be present throughout the disinfection of each village. They also say that non-medical inspectors would not have such a clear view of the dangers attaching to careless disinfecting. This may be so, but all the disinfecting at home is done by non-medical sanitary inspectors, and, although these are, of course, trained men, yet that is necessitated by the more complicated nature of their duties, and for the simpler work that would be entailed on a man employed on plague disinfection work in Punjab villages, I cannot understand why anything more is necessary than a *trustworthy, intelligent* man who on taking up these duties would be trained practically by the medical officer, and made to understand that in all matters connected with disinfections he is distinctly under the orders of the medical officer." Dr. James says he would be sorry to have the supervision of his good hospital assistants entrusted to bad European supervisors. Certainly, but why employ bad ones. Surely there are some intelligent and trustworthy non-commissioned officers in British regiments, and if the first supervisors obtained are not so, let us return them, and go on till we can get satisfactory men. The class is exactly that from which the European Sanitary Inspector is drawn, and good material must be available if we can get it.* "The employment of young Staff Corps officers for this work has been advocated, but is, I think, impracticable on account of difficulties with the rank question. It is a very exceptional Staff Corps officer who would take the orders of a medical officer unhesitatingly at all times, and carry them out to the letter."

Police cordons. Have they been effective?

No cordon of only 8 men to the mile could possibly be effective With crops on the ground, and a thorough knowledge of every *nullah* and ditch, a determined man could without difficulty pass through such a cordon by day or night, and even after the crops were gone the villagers, knowing all the inequalities of the ground and the position of each sentry would have no difficulty in passing through them aided by the darkness. Without therefore making any aspersions as to the venality of the policemen I have no hesitation in saying that the cordons were not effective, and I myself

* See page 108.

know instances in which they were passed both by night and by day. Thus a man in Bilron used frequently to pass through the cordon both of that place and of Palewal to visit a woman with whom he had an intrigue at the latter place, and the woman, on one occasion at any rate, went to Bilron from Palewal in broad day-night, and was accompanied part of the way by a constable who confessed that he had done so, and was punished for this offence. Numerous stories exist as to the various places in which the cordon was successfully passed either with the connivance of the constables or secretly, and one hears all over the country about the rich harvests that police constables, hospital assistants and compounders have reaped whilst on plague duty.

Inoculation.

Inoculation.

A separate account of the inoculation work that was done in Garhshankar tahsil has already been submitted to the Inspector General of Civil Hospitals through the Deputy Sanitary Commissioner.*

Risks of disinfecting work.

Risks attending the workers in disinfecting gangs.

In careless disinfecting these are undoubtedly considerable, but where disinfection is carefully done, all dust kept down and the whole of the interiors of the houses sprayed with disinfectant solutions before any coolies are allowed to enter, all men with cuts and wounds on their bodies weeded out of the gangs, the wearing of boots and shoes while at work insisted on, the gangs bathed thoroughly and their clothes disinfected when they come off duty, the risks are, I think, very small indeed. All cases which occurred in Garhshankar after Dr. Hunter and I came on duty there were found to have happened through the non-observance of some of these rules. In the villages last affected we made it a practice too to inoculate all the people who were employed on the disinfecting gangs before they went on duty, and in none of the three villages thus treated, *viz.*, Garhi, Bhagwain and Palewal, had we any plague cases from among the coolies of the cleaning gangs.

* Page 141.

I have already in my report to the Deputy Commissioner gone into this question at length, and will now merely quote what I said there :—"I do not think that in future outbreaks so many medical officers need be employed. If young, active, healthy men are selected it will be much more satisfactory to have one man in charge of plague operations in the case of an outbreak like the Hoshiarpur one, than two men who may have entirely different ideas, and who will be continually at variance with one another as to the best methods of combatting the epidemic. I do not bring this matter to your notice because of any hitch in the relations that existed between Dr. Hunter and myself. Nothing could have exceeded the cordiality of these, but he and I are at one in saying that either of us could have, with adequate assistance, done the work just as well had the other not been here, and that it was quite unnecessary to send the two men. It is, we think, a waste of skilled labour for a medical officer to be employed in inspecting the cleaning of every house in a village and passing it as satisfactory or not, or for him to have to sit all day in the sun, and watch the disinfection of villagers before re-admitting them to their village, and yet these have constituted the most laborious part of our work. Such duties could be done just as well by assistant surgeons, or even, I think, by non-medical European supervisors. The whole epidemic in the Hoshiarpur district could have been managed most satisfactorily, and the medical officers, who were sent in the beginning, would not have been overworked, as they undoubtedly were, if they had been relieved of the more laborious and less important portions of their routine work either by assistant surgeons or by European supervisors. I am aware that in expounding the view that non-medical European supervisors could do the routine work of disinfection we are running counter to the ideas of both Drs. James and Wilkinson, but at the same time we cannot see why with a little training a European non-commissioned officer should not be trusted with this work under the medical officer. The chief objections urged by the Banga medical officers seem to be that a European supervisor could not remain all day at the work, which would then necessarily be left to the care of the hospital assistant. This, however, is what occurs at present. The medical officer has other duties, and cannot always be present throughout the disinfection of each village. They also say that non-medical inspectors would not have such a clear view of the dangers attaching to careless disinfecting. This may be so, but all the disinfecting at home is done by non-medical sanitary inspectors, and, although these are, of course, trained men, yet that is necessitated by the more complicated nature of their duties, and for the simpler work that would be entailed on a man employed on plague disinfection work in Punjab villages, I cannot understand why anything more is necessary than a *trustworthy, intelligent* man who on taking up these duties would be trained practically by the medical officer, and made to understand that in all matters connected with disinfections he is distinctly under the orders of the medical officer." Dr. James says he would be sorry to have the supervision of his good hospital assistants entrusted to bad European supervisors. Certainly, but why employ bad ones. Surely there are some intelligent and trustworthy non-commissioned officers in British regiments, and if the first supervisors obtained are not so, let us return them, and go on till we can get satisfactory men. The class is exactly that from which the European Sanitary Inspector is drawn, and good material must be available if we can get it.* "The employment of young Staff Corps officers for this work has been advocated, but is, I think, impracticable on account of difficulties with the rank question. It is a very exceptional Staff Corps officer who would take the orders of a medical officer nhesitatingly at all times, and carry them out to the letter."

The economisation of medical or trained agency.

No cordon of only 8 men to the mile could possibly be effective With crops on the ground, and a thorough knowledge of every *nullah* and ditch, a determined man could without difficulty pass through such a cordon by day or night, and even after the crops were gone the villagers, knowing all the inequalities of the ground and the position of each sentry would have no difficulty in passing through them aided by the darkness. Without therefore making any aspersions as to the venality of the policemen I have no hesitation in saying that the cordons were not effective, and I myself

Police cordons. Have they been effective?

* See page 108.

know instances in which they were passed both by night and by day. Thus a man in Bilron used frequently to pass through the cordon both of that place and of Palewal to visit a woman with whom he had an intrigue at the latter place, and the woman, on one occasion at any rate, went to Bilron from Palewal in broad day-night, and was accompanied part of the way by a constable who confessed that he had done so, and was punished for this offence. Numerous stories exist as to the various places in which the cordon was successfully passed either with the connivance of the constables or secretly, and one hears all over the country about the rich harvests that police constables, hospital assistants and compounders have reaped whilst on plague duty.

Inoculation.

A separate account of the inoculation work that was done in Garhshankar tahsil has already been submitted to the Inspector General of Civil Hospitals through the Deputy Sanitary Commissioner.*

Inoculation.

Risks of disinfecting work.

In careless disinfecting these are undoubtedly considerable, but where disinfection is carefully done, all dust kept down and the whole of the interiors of the houses sprayed with disinfectant solutions before any coolies are allowed to enter, all men with cuts and wounds on their bodies weeded out of the gangs, the wearing of boots and shoes while at work insisted on, the gangs bathed thoroughly and their clothes disinfected when they come off duty, the risks are, I think, very small indeed. All cases which occurred in Garhshankar after Dr. Hunter and I came on duty there were found to have happened through the non-observance of some of these rules. In the villages last affected we made it a practice too to inoculate all the people who were employed on the disinfecting gangs before they went on duty, and in none of the taree villages thus treated, *viz.*, Garhi, Bhagwain and Palewal, had we any plague cases from among the coolies of the cleaning gangs.

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REMARKS BY SURGEON-CAPTAIN H. SMITH, I. M. S.

Theories of Infection.

In the 21 villages of this Circle *(Nawashahr) I think I have been able to prove to a demonstration that the original infection of each village was done through human agency, and my observation is that the spread of the disease within the villages was due almost, if not entirely, to the same agency. In some villages it affected those who associated together, and in others, in which there were factions, those amongst whom it had been originally introduced. In this connection I invite attention to the case of Kariha, noted in page 79 of Section I of this report, and to the annotated map of Kariha forwarded herewith.† Knowing from our observation that the disease is not one of those intensely infectious diseases such as small pox, measles, scarlet fever or typhus fever, it is not surprising that men who associate intimately together convey the disease to one another, and that in practice it takes a closer association than exists between men and rats to be of much practical potency. That plague is a very infectious and a most deadly disease to rats is undoubted, and it is also undoubted that having their abodes in and about houses they are also capable of conveying the infection to men. In this respect I think it most likely that rat contagion is conveyed through the handling of infected earth or things, or by the naked feet coming in contact with infected earth when there is any abrasion of the skin.

In this Circle there was no village, in which when unroofing operations were going on rats, either alive or dead, were not found. The dead rats were found in the roofs of the infected houses, and in other roofs than those of the infected houses, but generally in the roofs of the houses adjacent to those infected, and in such roofs there were no living rats found. Where colonies of living rats were found there were no dead ones found. This shows that once the disease got among a colony of rats it killed all that colony. In this Circle healthy living house-rats were observed in a number of instances in the camps, but not in the fields. There is nothing unusual about this. They followed the habitation of men and animals close to their village in search of food when the village was cleared out. Within the villages, diseased rats were found in the stage of delirium staggering about in unwonted places, and living diseased rats were found prior to the stage of delirium in search of water outside the houses. There is nothing strange in any of these facts. They are what we would expect. The fact that there was no village in which, when unroofing operations were proceeding, living rats were not found, and that in the roofs in which living rats were found no dead ones were found, and *vice versâ*, leads us to the definite conclusion that the rats of diseased colonies did not go out of their way to associate with independent healthy colonies, and *vice versâ*, and is convincing evidence that the rats did not roam about, as some would have us believe. I have been unable to find any history of rats having been observed wandering from village to village, nor have I been able to get any evidence of house-rats being found dead on the lines of communication from village to village. It is to be observed that the habitations of men and animals are the habitations of house-rats, and that they confine themselves thereto. They are quite distinct from field rats, and do not associate with them. These facts are quite consistent with what we know of other animals who claim an equal amount of intelligence, under similar circumstances of disease equally deadly to them, as I shall detail later on.

The doctrine that rats when their numbers are attacked by plague desert their abodes and seek for new homes in other colonies or in distant villages from dread of the disease, as they are said to do in the case of a sinking ship, implies a prescience and a reasoning intelligence which we find in no other of the lower animals under similar circumstances; even the villagers here have not displayed such intelligence. It is to be understood that the rats of a village have their homes and their family ties, if we may so speak, their everything within their own colonies. We find that animals in general suffer, or appear to suffer, considerable inconvenience when away from their homes, whether

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driven away from the stress of circumstances or not, and we naturally infer that the instinct of animals to remain at home is based on a very sound instinct which finds a place in the reasoning animal called man. The analogy of rats leaving a sinking ship—if it is a demonstrated fact that they do so—has no analogy to rats fleeing from dread of plague. Rats in a ship live in her bottom. When she leaks, they are the first living thing to be affected by the water. High up in the ship there is no place for them. Water is not their medium, and they are forced by the stress of circumstances to flee before it. Rats in their colonies on land are in their home, and in their natural element, and there is no such stress of circumstances to drive them away unless we assume that they have a prescience and a high class intellectual and reasoning capacity—much higher than is to be found in the average human being under similar circumstances. A few instances of similar circumstances amongst the lower animals is illustrative of these views. A disease, known as rabbit plague, is most infectious and most deadly to rabbits, when it gets into a warren, the rabbits do not wander and carry it to distant warrens. They die in their abodes, to the last rabbit. When scab or rot—a very fatal and infectious disease—gets amongst a flock of sheep, the non-infected do not desert their pasture lands. The diseased animal seems to stay aloof from the rest. This is not as it appears. The diseased animal is not fit to go about with the rest of the flock, and they do not wait on it. The case of the rest of a flock of deer going away or keeping aloof from the "stricken" one is no instance in point. Deer are most keen in scent, and recognise the smell of dogs or powder on the "stricken" one, and flee from these smells as from their natural enemy. Just as a bullock starts and makes off when he comes on the scent of a tiger or a leopard. In these latter instances and in case of rats leaving a sinking ship there is no analogy with animals fleeing from dread of an impending disease. We are not aware of any instance in nature of animals fleeing before an impending disease—if we exclude man from the category.

I have investigated this question in Section I of this report, and collected the facts concerning rats with exceeding care, and have gone into the matter at considerable length,—knowing that all over India and elsewhere very vague ideas are prevalent, as to how infection is conveyed to distant places, and also as to how it is conveyed to places quite near, to each other. If we decide that rats carry infection from village to village, and that they carry it extensively within villages, then, as we cannot control the movements of the rats, all our efforts are futile to prevent the spread from village to village, or within large towns. If, on the other hand, we decide that it is conveyed by rats to a minor extent within the village, and that practically to adjacent houses, and that it is not conveyed, at all, from village to village by rats, then the disease is amenable to human control.

Evacuation of villages in this Circle has been carried on as in the Banga Circle.

Disinfection of villages has also been carried on in this Circle as in the Banga except that we did not dig up the floors, on the following grounds. The floor is a hard and comparatively impermeable surface to water. The germs of the disease in the floors must lie in the very superficial portion of it. Under such circumstances our disinfecting solution will reach them, and be retained for a sufficient length of time in contact with them to destroy them. If we dig up the floor we cannot expect to remove all the germs. But we must expect to bury a good crop of them. When the villager sows his seeds, he ploughs the ground in order to bury them and, I maintain, that digging up floors will have a similar effect on the germs of plague. Again, digging up the floor spreads and mixes the germs in the soil, which it at the same time loosens, so that the disinfecting solution does not so readily get at them, nor is it so long retained in contact with them as when applied to the ordinary undisturbed floor.

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Cordons were the same here as in the Banga Circle. I may mention that, for a good while the system of passes gave considerable trouble to me, and often greatly delayed important business. The orders then were that no one was to give a pass except the Assistant Commissioner. When I had to send a message to any of my subordinates, whether urgent or ordinary, I had first to find the Assistant Commissioner, and get him to grant a pass. As some of the villages of this Circle were as much as 13 miles distant from each other, and as we were generally out every day in different directions, the inconvenience and delay on urgent business caused by such a system can be easily understood. I am not complaining of having to ask *non*-professional men for what, after all, were purely professional passes. But, I am of opinion, that these should have been more under the control of the medical officers who know best what persons were most likely to carry infection, instead of being entirely in the hands of the Assistant Commissioners who could not possibly know who were the people most likely to carry infection.

Character of Disease.

The character of the disease and its complications and *sequelæ* were substantially the same as elsewhere. The only unusual *sequelæ* were one case of aphasia in a young woman, and two cases of spastic paralysis. The first case was perfectly conscious, and fully recognised everything spoken, but could not even whisper. She had never learned to write. She recovered. The other two cases were brothers, of middle age. The spastic condition affected all the muscles of the body. The regions most distant from the head were most affected. One of them was unable to stand when the village returned, the other recovered as far as to be able to go about with the aid of a stick. Their speech was somewhat of a "scanning" character, but not like the scanning speech of glosso-labio-laryngial paralysis. The last time I saw them, they appeared to be slowly recovering.

The only member of the hospital staff affected by plague in this Circle was a compounder, and the only member of the disinfecting establishment a Chamar, and in this case the infection was traced to his work.

I find that the erratic dropping cases, which occurred late in many of our villages, were largely due to the people stealing into their houses in the village at night from the camp to look after their property.

Treatment of actual plague in this Circle was symptomatic. If we had been disposed to try inoculation as a prophylactic, the vast amount of supervision requisite for our scattered hospitals and villages, a number of which were twelve miles or more distant, rendered such work impossible. Besides, our orders were to turn out the villages at once on the recognition of plague, and as we found that the disease ceased directly the village was in camp, I was of opinion that statistics drawn from such a source, under such circumstances, would be worth absolutely nothing from a scientific point of view. If on the recognition of plague in a village, it were cordoned and inoculated wholesale and left alone, statistics in such a case would be most valuable, as a test of the utility of the remedy.

NAWASHAHR :
8th July 1898.

H. SMITH, M. D. M. CH.
Surgeon-Captain, I. M. S.

C.—NOTES ON THE PLAGUE OPERATIONS IN THE NAWASHAHR CIRCLE, JULLUNDUR, FEBRUARY-JULY 1898.

BY

SURGEON-LIEUTENANT H. Y. WALTON, M. B., F. R. C. S., I. M. S.,
Plague Medical Officer, Nawashahr.

NOTES BY SURGEON-LIEUTENANT WALTON.

In the following notes I do not propose to give a systematic report on the plague preventive measures, adopted in the Nawashahr Circle, but merely to indicate a few points that seem to me to be of importance, and about some of which there appears to be some difference of opinion.

My observations were confined to the villages of the Nawashahr Circle, *viz.* :—

Shikohpur.	Mahmudpur.
Sahlon.	Sodhian.
Kamam.	Aur.
Lodhipur.	Bajon.
Kathâron.	Piragpur.
Musapur.	Rasulpur.
Mahrampur.	Laroya.
Malpur.	Jhingran.
Hansron.	Bhanglan.
Chahlan.	Kariha.
Karnana.	

Some of my views are founded partly upon the experience I gained of plague during nearly ten months' plague duty in the Bombay Presidency.

The subjects which I propose to consider are the following :—

(1). Detection of plague in villages.
(2). Police cordons.
(3). Camps and hospitals.
(4). Quarantine.
(5). Disinfection of villages.
(6). Infection of villages.
(7). Treatment of plague.

(1).—DETECTION OF PLAGUE IN VILLAGES.

There can be no doubt that the concealment of the existence of plague in a village is a very easy matter, and that it was frequently and, in many cases, successfully carried out.

A few villages in the Nawashahr Circle, although surrounded by other villages in which plague was raging, appear to have got off scot-free. When one considers the nature and extent of business, agricultural and family connections between the inhabitants of neighbouring villages, it seems impossible to imagine that the inhabitants of these villages were never exposed to infection from without, or that they were all immune to the disease.

In very few cases do I think that we discovered the original plague cases: almost invariably we found several persons attacked, and often one or more dead.

Previous to a village being declared "infected" no systematic attempt was made to check communication with a similarly uninfected village. Probably a tolerably frequent occurrence was for plague to enter a village, and for the attacks, for some reason, to be few in number: a few corpses could easily be disposed of without exciting suspicion.

Surprise visits in my experience were invariably failures, although, as at Mahmudpur, plague was discovered in the same village by other means a few days later; and the number of sick left no doubt in my mind that at the time of the "surprise visit" the village was already infected.

In Bombay city I have repeatedly placed guards on all the exits of a single house, and searched the interior from the roof to the cellars, unsuccessfully, in cases where it was afterwards proved that a plague case was concealed. If this is the case in a single house how many hiding places must be available in an irregularly built, straggling village, or in the neighbouring crops.

Roll-calls in "uninfected" villages appear to me to be equally useless: there is no serious difficulty in impersonating a sick man unable to attend the roll-call.

In my opinion, it is of little avail to place any European officers on "inspection duty," except a medical officer, whose opinion is necessary to decide whether a given case is one of plague or not.

The only method of detecting plague at once seems to me to be through the local lambardars and zaildars. These officials have repeatedly told me that it would be impossible for any case of illness to exist in their villages without their knowledge If the lambardars and zaildars were made personally responsible to the Plague Officer, and were required to report to him daily on the condition of their villages, and *if severe punishment was meted out at once* to all who failed to report cases of sickness, I think that the results would be more satisfactory than those obtained by a regular staff of men—many of them strangers to the district—told off to search villages, suspicious or otherwise. I believe that in only two cases were lambardars punished, under the Epidemic Diseases Act, for concealing plague. Certainly wilful concealment for several days was the rule in the Nawashahr Circle.

I do not think that any *severe* epidemic of plague in a village could be concealed, although, as I have stated above, I believe that where only a few persons are attacked there is little difficulty in concealment.

Rewards.

The system of offering rewards for information of the existence of plague in a village is open to many objections. I am not inclined to believe in the probability of plague being wilfully introduced into a village in order that the informer might draw reward, but I know of several cases where this system has aroused a great deal of ill-feeling between neighbouring villages, which will probably continue longer than the plague epidemic. Again, as at Sodhian, it sometimes happens that a reward is given to a man who afterwards proves himself to be rather deserving of punishment for wilful obstruction than of reward for assistance rendered.

I think, too, that there is a prevalent popular idea that Government must derive some great benefit from the discovery of plague in a new village, since it is prepared to pay so much for information!

(2). POLICE CORDONS.

Whatever may be the mode of conveyance of plague infection from village to village—whether by human or other agency—the fact has been clearly demonstrated that placing a cordon of police round a village, *after* it has been declared to be infected, invariably fails to stop the spread of the disease to another village. I do not consider this to be at all surprising, nor reflect in the least upon the zeal with which the police did their duty. How easy it must be for a determined man, with local knowledge of every *nullah*, field and lane in the vicinity, to evade the observation of police guards suddenly placed on duty in an unfamiliar place.

During the first three months of the epidemic the country was covered with high crops, under cover of which it must have been quite a simple matter to slip by a guard, even in the day time, much more so on a dark night.*

The greatest strength of any cordon was eight men to the mile—*i. e.*, with gaps of 220 yards between every two men. Although a cordon of any available strength appears to be inadequate to prevent resolute men breaking singly through it, I believe that even a numerically very weak cordon indeed has sufficient *moral* effect to prevent emigration on any large scale. After all, the majority of people who leave an infected village presumably have not got plague.

It seems to me that their desire to leave the infected spot is a perfectly legitimate and natural one, and that—as I have suggested under the head of "Quarantine"—it would not be a source of the least danger if it were encouraged.

Believing, as I do, that any cordon, however weak, does discourage attempts to leave a village on a large scale, I consider that a given number of *sipâhis* would be more advantageously employed if *a few sentries* were placed, at the beginning of an epidemic, round *all* the villages in the neighbourhood, with instructions to check, as far as possible, strangers coming and going, and to report the number of bodies buried or burnt day by day at the village burning ground, than, as under the present arrangements, in endeavouring to form an impossible barrier solely round villages known to be infected.

* I think Dr. Walton must be referring to the time when he first came on duty—(February). The fields were all bare in October, November and December, when the epidemic commenced.

It has been suggested that a single cordon covering a large circumference placed round the infected area would be more successful than separate cordons round infected villages, but, for the reasons given above, I consider that, besides being unfair to uninfected villages within the area, such a scheme is doomed to failure.

(3). Camps and Hospitals.

(a). Camps.

The chief point of interest in connection with the camps in the Nawashahr Circle was that, owing mainly to the difficulty in obtaining *chhappar* huts in sufficient numbers the villagers were in many cases allowed to build their own camps.

This, I feel sure, was a mistake. It is most important, from the administrative and sanitary points of view, that the camps should be arranged in a regular, orderly way, in fact like a military encampment. It is impossible to adequately inspect an irregularly constructed camp, and the daily roll-calls can never be satisfactorily held. The huts built by the villagers were very much more solid affairs than those provided by Government, and the supports of the roofs were often formed by growing trees. If a case of plague occurred in such a hut it was a difficult matter to remove the hut to the "segregation camp" and to re-erect it there. The huts straggled over a large area of ground, and the police cordons required to surround the camps were consequently unnecessarily large.

During the heavy rains that occurred during the month of February some twenty head of cattle died at Shikohpur alone.

I would suggest that rough shelters should always be provided for cattle when rain is expected.

(b). Hospitals.

A plague hospital should consist of two distinct parts: one for undoubted plague patients, and the other, at some considerable distance from the first, for "suspected" cases. A separate staff of servants need not be provided for the latter, with the exception of a "sweeper," as the patients' own friends could perform all the services required by the "suspected" men.

It may, perhaps, be objected to this dual nature of plague hospitals, that the number of "suspected" cases is very small, and that such a case can always be kept under observation in a small hut near the main hospital. Although it is quite true that during the height of the recent epidemic in the Nawashahr Circle one seldom had much difficulty in deciding whether a case of sickness was one of plague or not*, still it must be generally conceded that, more especially at the beginning and towards the end of an epidemic, a fairly considerable number of cases do present themselves, concerning the nature of which even those medical officers, who have had considerable clinical experience of plague, are, for a time at any rate, somewhat doubtful.

At one of the villages in the Nawashahr Circle—Sahlon—a case in point occurred. A young girl was shown to be suffering from fever (103°) and a large swelling in one parotid region, encroaching beyond the limits of the parotid gland. I sent the child to hospital with little doubt that it was plague. Shortly afterwards a swelling appeared on the other side of the face, and in 36 hours there was a continuous "collar" stretching from ear to ear. The child's temperature fell to 98°, no other symptoms of plague appeared, and in a few days she was quite convalescent. If there had been no plague about I should not have hesitated to call the disease "mumps," and as I felt very doubtful about the nature of the case, on the occasion of my second visit to the hospital I had the child "disinfected" and removed to a separate hut. In a day or two her mother was sent to hospital with undoubted mumps.

* The point that struck me most on first beginning work in the Punjab was the very "typical" symptoms that the large majority of patients presented. I had been on plague duty for the preceding three months at Satara, in the Deccan, where the type of the disease was quite different. Quite half the patients died without the development of buboes: or, at least, if these appeared they could only be detected at quite a late stage.

I spoke to Surgeon-Captain James about the case some time afterwards and understood him to say that he too had seen several cases of mumps in the Banga circle about the same time.

I could cite many other cases—notably one of a police constable, the diagnosis of which remained very doubtful.

It seems to me that one has no moral right to send to a plague hospital cases about whom there is the least doubt, and although I had had a considerable previous experience of plague in the Bombay Presidency, a good many doubtful cases came under my notice in the Nawashahr circle.

I do not think that setting aside a few huts, close to the plague wards, is sufficient. Such huts should be provided as a matter of routine,—*at a considerable distance*—at least 100 yards from the plague hospitals. These huts should only accommodate one patient, and if the case turns out to be one of plague, the hut should be taken to pieces, disinfected and exposed to the sun for several days, and the site on which it stood should be covered with grass and burnt.

Natives will never believe that a case is plague unless buboes are present. They are therefore apt to conceal the "early" cases—those that we are most anxious to get to hospital, and for whom we can do most. But if the friends of the patient know and see that, as long as there is the least doubt about the nature of a case, the patient will be kept quite apart from the plague hospital, they have little or no object in concealing any cases of illness that may occur.

Latterly, when the strain upon the police was very heavy the hospital and segregation camps were quite inadequately guarded. There would have been little difficulty at night in persons visiting their friends in hospital, and I have no doubt that this often occurred.

(4). Quarantine.

No facilities were offered to people wishing to leave an infected village, and, as I have already mentioned under the heading of "Police cordons," I am inclined to think that most of the instances of cordons being broken through are to be attributed to this fact.

It is quite natural for people to wish to remove themselves and families from a plague stricken village; and, provided that it can be done without exposing other places to the danger of infection, this should rather be encouraged than otherwise. I would suggest that a central quarantine camp might be provided in each "circle," and that persons wishing to leave a village, at any stage of the epidemic—before, during or after their villages have become infected—be allowed to enter the camp, and that they be made as comfortable as possible, during their stage there.

As regards the period of detention I consider ten days too short. Two cases occurred within my experience in which after very careful investigation I was convinced that the period of incubation—or at least the period that had elapsed since the last date of possible contact with a plague case—in these two particular instances, was ten days. This is I admit quite exceptional, and these instances were the only two that occurred among a very large number of people. I would recommend that in such a camp as I advocate fifteen days—or, at the least, twelve days—be the period of detention. Separate huts should be provided for each family, and the quarantine camp should be sub-divided into three parts after the expiry of five (or four) days, people should be moved to the next section and after ten (or eight) days to the third section. At every transfer the people and their belongings should be thoroughly disinfected. By the time an individual reached the second camp, there would be little risk of him getting plague; if he did, however, those living with him would have to start their quarantine afresh in the first camp.

As regards the question of Quarantine *v.* Inoculation by M. Haffkine's method, I think that our experience of the latter is not yet sufficient, and that such evidence as is available can scarcely be considered favourable enough to warrant its adoption as an alternative to quarantine.

(5). Disinfection of Villages.

The selection of the most reliable method of disinfecting a village is one of the most controversial subject in connection with plague. The variety of views that are held about this matter are, however, really due to the fact that our knowledge of the natural history of the plague bacillus is by no means complete. Notwithstanding the large number of eminent scientific men who have been occupied with the subject of the life history of the bacillus, for some time past, both in Europe and Asia, the results obtained hitherto leave many very important points undecided.

M. Metchnikoff, at the Moscow Congress in August 1897, made the following remarks:—

"L'histoire naturelle du bacille pesteux, malgré une quantité de faits precieux et bien établis qui la concerne, est encore loin d'être complète. Nous ignorons notamment les conditions dans lesquelles le bacille se conserve dans la nature pendant de longues périodes. Depuis les travaux de Kitasato sur la grande sensibilité du bacille pesteux vis-à-vis de la dessication de l'insolation et des antiseptiques, on admet généralement que ce microbe ne peut se conserver en dehors de l'organisme que pendant un temps relativement trés court, et encore en perdant la majéure parti de sa virulence. Ces faits n'expliquent pas suffisament certaines observations épidémiologiques d'après lesquelles la peste serait—communiquée *pardes effets conservés pendant long temps a l'état sec*, on encore par des marchandises expédiées à longue distance. En se basant sur ces données, *on est amené à supposer l'existence d'une forme de résistance du bacille pesteux qui, jusqu'à présent n'a pas été rencontré.*"

The object of the disinfection of a village is, of course, to destroy the plague bacillus, but until we can reconcile all observed facts with laboratory experiments, the methods of disinfection adopted must always be more or less empirical and of the nature of experiments.

Practically, the results obtained are the best tests of the efficacy of the method employed, and up to the present, they have been very strikingly successful in the Jullundur District. Whether, however, sufficient time has yet elapsed to justify us in being sanguine about the future, is a matter of opinion.

I feel persuaded that "Phenyle"—the disinfectant employed—is unreliable for the purpose required. It was found impossible to keep the strength of the emulsion constant—this probably was rarely stronger than 1 in 500 and often considerably weaker. Considering that the period during which this emulsion was in contact with most parts of a house was of very short duration, and that the walls were coated with the accumulated dirt and grease of years. I cannot believe that any phenol compound would infallibly destroy even the least resistant forms of the plague bacillus; much less those forms endowed with great powers of resistance, referred to by M. Metchnikoff in the quotation given above.

No doubt the floors of the houses were subjected to a more prolonged contact with the disinfectant, but even this was only a matter, at most, of an hour or two, and I think it extremely unlikely that such a dilute emulsion would certainly destroy all the resistant forms of plague bacilli that it came across.

Is it then worth while going to the trouble and expense of using any disinfectant at all for spraying the houses?

Having regard to the admitted imperfection of our knowledge of all the forms of the plague bacillus it certainly is desirable to do so, but the germicide solution should be a powerful and reliable one. Perchloride of mercury, the disinfectant employed in Bombay, possesses both these qualities. It certainly is rather more difficult to use than phenyle, owing to its comparative insolubility, but this difficulty can easily be overcome. In Bombay I made and used very concentrated solutions of corrosive sublimate in water, with the addition of hydrochloric acid. These solutions were kept, made up, in bottles, the sides of which were marked with divisions, like a medicine bottle. The man in charge of the disinfecting gang poured the amount of solution contained between two of these divisions into water in a bucket, whose capacity had been measured beforehand. (A mark was painted, at a certain level, on the inside of the bucket, and the capacity of the bucket, up to that mark, was clearly painted on the outside of each bucket, there was thus no difficulty in ensuring that a solution of constant and known strength was employed in every case).

Perchloride of mercury has the additional advantage of being a powerful poison. Any scraps or crumbs of food, with which it comes into contact are poisoned—an important matter, since rats, and, according to Mr. Hankin, ants, too, so frequently serve as carriers of the disease. Indeed, according to M. Metchnikoff, as in the case of so many bacilli, the occasional "passage" of the microbe through an animal of a different species is necessary to prevent the attenuation and to exalt the virulence of the plague bacillus.

Of course, with perchloride of mercury a different pattern of pump to that recently used would have to be adopted; but this, I think, would be a very great improvement.

As it is, the metal pumps are expensive and, owing to the rough usage they receive at the hands of ignorant coolies, are very liable to get out of order and become useless. In no village in the Nawashahr Circle, could I find a "mistri" capable of repairing any but the most trivial injury. In Bombay, square sided wooden pumps, of very simple construction, were used: even cheaper ones could easily be constructed of hollow bamboos.

Lime-washing is certainly of use, provided the lime is good and mixed only just before use. Its employment has the additional advantage that one can see at a glance whether all parts of the room have been subjected to it or not.

The villagers, too, seemed to appreciate the clean appearance that their houses presented, after being lime-washed. Perhaps this may stimulate the owners, for a time, to keep them so!

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The ideal method of dealing with the houses in an infected village, would be to completely unroof them all. But practically, for various reasons, this is not often found to be possible. Certainly the roofs of all houses, in which plague cases are known to have occurred, should be completely removed, and it is well to remove those of the adjoining houses at the same time. As regards the other houses a strip of roof, running north and south, and extending from wall to wall, should be removed from each room. Owing to the great variation in size of the rooms it is impossible to give any definite dimensions applicable to all cases, but the strip should certainly never be less than four feet wide, and in large rooms it may be necessary to remove two or more strips. The only way of seeing whether enough of the roof has been removed is to visit the house, at different times of the day, and to notice whether, at one time or another, the sunlight reaches every part of the room.

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It is admitted that the floor is generally the most infected part of the room, hence the idea that it would be a good thing to remove it. But the practice of digging up two or three inches of the soil and carrying it outside to be buried or burnt cannot, I think, be expected to get rid of the infection. The floors of village rooms are made of mud and cowdung, firmly stamped down and are practically impermeable to water. The plague bacillus in the forms with which we are acquainted is an aerobic bacillus and therefore requires a free supply of air for its existence. It, therefore, almost certainly lives merely upon the surface of the floor, where it can be reached and dealt with by the ordinary chemical germicide solutions.

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But, although the bacillus as we know it is aerobic, it is quite possible that, in its more resistant condition—spore stage, or whatever it may be—it may be able to remain dormant, for an indefinite period, buried under the surface, but ready to re-assume full activity and virulence when again exposed to a favourable environment.

When the floor of a room is dug up and removed, numbers of bacilli must remain behind, only to be buried a few inches below the surface, when the owner of the house re-prepares his floor. When the floor is again dug up for any purpose, or as the result of wear, the bacillus will again come to the surface, ready to start on a fresh career of activity. Perhaps like the tetanus bacillus, found in garden mould, it may often at first be almost non-pathogenic, but a few passages through rats or human beings would soon exalt its virulence.

Undoubtedly the best way of dealing with the floor is to spread a thick layer of grass over it, and burn the latter. An intense degree of heat is thus generated, which must be quite sufficient to destroy any form of bacillus that is exposed to it, either on the surface of the floor or a few inches beneath it. But, unfortunately, this method is not often practicable in dwelling-houses, as there is great danger of setting fire to the rafters, &c. In cattle sheds it may often be used with advantage.

All cattle sheds and out-houses should be treated in exactly the same way as the rest of the village. The villagers do not like their out-houses being disturbed, as a large number of them are filled with grain and forage. But it is precisely for this reason that great attention should be paid to such places.

When once the disinfecting gang is at work in a village, the rats leave the dwelling-houses, where they are constantly being disturbed, and take refuge in the quiet, outlying sheds. All stores must be removed and spread out in the sun, and the sheds must be disinfected and lime-washed with very great care. It is especially important in these cases to make an adequate opening in the roof, since, owing to the rough state of the walls and floor, it is difficult to ensure that all parts have been reached by the disinfectant.

The "ten days" rule.—This rule, namely, that no disinfecting work shall be begun in a village until ten days have elapsed since the village was evacuated—was, I believe, framed with the intention of allowing the infected rats to die undisturbed in the village, instead of carrying infection elsewhere.

But there is little or no evidence to show that diseased rats do leave an infected village, and the delay is inconvenient and unnecessary. It would be better for the village to lie "fallow" for ten days after the completion of disinfection instead of before its commencement. This would give the sunlight some time to exert its influence, before the village is re-occupied, and the holes in the roofs repaired.

Modes of infection of villages.

(6). In most cases it is almost impossible to ascertain all the facts in connection with the introduction of plague into a new village.

The villagers, for fear of subsequent prosecution or other consequences, are naturally reluctant to relate truthfully all the circumstances connected with the outbreak, and lay the blame on one person—usually one who died of the disease, and to whom, therefore no ulterior consequences can ensue—whereas it might, with equal justice, have been laid upon several persons, who succeeded in breaking through a police cordon.

Whilst it is undoubtedly true that in the case of one or two villages in the Nawashahr Circle, *e.g.*, at Karnana, the evidence seems unequivocal that the disease was directly introduced by a single individual, returning from an infected village to a healthy one, it seems to me to be eminently unscientific to assume, in all cases, that because a man escaped from an infected to an uninfected village, therefore he was the one to introduce plague into that village. Sufficient evidence has been adduced to prove that clothes may be a source of infection, but I have never met a villager who considered the possibility of that being the mode by which plague entered his village.

My time was so fully occupied with other work, and I so soon became convinced of the futility of placing much reliance on the stories of interested villagers, that, to my regret, I was unable to accumulate much evidence on the subject of the mode of infection of given villages.

As regards the spread of the disease, *within a village*, I was much struck with the fact—originally pointed out to me by Surgeon-Captain James at Khankhanan—that, in every village, the disease appears to have passed from one house to adjoining houses, influenced merely by the proximity of the houses, and scarcely at all by the convenience of human access from one to the other. Thus, after the roofs of the infected houses had been removed, standing on an adjacent house top one could trace an almost unbroken chain of infected houses stretching often through several distinct quarters of the village. On enquiring into the caste and other circumstances of the inhabitants one often found that there could have been no common interests nor communication between the owners of adjacent houses—one might be a Brahmin and his neighbour a Chamar—and to pass from one house to the next, along the lanes of the village, it was often necessary to make a wide detour, leaving the village by one gate and re-entering it by another.

This very striking fact—one which was practically universal in the Nawashahr Circle—appears to demonstrate, almost conclusively, that the common mode by which plague spreads in a village is not by human intercourse. The agents which at once suggest themselves are rats or other vermin (cats, ants, ticks). These animals have their regular "runs," and would naturally pass from one house to the next, undeterred by caste or other prejudices.

We know that rats died in large numbers in the infected villages: quantities were found by the disinfecting gangs in the Nawashahr Circle.

That rats ever carry the plague from village to village—except where one village is merely an extension of the first—was never proved in any of our villages. No rats were ever seen migrating, and to undertake long journeys is quite foreign to the nature of these animals.

That clothes or household utensils may be a source of infection was impressed upon my mind by the success that followed disinfection of these articles in a camp where the disease was spreading, (Shikohpur), but, as I have already mentioned under "Disinfection," I would rather attribute the favourable results to the free exposure of the wet clothes to the sunlight, than to the disinfectant—phenyle—employed.

(7). Treatment of Plague.

As regards the treatment of persons suffering from plague, no one appears to be able to claim very satisfactory results; this of course, is only to be expected considering the nature of the disease, and the comparatively short experience that we have had of it. Plague, except perhaps in the very mildest and "abortive" attacks, is a septicæmia, and the ordinary treatment of septicæmias—essentially one of stimulation, to enable the patient to tide over the time until his tissues are able to elaborate means of dealing with the bacillus—has been practised by everybody.

Many drugs have been vaunted, and it has almost been claimed for some of them that they exert a "specific" effect on plague but, as in the case of most so-called "specifics," no rational explanation is forthcoming as to their mode of action, nor to my knowledge, has it been demonstrated that the results so obtained are any better than those by any other method. Indeed such drugs are almost always administered together with stimulants, and probably any favourable results obtained are due to the latter alone.

Treatment by antitoxic serum is certainly the most rational for such a disease as plague: it is much to be regretted that it has not had a more systematic trial on a larger scale. I think that the favourable results obtained by M. Yersin,—unfortunately he had many unfavourable ones, too, due to the weakness of his serum, and to the late stage of the disease to which many of his patients had arrived—have scarcely been sufficiently appreciated. M. Simmond, who is at present trying some stronger serum at Karachi, sent out by the Pasteur Institute of Paris, should be more successful, but up to

the present, the published results are too meagre to enable one to form any decided opinion on the subject.

Hakims were always encouraged to attend those who preferred them in the Nawashahr circle, but I found it necessary to dissuade them, as far as possible, from employing the local applications to the buboes, that they affected. These were almost invariably caustics applied with a lavish hand and the result was great loss of time and tardy convalescence, owing to the sloughing of the skin over large areas, long after the original buboes had become absorbed.

Many patients of their own accord combined in their persons both methods of treatment—Eastern and Western—probably on the principle that if one did not cure, the other might! I found it a good plan to have written instructions, as to the routine treatment of patients, hung up in the hospital, so that there might be no excuse for hospital assistants or compounders neglecting to do something for cases admitted in my absence.

As regards the local treatment of buboes. No doubt plague starts as a "local infection," hence some people have advocated early excision of the bubo; but this is quite irrational. Perhaps in mild and abortive attacks the process never proceeds beyond the stage of a local infection, but in such cases there would be no advantage gained by excising the bubo, since the infection is never confined to the bubo alone. All the lymphatics leading from the point of inoculation are equally infected, and it is a mere chance whether the bubo is detected at all before the case has become one of septicæmia. In performing *post-mortem* examinations on plague patients, it is often found that many of the deeper glands—pelvic, mesenteric, mediastinal—are bubonic, without it being possible to detect any appreciable enlargement of the more superficial ones.

Very many, even large, buboes become absorbed and entirely disappear, especially if the patient can be persuaded to keep lying down and quiet.

There is often a very deceptive sense of fluctuations due to the intense œdematous infiltration of the periglandular tissues. This is especially the case in deep seated buboes, under the deep fascia. Until one has acquired some little experience of the disease one is often tempted to incise such buboes, in order to prevent deep burrowing of pus. If this be done, unless the very greatest care be taken, and strict asepsis observed—a very difficult matter under the conditions prevailing—the wound often fungates and takes a very long time to heal.

The presence or absence of œdema of the skin over a deep seated bubo, does not seem to me to be, in plague, of any value as evidence of deep seated pus.

It is, of course, important that bubonic pus should be treated like any other abscess, and evacuated. As the result of delay, one sometimes sees the entire axilla, or the greater part of Scarpa's triangle, looking like a dissection—all the inter-muscular and other connective tissue having disappeared. But this result is still more often due to the sloughing *en masse* of the contents of the cavity, often with very little formation of pus, and must be attributed to the intense virulence of the infection.

In opening buboes, whether superficial or deep, it is very essential that the incision should be a free one. I have often regretted making too small an incision, but never too large a one. The vitality of all the tissues is much reduced in plague, and a small incision leads very often to deep and wide-spread burrowing of pus.

The staff of a hospital should always be sufficient to allow of one hospital assistant or compounder being on night duty. This was generally quite impossible in the Nawashahr circle, and for this reason the mortality was certainly greater than it need have been.

Good nursing is very important in plague—quite as much so indeed in my opinion as drugs. I had no trained nurses working under me, but the *dhais* I had did very good service. There is no doubt, however, that a properly trained European nurse is far preferable and that her attention would be much appreciated by the sufferers.

APPENDICES.

APPENDIX A.

ESTABLISHMENT, FURNITURE AND EQUIPMENT OF TEMPORARY PLAGUE HOSPITALS.

I.—Establishment.

1. A Hospital Assistant.
2. A Compounder.
3. A Dhai or native nurse.

In the larger hospitals European Nurses were employed and were found most useful. In some of the smaller villages one Hospital Assistant without a Compounder, and even in extreme cases a Compounder without a Hospital Assistant was used. The arrangement on the whole worked well.

4. One Hospital Cook (Hindu).
5. One Bhisti.
6. One Sweeper.
7. Two or more Kahars, Jhinwars, or Ramdasis, who acted as dooli-bearers, ward orderlies, &c. These people also did the night watching—a most important item in the treatment of plague when delirious patients give trouble.

When the hospital contained more than 30 patients the above establishment (4, 5, 6 and 7) had to be doubled.

II.—Hospital Furniture.

For a hospital consisting of two sheds for patients each shed holding 12 patients.

1. Beds	24
2. Bags of country cloth filled with *parali* grass for mattresses. On the patient being discharged from hospital or dying the grass is removed and burned and the bags boiled in phenyle lotion and re-filled	
3. Baths	30
4. Blankets 50 in the warm weather and 100 in winter	2
5. Box for medicine with lock and key	1
6. Chair for office	1
7. Gamlas (kunalies)	30
8. Gharrahs for holding water, lotion, &c.	10
9. Karahas. (These are large open iron vessels in which the villagers boil the sugar-cane juice in the preparation of country sugar. They were readily lent us and were most useful for boiling patient's clothing, blankets, bedding, &c.)	2
10. Empty Kerosine tins. (These were fitted with wooden handles by the local village carpenter and made excellent buckets for carrying about bath water, anticeptic lotion, &c.)	10
11. Lanterns (2 for wards—1 for dispensary)	3
12. Native cooking vessels 1 degheha, 2 baties, (1 large, 1 small) 2 thalies (brass), 1 karchi, 3 katoras, 1 parat, 1 garwa, 1 dol, 1 baltohi and 1 loh.	
13. Native stoves (angithees) (in winter only)	6
14. Pocket book	1
15. Stationery—Pens, ink, paper ($\frac{1}{2}$ quire foolscap and 1 quire Hinai) blotting paper, inkstand, ruler and pencil.	
16. Table for office and dispensary	1
17. Registers, 1 for patients and 1 for dead stock, &c.	2

III.—Medicines.

These varied according to the method of treatment adopted by the Medical Officer in charge. But the following list was found to contain all the drugs most commonly required :—

1. Acitas Plumbi	4 ozs.	36. Lin. Camp Co.	
2. Acid Acetic	2 „	37. Lin. Terebnith	2 lbs.
3. „ Boric	1 lb.	38. Linseed Meal	
4. „ Carbolic...	2 lbs.	39. Magnesii, suph.	2 „
5. „ Nitric Fort.	2 ozs.	40. „ carb.	2 „
6. „ Sulphuric Dil.	8 „	41. Morphinae Hydrochlor	1 lb.
7. „ Nitro Hydrochl Dil.	8 „	42. Olium Recini	1 drm.
8. Aetheris Nitrosi Spiritus	8 „	43. Opium	2 lbs.
9. Alum	4 „	44. Opii, Tinctura	1 drm.
10. Ammonii, Aromat, Spiritus ...	8 „	45. Phenyle	4 ozs.
11. „ Corbonos	1 lb.	46. Pil Rhei Co.	4 galllons.
12. „ Acetatis Liq.	8 ozs.	47. Potassii Bromidum	4 ozs.
13. „ Chloridum	4 lbs.	48. „ Bicarb	2 „
14. Argentri Nitras	1 oz.	49. „ Liquor	1 lb.
15. Arsenicalis Liq.	1 lb.	50. „ Chloras	4 ozs.
16. Belladonna Extrat.	1 „	51. „ Nitros	8 „
17. Bismuthi Subnitras	1 „	52. „ Permangan	8 „
18. Chlorodyne	4 ozs.	53. Pulv. Ipecac. Co.	1 lb.

19. Chloral Hydrat.	8 ozs.	54. Quin Sulphas	2 ozs.
20. Chloroform	8 „	55. Sodii Bicarb	8 „
21. Cupri Sulphas	2 „	56. „ Salicylas	2 „
22. Digitalis Tinct.	4 „	57. „ Sulphas	8 „
23. Ergot Extrat Liq.	1 „	58. Spiritus Rectificatus	1 lb.
24. Ess Menth Pip	1 „	59. Spirit Methylated	1 „
25. Ferri Perchlorid Tinct	1 lb.	60. Strychnine	½ drm.
26. Glycerine	1 „	61. Syrupas Phos. C Quinine C Strych (Easton's Syrup)	1 lb.
27. Hydrargyrum Perchloridum ...	4 lbs.	62. Tinct. Scillae	1 „
28. Hyd Perchloride Liquor	4 „	63. „ Camph.	1 „
29. Hydrarg C. Creta	2 ozs.	64. „ Rhei	1 „
30. Hydrarg Oxid Flavum	1 drm.	65. Unguentum Hydrarg	8 ozs.
31. „ Subchloridum	2 ozs.	66. „ Hyd. Nit.	8 „
32. Hyoscyami, Tinctura	2 „	67. „ Simplex	1 lb.
33. Iodi tinctura	4 „	68. Zinci Suph.	8 ozs.
34. Iodoform C Borac	4 „	69. Zinzerberis Pulv.	8 „
35. Ipecac. Vinum	4 „		

IV.—Sundries.

1. Country cloth for bandages	16 yards.
2. Carbolic soap	2 cakes.
3. Cotton wool for dressings	½ seer.
4. Charcoal for fires	as required.
5. Dressing trays	2
6. Enema	1
7. Feeding cups	2
8. Feeding bottles for infants	2
9. Galipots for ointments, &c.	1 dozen.
10. Hypodermic syringe	1
11. Kerosine oil	1 tin.
12. Lime for the floors	1 maund.
13. Lint for dressings	1 lb.
14. Measures for one pint, one 4 oz. and one minium.	
15. Pestle and mortar, wedgwood	1
16. Pocket case	1
17. Pill slab with spatula	1
18. Phials and corks	1 dozen.
19. Rum	10 pints.
20. Rod (bamboo) 6 ft. long for measuring the depth of graves	1
21. Scales and weights	1 set.
22. Spirit lamp	1
23. Stethoscope	1
24. Test tubes	2
25. Thermometers	2
26. Towels	2
27. Wood	as required

V.—Diet.

1. Ata	1 maund.	7. Salt ...	2 seers.
2. Dal mung	10 seers.	8. Condiments,—Haldi, mirich, dhania, &c.	1 seer.
3. Chawal	10 „	Milk and meat for soups to be supplied on indent	
4. Sago	10 „		
5. Sugar	10 „		
6. Ghee	5 seers.		

APPENDIX B.

Table showing the Sex and Caste of the people attacked with Plague in the Jullundur District.

Number.	Villages.	Sex. Number of males attacked.	Number of females attacked.	Number of males under 10 years.	Number of females under 10 years.	Total.	List according to castes. Hindus. Brahmins and Khatris.	Jats.	Tarkhan, Lohar, Chimba and Sunars.	Jhinwars.	Nais.	Khumars.	Acharaj.	Faqirs and Manganwalas.	Rajputs.	Total.	Muhammadans. Rajputs.	Mughal and Pathans.	Kassais.	Bhrais.	Lohar, Tarkhan, Teli, Dhobi and Sunars.	Jats.	Rawals.	Sayed and Sheikhs.	Arains.	Total.	Other castes. Chamar and Ramdasis.	Chuhras.	Sahnsis.	Total.	Remarks.
1	Khatkar Kalan	30	39	4	6	79	13	11	5	2	2	3	...	...	...	36	1	...	...	...	7	...	1	2	4	15	18	10	...	28	
2	Jhandher Khurd	14	12	2	1	29	5	8	1	2	...	...	...	...	...	16	...	...	...	...	1	...	...	...	...	1	12	...	...	12	
3	Khankhanan	69	78	18	10	175	18	108	14	...	2	3	...	2	...	147	2	...	...	4	4	4	...	...	1	15	12	1	...	13	
4	Khatkar Khurd	4	3	1	2	10	...	10	...	...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
5	Shikohpur	28	34	7	6	75	4	34	2	...	...	...	...	...	...	40	...	...	...	...	9	...	...	...	...	9	26	...	...	26	
6	Sirhal Qazian	37	31	4	10	82	10	10	1	1	1	...	...	1	...	24	...	...	1	...	18	2	...	1	19	41	14	3	...	17	
7	Mallapota	52	25	8	6	91	26	28	12	4	...	...	...	...	...	70	4	...	...	...	2	...	...	...	...	6	15	...	...	15	
8	Gunachaur	59	61	15	12	147	36	12	12	3	...	4	...	...	6	73	12	...	...	4	7	2	...	...	32	57	1	16	...	17	
9	Jhandher Khurd	1	...	...	...	1	...	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
10	Sohlon	46	49	8	4	107	6	...	3	1	1	...	...	1	83	95	...	...	...	...	1	...	...	...	...	1	11	...	...	11	
11	Mehlgahla	67	26	5	3	101	14	34	2	...	1	...	...	...	...	51	...	...	...	...	2	...	...	...	...	2	41	7	...	48	
12	Kumam	21	32	4	4	61	11	5	13	...	...	...	...	...	...	29	14	...	...	...	13	...	...	...	2	29	3	...	...	3	
13	Jagatpur	27	21	7	8	63	5	12	6	5	...	...	...	2	...	30	...	...	...	1	4	1	...	...	...	6	25	2	...	27	
14	Khatkar Khurd	1	2	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	3	
15	Katharon	20	18	...	...	38	5	10	4	2	...	...	...	...	...	21	6	...	...	...	10	...	...	...	...	16	1	...	...	1	
16	Karnana	1	...	...	...	1	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
17	Balon	15	7	5	1	28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	19	...	...	...	25	3	...	...	3	
18	Lakhpur	15	11	4	1	31	...	22	1	3	...	...	...	...	...	26	...	...	1	...	...	...	...	...	...	1	4	...	...	4	
19	Nurpur	10	8	...	1	19	...	4	1	2	...	...	...	...	...	7	...	...	...	...	...	...	...	...	...	...	12	...	...	12	
20	Lodhipur	21	21	5	2	49	...	12	...	...	...	...	...	...	...	12	...	...	...	...	13	...	...	...	...	13	24	...	...	24	
21	Salh Kalan	6	5	1	...	12	...	5	2	...	...	...	...	...	...	7	...	...	...	...	2	2	...	...	1	5	...	...	...	...	
22	Mahrampur	20	22	8	6	56	2	20	13	1	...	...	...	...	...	36	...	...	...	...	6	...	...	...	...	6	14	...	...	14	
23	Naura	...	1	...	...	1	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
24	Masani	15	14	2	2	33	1	6	...	...	...	...	...	...	...	7	6	3	...	...	...	...	...	...	...	9	6	9	2	17	
25	Banga	43	41	10	9	103	35	9	4	2	2	4	...	...	3	59	1	...	...	2	21	5	...	...	1	30	2	10	2	14	
26	Katt	9	15	4	1	29	3	22	4	...	...	...	...	...	...	29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
27	Haphowal	4	7	2	...	13	...	7	4	...	...	...	...	...	...	11	...	...	...	...	...	...	...	...	...	...	2	...	...	2	
28	Chakbilga	12	16	2	3	33	8	18	4	1	...	...	...	2	...	33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
29	Dhahau	20	18	5	4	47	...	14	9	1	5	...	...	1	...	30	...	...	...	1	3	7	...	...	...	11	4	2	...	6	
30	Tahirpur	8	13	4	6	31	...	28	2	...	...	...	...	...	...	30	...	...	...	...	...	...	1	...	...	1	...	...	...	...	
31	Mazaranaabad	...	1	2	...	3	...	3	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
32	Mahmudpur	15	9	...	...	24	1	21	...	...	...	...	...	...	...	22	...	...	...	...	...	...	...	...	...	...	2	...	...	2	
33	Souran	5	6	5	1	17	...	14	...	...	...	...	...	...	...	14	...	...	...	...	...	...	...	...	1	1	2	...	...	2	
34	Musapur	19	12	...	1	32	2	...	1	...	...	...	...	...	...	3	...	...	...	...	1	...	...	...	...	1	26	2	...	28	
35	Sodhian	7	11	1	2	21	3	13	3	...	...	...	...	...	...	19	...	...	...	...	...	...	...	...	...	...	2	...	...	2	
36	Lidhar Kalan	11	7	5	3	26	1	2	6	1	...	...	...	...	...	10	...	...	...	...	1	1	...	...	...	2	2	...	13	15	
37	Khanpur	10	10	1	1	22	1	18	...	...	2	...	...	...	...	21	...	...	...	...	1	...	...	...	...	1	...	...	...	...	
38	Bahrwal	11	8	2	1	22	...	16	...	1	...	...	...	...	...	17	...	...	...	...	5	...	...	...	...	5	...	...	...	...	
39	Mazari	2	4	1	1	8	...	4	...	2	...	...	...	...	...	6	...	...	...	...	...	...	...	...	...	...	2	...	...	2	
40	Salh Khurd	3	8	2	3	16	...	2	...	...	...	...	...	...	...	2	...	...	...	...	...	7	...	...	...	7	7	...	...	7	
41	Heon	1	...	1	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	
42	Laugeri	13	10	...	1	24	...	4	2	1	...	...	...	...	...	7	...	...	...	...	...	9	...	...	...	9	6	...	2	8	
43	Lalpur	5	19	...	5	29	...	...	...	...	...	...	...	...	...	...	...	29	...	...	...	...	...	...	...	29	...	...	...	...	
44	Chahlon	9	14	3	3	29	...	17	...	1	...	...	...	...	...	18	...	...	...	...	8	...	...	...	...	8	3	...	...	3	
45	Karnana	15	17	4	6	42	6	...	1	...	...	...	...	...	31	38	...	...	...	...	...	...	...	...	...	...	4	...	...	4	
46	Bisla	10	13	4	1	28	2	20	3	...	...	...	...	...	...	25	...	...	...	...	...	2	...	...	...	2	1	...	...	1	
47	Aur	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	
48	Malpur	4	5	...	...	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	...	...	9	
49	Bika	8	5	1	2	16	...	11	...	...	3	...	...	...	...	14	...	...	...	...	...	...	...	...	...	...	2	...	...	2	
50	Hansaron	15	16	2	7	40	...	40	...	...	...	...	...	...	...	40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
51	Sirhal Mandi	16	31	7	2	56	3	1	3	1	...	...	...	...	20	28	...	...	1	...	...	5	...	...	14	20	7	1	...	8	
52	Dhandhua	10	12	1	...	23	...	...	...	...	...	...	...	...	...	...	...	20	3	...	...	...	...	...	...	23	...	...	...	...	
53	Mokandpur	8	5	2	...	15	8	1	1	...	...	4	...	...	...	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
54	Gobindpur	9	14	1	...	24	1	5	2	2	...	...	...	...	...	10	...	...	...	...	8	...	...	...	...	8	6	...	...	6	
55	Lohl	12	11	7	4	34	...	18	5	1	...	...	...	6	...	30	1	...	...	...	...	...	...	...	...	1	3	...	...	3	
56	Chak Kalal	13	14	3	2	32	29	...	1	...	...	...	...	...	...	30	...	...	...	...	...	...	...	...	...	...	2	...	...	2	
57	Punian	28	24	6	...	58	13	37	6	...	...	...	...	...	...	56	...	...	...	...	...	...	...	1	...	1	1	...	...	1	
58	Kariha	78	87	8	22	195	2	8	1	1	...	...	...	1	...	13	29	...	...	...	23	...	...	...	33	85	96	1	...	97	
59	Piragpur	30	40	5	8	83	...	...	1	1	...	...	...	...	...	2	50	...	...	...	22	...	...	...	...	72	5	3	1	9	
60	Rasulpur	15	22	...	5	42	2	24	13	1	...	...	...	1	...	41	...	...	...	...	...	...	...	...	...	...	1	...	...	1	
61	Rehpa	7	11	2	1	21	...	18	...	...	...	...	...	...	...	18	...	...	...	...	1	...	...	...	...	1	2	...	...	2	
62	Gosal	1	8	1	1	11	...	8	1	...	...	...	...	...	...	9	...	...	...	...	1	...	...	...	...	1	1	...	...	1	
63	Bhangal	20	24	1	...	45	10	31	1	...	...	...	...	1	...	43	...	...	...	...	1	...	...	...	...	1	1	...	...	1	
64	Bajon	4	11	1	...	16	1	11	3	...	...	...	...	...	...	15	...	...	...	...	...	...	...	...	...	...	1	...	...	1	
65	Mallah	4	6	...	1	11	...	7	3	...	...	...	...	...	...	10	...	...	...	...	1	...	...	...	...	1	...	...	...	...	
66	Aujla	1	2	1	...	5	...	4	...	...	1	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
67	Chhokran	2	3	4	1	10	...	6	...	...	2	...	...	...	...	8	...	...	...	...	2	...	...	...	...	2	...	...	...	...	
68	Laroya	6	6	1	...	13	...	12	1	...	...	...	...	...	...	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
69	Pharala	11	7	...	...	18	6	9	1	...	...	...	...	...	...	16	...	...	...	...	...	...	...	...	...	...	...	2	...	2	
70	Ludhana Jhika	1	6	1	1	9	1	3	...	...	...	...	...	...	2	6	...	...	2	...	1	...	...	...	...	3	...	...	...	...	
71	Bhaura	1	3	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	4	
72	Turan	3	1	...	...	4	...	4	...	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
73	Jhingar	4	6	1	2	13	...	13	...	...	...	...	...	...	...	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
74	Bahrwal	...	...	1	...	1	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
75	Aur	Detail not received.				4	...	...	...	...	...	...	...	...	...	...	Detail not received.									4	...	...	...	...	
	Total ...	1,122	1,160	224	196	2,706	294	854	179	50	21	10	4	18	143	1,576	123	51	6	12	205	63	3	3	108	587	454	67	22	543	

APPENDIX B.

APPENDIX C.

Table showing the Sex and Caste of the people attacked with Plague in the Hoshiarpur District.

Serial No.	Names of Villages.	SEX.					LIST ACCORDING TO CASTES.																										Remarks.
		Number males attacked.	Number females attacked.	Number females under 10 years.	Number males under 10 years.	Total.	Hindus.																										
							Jats.	Khatris and Brah-mins.	Lohar and Tarkhan, Chimbas.	Jhiwars.	Nais.	Khumars and Gujars.	Achraj.	Mangalwalas.	Rajputs.	Total.	Rajputs.	Mughal and Pathans.	Kassais.	Bharais.	Arains.	Lohar, Teli, Tarkhan, Dhobi, Sunar and Fagirs.	Jats and Gujars.	Rawals.	Sayed and Sheikhs.	Total.	Chamars and Ramdasis.	Sweepers.	Salmsis.	Total.	
1	Birampur																																
2	Purkhowal	28	14	5	2	49	...	1	...	...	...	...	...	...	1	2	21	...	...	...	...	...	...	...	31	12	4	...	16			
3	Rampur Bilron	9	10	1	...	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15	...	...	...	...			
4	Simal Mazara	19	14	8	2	43	...	...	4	1	...	...	...	...	5	10	...	2	...	...	...	...	...	...	3	2	2	...	4			
5	Doron	24	16	3	2	45	...	...	4	4	...	...	...	...	8	16	...	...	...	...	...	...	...	...	19	...	...	...	...			
6	Bhajjal	3	...	5	6	51	11	...	...	...	...	7	...	...	7	25	...	2	...	...	2	...	...	...	2	10	...	...	10			
7	Sadhowal	21	18	7	6	52	35	1	1	...	...	...	...	...	2	39	...	...	...	...	2	9	2	1	4	2	1	...	3			
8	Hajipur	9	5	3	5	22	...	...	...	...	...	...	...	...	...	37	...	...	...	...	2	19	...	...	21	10	2	...	12			
9	Parrowal	31	49	7	3	90	29	...	...	...	82	...	...	...	...	82	...	...	...	...	2	...	...	...	2	2	...	...	2			
10	Garhshankar	10	10	6	4	30	...	15	12	8	11	...	1	...	...	47	26	2	14	6	18	29	...	...	95	10	1	...	11			
11	Sanwali	65	65	21	6	157	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	8	...	...	9	13	...	...	13			
12	Kallewal	6	8	1	6	27	23	...	...	2	...	...	...	...	25	50	...	...	...	...	...	...	...	6	101	7	...	...	7			
13	Garhi	5	11	5	1	16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	6	...	7			
14	Chinkoi	55	36	9	10	110	86	...	...	...	...	...	...	...	11	97	...	...	...	...	8	...	...	...	8	3	...	...	3			
15	Bhagwain	5	5	3	1	14	11	...	...	...	...	...	...	...	4	15	...	...	...	...	...	...	1	...	1	16	...	...	16			
16	Palewal	4	4	...	3	11	...	...	...	...	...	...	...	...	4	389	47	4	14	6	19	72	24	1	7	194	99	21	...	120			
		1	2	...	1	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
	Total ...	395	267	82	59	703	217	29	23	15	11	89	1	...	4	389	47	4	14	6	19	72	24	1	7	194	99	21	...	120			

GARHSHANKAR :

G. Y. C. HUNTER, Surgeon-Captain, I.M.S.,
Plague Medical Officer.

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