4356/78

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(3) Initials of the Referencer

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Public Works DEPARTMENT

G.O. No. / ~~B.P. No.~~		~~Press.~~ / ~~Mis.~~
	4356 -W	
Dated	14.11.1878	~~197~~ .

Not to be folded or roughly handled

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

14th November 1878, No. 4,356 W.

Buildings and Roads.
Military Works.

Read the following paper:—

No. 174. From Colonel C. POLLARD, R.E., Deputy Secretary to the Government of India, Public Works Department (Military Works), to the Secretary to the Government of Madras, Public Works Department, dated Simla, 22nd October 1878, Nos. 1,471-76 M.W.

In forwarding, for information, the accompanying copy of a Memorandum by the Army Sanitary Commission on the Medical and Sanitary Report of the Madras Native Army for 1876, I am directed to invite particular attention to the remarks of the Commission in regard to the necessity of providing better surface drainage and improving the sanitary condition of the huts of the Native soldiers, as also to the question of water-supply of stations where deficiency exists in dry weather.

2. I am also to invite attention to Public Works Department Nos. 1,181-86 M.W., dated 8th November 1877, and to inquire what action has been taken thereon.

Memorandum of the Army Sanitary Commission on the Medical and Sanitary Report of the Native Army of Madras for 1876.

This Report, as its title indicates, is chiefly occupied with departmental details not calling for remark by the Commission.

There is not much information in the reports of Medical Officers on the general sanitary state of stations, apparently because this important element in the health of troops is considered to be, on the whole, not unsatisfactory, although, as will be presently evident, considerable improvements are required, especially in the drainage of certain stations.

The details are summed up in an instructive report submitted to the Government by Dr. George Smith, Surgeon-General, Indian Medical Department, from which, and from the regimental reports, the following practical points have been selected for notice:—

1. The following paragraph from Dr. Smith's report states the conditions of life among the Native population generally for the time being:—

"In 1874 the rainfall was good, the crops above the average, the food-supply abundant, and prices moderate. In 1875 the rainfall was seriously deficient, the crops scanty, and the prices steadily rising. In the year under review the ominous warnings of the preceding year culminated in a famine of grain and of water, in the establishment of relief-camps and institution of relief-works, and in widespread suffering and mortality from starvation and pestilence."

Of the Native population exposed to those unfavorable climatic conditions, a force of 27,737 men of the Native Army, scattered over all the Presidency, yielded the following health statistics:—

	Ratios per 1,000 Strength.
Admissions	769·2
Daily sick	27·7
Total deaths	13·8
Invalided { for discharge	32·9
{ sick leave	21·1

The sick-rate of 1876 was below the average of the three preceding years; but the death ratio was higher, as is shown by the following comparison:—

	Deaths per 1,000.
1873	9·2
1874	9·9
1875	11·7
1876	13·8

It is possible that some explanation of these results may be found in the facts given by Dr Smith in the preceding extract.

2. Want of rainfall in India means a great change in atmospheric conditions, together with increasing impurity of water sources, and dearer food, which, nevertheless, the sepoy has to provide for those depending upon him in the Madras Presidency. He can only do this in favorable seasons; but his pay "is not sufficient, even with compensation allowance, in seasons of dearth, such as the year under review has been, nor is his pay in ordinary seasons sufficient to keep him in the condition of an efficient soldier, if it be spent in the maintenance of followers who overcrowd the little hut, and live like parasites upon its owner. ... ... The remedy is largely in the hands of Commanding Officers."

These facts, together with dearer food and climatic change, may account for the apparent rise in the death-rates of recent years. There has been a larger proportion of fatal cases of illness, although both admission and sick-rates have been below the average.

3. The following were the chief admission causes during 1876:—

Diseases.	Total Admissions.	Admissions per 1,000 Strength.
Eruptive fevers	252	9·
Continued fevers	580	20·9
Malarious fevers	8,496	306·2
Rheumatic diseases	1,147	41·3
Diseases of lungs	711	25·6
Diarrhœa	801	28·8
Dysentery	833	30·
Eye diseases	870	31·3
Skin diseases	2,098	75·6

This abstract shows that no fewer than 10½ per cent. of the Native Army was in hospital with eye and skin diseases, and that a third of the Army was in hospital for fevers, chiefly of malarial origin. No account is given of the reasons why so large an amount of inefficiency arises from eye and skin diseases.

Dr. Smith calls attention to the fact "that sea-coast stations, and specially those on the west coasts, pre-dispose to skin affections; climate and fish diet are probably the causes of this proclivity." But both classes of affections are not unusually results of some want of cleanly habits among troops. The subject merits inquiry.

The next abstract shows the death causes:—

Diseases.	Total Deaths.	Deaths per 1,000 Strength.
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Malarious fevers	59	2·10
Rheumatic diseases	4	·1
Diseases of lungs	33	1·1
Diarrhœa	12	·4
Dysentery	14	·5

Referring to the influence of malaria, Dr. Smith says that malarial diseases probably caused half the mortality of the Army.

4. These abstracts, which are made up from the statistical forms in use, take no account of cholera; and information about this pestilence in a great epidemic season has to be sought for in the district or regimental reports, from which the following data are quoted:—

Presidency District.—"During a year in which cholera prevailed epidemically and fatally to an alarming degree in Madras and Vellore, it tells well for the general hygienic conditions of our troops that only twenty-two men were seized with the disease, and eight succumbed to it." The average strength present was 2,824, and if the cholera deaths took place solely in this number the death-rate would be 2·8 per 1,000.

Northern District.—Out of a strength present of 2,627, there were four cases and two deaths = 0·8 per 1,000. On this low death-rate the Deputy Surgeon-General remarks as follows:—"Looking to the extensive prevalence of this zymotic over the district, there is in the fewness of the cases which have occurred among our troops incontrovertible evidence in favor of the general hygienic conditions in which those troops have lived, however much in particular respects those conditions demand improvement."

Southern District.—Cholera prevailed epidemically throughout the circle. But out of a strength present of 3,257, there were 25 cases and 13 deaths among Native troops, equal to a death-rate of 4 per 1,000.

In the districts of *Malabar* and *Canara* there was no cholera among troops out of 1,962 men present. In an outbreak at Mangalore, 1 woman and 4 children, however, died of cholera.

Mysore Division.—Out of a strength of 3,235, there were 9 admissions from cholera and 4 deaths, 1 at Bangalore and 3 at French Rocks, equal to a death-rate of 1·2 per 1,000.

In the *Ceded Districts* there were 10 cholera cases, and 4 deaths out of 1,520 Native troops.

The *Hyderabad Subsidiary Force* numbered 3,201 Native troops present, among whom there were 23 cases of cholera and 10 deaths, besides 10 deaths in families and 6 among followers. The reporter makes the remark that Hyderabad itself is nearly always "in a chronic state of cholera," and the remedy for such a state of things is not quarantine at Secunderabad, which moreover, is stated to be impracticable, but cleansing and improving the city, besides improving the lines in Secunderabad itself.

Nagpore Force.—Out of 2,907 men present of this force, 8 died of cholera.

There was no cholera among 2,713 men present in *British Burma* division.

There was very little cholera in *Saugor* circle, and only one death out of 2,865 men present.

The Medical Officer of the 5th Regiment, Native Infantry, at Saugor, gives the following account of the cases in his regiment:—"The disease was clearly imported and was often most fatal in the cleanest places .... There is no evidence to show that the water or air had anything to do with propagating the complaint, but a good deal to point in the opposite direction." There is no proof given of these statements. They may both be correct, but cases of this kind are far too important to be settled by any such opinions. What we want are the facts. If the sepoys' families among which the cases took place had been visiting in affected localities, and were thereafter attacked, this fact should have been stated, or if the disease broke out in the lines after personal communication, the whole chain of facts should have been given in detail. And with reference to the assumed absence of any sanitary defects, this experience would have been very important had the lines been fully described. The remark appears to be called for, because at Banda, in the same division, there were three cases and one death in the lines of the 20th Regiment, Native Infantry, and the Medical Officer says: "The cause, I am of strong opinion, was owing to the very dirty state of the courtyard of their hut. They all lived in one hut; the disease did not spread."

An important fact is mentioned by the Medical Officer of the 33rd Regiment, 638 strong, stationed at *Dorundah*, in Bengal. There was an outbreak of cholera amongst the civil population residing within cantonment limits. Forty cases occurred, of which 26 were fatal. "The disease did not extend to the sepoys or their families."

5. This comparative exemption from cholera in Native Regiments, during a great epidemic among other natives of the same country, was very striking in 1876. The civil mortality was 9·4 per 1,000, while in Madras Native Regiments it was 1·7 per 1,000 in hospital on the strength present. With these facts before him, the Surgeon-General is justified in saying that they "prove what sanitation, even when confessedly imperfect, can do towards warding off the attacks of that most fatal disease.....There are many preventable diseases which sanitation has yet to grapple with. The success of the past is the best omen for the future."

6. The following abstract shows the relative prevalence of malarial fevers in the different divisions of Madras Presidency:—

Divisions and Districts.	Ratios per 1,000 Strength.	
	Admissions.	Deaths.
Malabar and Canara	88·1	·5
Presidency	104·4	·3
Southern	163·9	1·5
Bengal (Madras Troops)	173·9	1·5
Ceded Districts	176·9	3·8
Mysore	179·9	2·1
British Burmah	343·1	2·2
Northern	380·	4·1
Hyderabad	413·6	1·5
Nagpore Force	456·4	1·6
Saugor	620·	3·8

The proportionate liability of troops to malarial fevers no doubt varies from year to year; but it is impossible to overlook the significance of the year's facts. There must be some fundamental reasons for these diversities in liability to malarial fevers. Difference of clothing or of living, or even of exposure, can scarcely account for them. And in all probability the causes must be sought in local climates, in the drainage of stations, and in the state of the sepoy's accommodation.

7. The following brief extracts from the Regimental Reports will show the nature of the facts under these heads:—

Presidency District.—Accommodation for troops at Pallavaram "very inadequate;" at Vepery and Vellore "very faulty," "Lines of 37th Regiment, Native Infantry, at Vepery, are on low ground, badly built, badly ventilated, and badly drained;" during the rainy season "parts of them under water." There are similar complaints about the lines of the 14th Regiment, Native Infantry, at Vellore.

Northern District.—Left Wing, 2nd Regiment, Native Infantry, at Sumbulpore. General drainage and conservancy in the lines defective. V-shaped drains imperfectly joined, and permit soakage. The drains open into reservoirs at the west end of the lines. These also are a nuisance, overflowing the ground, "causing contamination of a well within a few yards of the lines." The whole drainage question has been repeatedly represented to the proper authorities.

Berhampore.—"Ground on either side of the road is cut with shallow channels, for the purpose of carrying away surface water. In these cutcha channels are sunk, opposite to each hut, an earthen tub for holding sewage from each individual hut; sewage daily baled out, and conveyed away some distance from the lines" (a safe enough method, if properly carried out). "But frequently these tubs overflow, and the contents run into the cutcha drains, and either soak into the ground, or are evaporated by the heat and diffused into the air. Sepoys' compounds constantly damp, and the sewage percolates freely into the soil."

Lines of the 7th Regiment, Native Infantry, at *Vizagapatam.*—Drainage very bad; "all the sewage and impurities must naturally percolate into the loose sandy soil on which the huts are built."

Cuttack.—Drainage of lines requires immediate attention, or a still better step would be to remove the lines.

Southern District.—The lines of the 39th and 32nd Regiments, Native Infantry, at Trichinopoly, are said to be badly drained, and the water channels permit of contamination of the sub-soil.

Mysore Division.—Surface drainage at Bangalore is generally effected by V-shaped masonry drains, but there are exceptions where only surface cuts are used, as in the case of the 23rd Regiment, Native Infantry. In certain cases the V-shaped stone drains allow the fluid to percolate at the joints.

At Mercara, the huts are situated in a deep hollow, in the bottom of which is a marshy swamp, "from which a dense malarious fog rises nightly." The surface has been levelled and drained, but this is done by cuts in the earth, "torn into holes in the monsoon, and becomes cesspools from soakage of sewage matter in the dry weather." There is a dirty village in the hollow besides the lines. The death-rate among troops was 29·7 per 1,000 in 1876.

Ceded Districts.—At stations in these districts the lines are drained by surface earth cuts.

Hyderabad Subsidiary Force.—The surface drainage of Native lines in Secunderabad is of the same general description. There are apparently only surface cuts, and the floors of some huts are much below the surface of the ground. The lines of the Sappers and Miners are in this state, and in 1876 their death-rate was 34·2 per 1,000. The Medical Officer says, that "the dampness of the locality and the construction of the huts appear to have a prejudicial effect on the health of the men."

In the *Nagpore Force* the drainage of lines is said to be very indifferent. At Kamptee "during the rains, and for some time after their cessation, the floors and walls of the huts are very damp from the retentive nature of the sub-soil. . . At present the Native lines are without any system of drainage, and year by year the ground must become more saturated with organic impurities."

Similar statements are made about the drainage of Sectabuldee and Hoshungabad, but as regards the amount of fever at the latter station, the Medical Officer remarks, that "climate can hardly be considered as playing the chief part in the causation of this ailment, when the insanitary and humid condition of the sub-soil of the station, the bad housing, want of proper warm clothing, insufficient and non-nutritive food in many instances, and the fact that the men and their families generally sleep on their mats spread on the cold ground, doubtless saturated, as well as the walls, &c., of the building, with moisture, by the rise of sub-soil water by capillary attraction, is borne in mind." The total death-rate at this station was 26 per 1,000.

The following facts are stated about the drainage of Native lines at Raipore:—"In the double rows of huts the latrines are placed near the division walls between the compounds,

and in 394 compounds so situated there is no escape for any portion of the urine and latrine washing water outside, and therefore it must all soak into the floors of these compounds. In the remaining 315 compounds, where the drains of the latrines communicate with the drains outside, a portion of the urine and latrine washing water escapes outside."

The facts regarding the left wing, 16th Native Infantry Regiment, at Jubbulpore, may be here cited as illustrating the effect of better sanitary conditions on health. Out of an average strength of 652 present, the admissions in 1876 were 582 per 1,000, the daily sick under 2 per cent., and the death-rate 1·4 per 1,000. The Medical Officer states that he is inclined to attribute the improvement to three causes: 1st, favorable climate during the year; 2nd, purchase by the men of better food and warmer clothing; 3rd, the men having become as it were acclimatized. Other local conditions are reported favorable, except the water, which is stated to be "very bad" in quality.

8. So far as the evidence goes, it appears to show that to damp sub-soil of stations especially around and under sepoy's huts, together with the material used and the mode of construction of huts, must be attributed the principal causation of paroxysmal fevers, at least within the lines. The facts under these heads appear to show (as often pointed out) that mere surface cuts are insufficient for drainage purposes, and that the rainfall ought to be passed away from the lines by impervious shallow surface channels.

The need of better lines at many stations is obvious, but it seems probable that much good might be done by the men themselves, if they were taught the benefit of raising the floors of huts above the ground level, and sleeping above the level of the floors. The Surgeon-General states that "in the several reports from executive Medical-Officers, attention has been called to the condition of the lines, and various improvements suggested. In many cases the sites are bad, in others unhealthy; in many the lines are overcrowded, and in most the huts are badly ventilated, the drainage defective, and the soil polluted." But it is at the same time satisfactory to be informed that "from year to year the pressing subject of sanitation is engaging the attention of authorities, civil, military, and medical. The progress made may not be rapid, but it is satisfactory. The principles of the science are well understood and their value acknowledged. The principal want is that of funds. It is a matter of difficulty to remedy the defects of old huts, of old lines, and of objectionable sites. Something may be done, and is being done; but in many cases entire re-construction alone will meet the requirements of the case."

9. *Water-supply.*—No chemical account is given of the water used by Native troops. It is generally reported as good and sufficient; but at some stations both quality and quantity are materially influenced by atmospheric conditions.

The station where improvement in this prime element of health is most dwelt on is Secunderabad, where it is stated that "on account of the scanty rainfall the water-supply in all the wells in the regimental lines, as well as those in the cantonment, has been very deficient, and may be expected to be very much more so as the season advances. Means have been taken by deepening all wells to improve the supply, and, in some instances, with success. But until some scheme is adopted to supply water from the Hoosain Saugor tank to the town of Secunderabad in seasons of drought, a like scarcity will always exist." Whether this tank is the best source of supply would of course be subject of careful inquiry, but the facts may be received in proof that the health of troops (so far as water is concerned) at this large station depends upon the amount of rainfall, and that no sufficient provision has hitherto been made to provide the lines with wholesome water. It may, moreover, be asked whether to this want is not to be attributed some of the cholera and enteric fever mortality at this station.

10. (1.) The facts regarding the comparative exemption from cholera of Native troops during a great epidemic among the civil population appear to justify the opinion of the Surgeon-General already cited as to the effect of even imperfect sanitation in diminishing the intensity of cholera, while the reports themselves show that much good has been done in attention to conservancy and general sanitary improvement of lines.

(2.) That, nevertheless, the great prevalence of paroxysmal fevers, and the account given in the reports of the state of the drainage of lines, huts, and compounds, and the habits of sepoys of sleeping near the ground level, appear to point to the necessity of providing better surface drainage by shallow-sectioned impervious surface drains, and improving huts and compounds, as a necessary step in reducing the amount of these fevers.

(3.) That the water-supply of Secunderabad and other stations, where deficiency exists in dry weather, should be improved as soon as possible.

(4.) It is scarcely necessary to enter into further details of sanitary condition at these Native stations. The cardinal defects are evidently those connected with the drainage of lines and compounds, and structural defects in the huts themselves. If the conservancy arrangements are well attended to, and lines and compounds kept clean, while the drainage defects are remedied and the huts improved in cases where new lines are not contemplated, it may be safely predicted that Native troops will continue to enjoy comparative immunity from epidemics, and

that the chief inefficiency causes, namely, fevers, rheumatic affections, and bowel diseases, will soon show a marked reduction in amount.

4th June 1878.

No. 175. ORDER THEREON, 14th November 1878, No. 4,356 W.

COMMUNICATED to Superintending Engineers in continuation of G.O., No. 1,923 W, of the 3rd December 1877, for early report of the action, if any, taken by District Engineers upon that order.

(True Extract.)

Colonel, R.E.,
Secy. to Govt., P.W.D.

To Superintending Engineers.
To the Military Department.

Exd. T. O'Connor.
Spare Copies

BUILDINGS AND ROADS.
MILITARY WORKS.

Govt. of [1878] Madras.

PUBLIC WORKS.

To

THE SUPERINTENDING ENGINEERS,
&c., &c., &c.

Dated November 14th.

Issued

Recd. *Encl.*

G. O., 14th November 1878, No. 4,356 W.

NOVEMBER.

Nos. 174-175.

Hats of Native Soldiers in India.—Memorandum by the Army Sanitary Commission for 1876 in regard to the insanitary condition of the —, communicated to Superintending Engineers for early report.

Nos. 1471-76M.W.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

MILITARY WORKS.

To

THE GOVERNMENTS OF MADRAS AND BENGAL.
THE CHIEF COMMISSIONERS OF MYSORE AND CENTRAL PROVINCES.
THE RESIDENT AT HYDERABAD.
THE INSPECTOR GENERAL OF MILITARY WORKS.

SIMLA, 22nd October 1878.

SIR,

In forwarding, for information, the accompanying copy of a memorandum by the Army Sanitary Commission on the Medical and Sanitary Report of the Madras Native Army for 1876, I am directed to invite particular attention to the remarks of the Commission in regard to the necessity of providing better surface drainage and improving the sanitary condition of the huts of the Native soldiers, as also to the question of water-supply of stations where deficiency exists in dry weather.

2. I am also to invite attention to Public Works Department Nos. 1181-86M.W., dated 8th November 1877, and to enquire what action has been taken thereon.

I have the honor to be,
SIR,
Your most obedient servant,

Charles Pollard Colonel, R.E.,
Depy. Secy. to the Govt. of India.

No. 1471 M.W.

To The Secretary to the Govt. of Madras,
Public Works Department.

3.12.77 In 1723 a

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

MILITARY WORKS.

To

21.12.77

Nos. 1471-76 M.W.

Dated Simla, 22nd October 1878.

Received

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Govt. C. B. Press, Simla—No. 360, P. W. D.—28-10-78—100.

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There was very little cholera is *Saugor* circle, and only one death out of 2,865 men present.

The Medical Officer of the 5th Regiment, Native Infantry, at Saugor, gives the following account of the cases in his regiment :—"The disease was clearly imported and was often most fatal "in the cleanest places.....There is no evidence to show that the water or air had any-"thing to do with propagating the complaint, but a good deal to point in the opposite direc-"tion." There is no proof given of these statements. They may both be correct, but cases of this kind are far too important to be settled by any such opinions. What we want are the facts. If the sepoys' families among which the cases took place had been visiting in affected localities, and were thereafter attacked, this fact should have been stated, or if the disease broke out in the lines after personal communication, the whole chain of facts should have been given in detail. And with reference to the assumed absence of any sanitary defects, this experience would have been very important had the lines been fully described. The remark

appears to be called for, because at Banda, in the same division, there were three cases and one death in the lines of the 20th Regiment, Native Infantry, and the Medical Officer says : "The cause, I am of strong opinion, was owing to the very dirty state of the courtyard of their hut. "They all lived in one hut; the disease did not spread."

An important fact is mentioned by the Medical Officer of the 33rd Regiment, 638 strong, stationed at *Dorundah*, in Bengal. There was an outbreak of cholera amongst the civil population residing within cantonment limits. Forty cases occurred, of which 26 were fatal. "The disease did not extend to the sepoys or their families."

5. This comparative exemption from cholera in Native regiments, during a great epidemic among other natives of the same country, was very striking in 1876. The civil mortality was 9·4 per 1,000, while in Madras Native regiments it was 1·7 per 1,000 in hospital on the strength present. With these facts before him, the Surgeon-General is justified in saying that they "prove what sanitation, even when confessedly imperfect, can do towards warding off the "attacks of that most fatal disease.....There are many preventable diseases which sanitation "has yet to grapple with. The success of the past is the best omen for the future."

6. The following abstract shows the relative prevalence of malarial fevers in the different divisions of Madras Presidency :—

Divisions and Districts.	Ratios per 1,000 strength.	
	Admissions.	Deaths.
Malabar and Canara Presidency	88·1	·5
Southern	104·4	·3
Bengal (Madras troops) ...	163·9	1·5
Ceded Districts ...	173·9	1·5
Mysore	176·9	3·8
British Burma	179·9	2·1
Northern	343·1	2·2
Hyderabad	380·	4·1
Nagpore Force	413·6	1·5
Saugor	620·	3·8

The proportionate liability of troops to malarial fevers no doubt varies from year to year; but it is impossible to overlook the significance of the year's facts. There must be some fundamental reasons for these diversities in liability to malarial fevers. Difference of clothing or of living, or even of exposure, can scarcely account for them. And in all probability the causes must be sought in local climates, in the drainage of stations, and in the state of the sepoy's accommodation.

7. The following brief extracts from the regimental reports will show the nature of the facts under these heads :—

Presidency District.—Accommodation for troops at Palaveram "very inadequate"; at Vepery and Vellore "very faulty", "Lines of 37th Regiment, Native Infantry, at Vepery, are "on low ground, badly built, badly ventilated, and badly drained;" during the rainy season "parts of them under water." There are similar complaints about the lines of the 14th Regiment, Native Infantry, at Vellore.

Northern District.—Left wing, 2nd Regiment, Native Infantry, at Sumbulpore. Genera drainage and conservancy in the lines defective. V-shaped drains imperfectly joined, and permit soakage. The drains open into reservoirs at the west end of the lines. These also are a nuisance, overflowing the ground, "causing contamination of a well within a few yards of the lines." The whole drainage question has been repeatedly represented to the proper authorities.

Berhampore.—"Ground on either side of the road is cut with shallow channels, for the "purpose of carrying away surface water. In these cutcha channels are sunk, opposite to each "hut, an earthen tub for holding sewage from each individual hut; sewage daily baled out, "and conveyed away some distance from the lines" (a safe enough method, if properly carried "out). "But frequently these tubs overflow, and the contents run into the cutcha drains, "and either soak into the ground, or are evaporated by the heat and diffused into the air. "Sepoys' compounds constantly damp, and the sewage percolates freely into the soil."

Lines of the 7th Regiment, Native Infantry, at *Vizagapatam*.—Drainage very bad; "all the sewage and impurities must naturally percolate into the loose sandy soil on which the huts are built."

Cuttack.—Drianage of lines requires immediate attention, or a still better step would be to remove the lines.

Southern District.—The lines of the 39th and 32nd Regiments, Native Infantry, at Trichinopoly, are said to be badly drained, and the water channels permit of contamination of the sub-soil.

Mysore Division.—Surface drainage at Bangalore is generally effected by V-shaped masonry drains, but there are exceptions where only surface cuts are used, as in the case of the 23rd Regiment, Native Infantry. In certain cases the V-shaped stone drains allow the fluid to percolate at the joints.

At Mercara, the huts are situated in a deep hollow, in the bottom of which is a marshy swamp, "from which a dense malarious fog rises nightly." The surface has been levelled and drained, but this is done by cuts in the earth, "torn into holes in the monsoon, and "becomes cesspools from soakage of sewage matter in the dry weather." There is a dirty village in the hollow besides the lines. The death-rate among troops was 29·7 per 1,000 in 1876.

Ceded Districts.—At stations in these districts the lines are drained by surface earth-cuts.

Hyderabad Subsidiary Force.—The surface drainage of Native lines in Secunderabad is of the same general description. There are apparently only surface cuts, and the floors of some huts are much below the surface of the ground. The lines of the Sappers and Miners are in this state, and in 1876 their death-rate was 34·2 per 1,000. The Medical Officer says, that "the dampness of the locality and the construction of the huts appear to have a prejudicial "effect on the health of the men."

In the *Nagpore Force* the drainage of lines is said to be very indifferent. At Kamptee "during the rains, and for some time after their cessation, the floors and walls of the huts "are very damp from the retentive nature of the sub-soil .....At present the Native lines are "without any system of drainage, and year by year the ground must become more saturated "with organic impurities."

Similar statements are made about the drainage of Sectabuldee and Hoshungabad, but as regards the amount of fever at the latter station, the Medical Officer remarks, that "climate "can hardly be considered as playing the chief part in the causation of this ailment, when the "insanitary and humid condition of the sub-soil of the station, the bad housing, want of proper "warm clothing, insufficient and non-nutritive food in many instances, and the fact that the "men and their families generally sleep on their mats spread on the cold ground, doubtless "saturated, as well as the walls, &c., of the building, with moisture, by the rise of sub-soil "water by capillary attraction, is borne in mind." The total death-rate at this station was 26 per 1,000.

The following facts are stated about the drainage of Native lines at Raipore:—"In the "double rows of huts the latrines are placed near the division walls between the compounds, "and in 394 compounds so situated there is no escape for any portion of the urine and latrine "washing water outside, and therefore it must all soak into the floors of these compounds. "In the remaining 315 compounds, where the drains of the latrines communicate with the "drains outside, a portion of the urine and latrine washing water escapes outside."

The facts regarding the left wing, 16th Native Infantry Regiment, at Jubbulpore, may be here cited as illustrating the effect of better sanitary conditions on health. Out of an average strength of 652 present, the admissions in 1876 were 582 per 1,000, the daily sick under 2 per cent., and the death-rate 1·4 per 1,000. The Medical Officer states that he is inclined to attribute the improvement to three causes: 1st, favourable climate during the year; 2nd, purchase by the men of better food and warmer clothing; 3rd, the men having become as it were acclimatized. Other local conditions are reported favourable, except the water, which is stated to be "very bad" in quality.

8. So far as the evidence goes, it appears to show that to damp sub-soil of stations especially around and under sepoy's huts, together with the material used and the mode of construction of huts, must be attributed the principal causation of paroxysmal fevers, at least within the lines. The facts under these heads appear to show (as often pointed out) that mere surface cuts are insufficient for drainage purposes, and that the rainfall ought to be passed away from the lines by impervious shallow surface channels.

The need of better lines at many stations is obvious, but it seems probable that much good might be done by the men themselves, if they were taught the benefit of raising the floors of huts above the ground level, and sleeping above the level of the floors. The Surgeon-"General states that "in the several reports from executive Medical-Officers, attention has "been called to the condition of the lines, and various improvements suggested. In many "cases the sites are bad, in others unhealthy; in many the lines are overcrowded, and in most "the huts are badly ventilated, the drainage defective, and the soil polluted." But it is at the same time satisfactory to be informed that "from year to year the pressing subject of sanitation "is engaging the attention of authorities, civil, military, and medical. The progress made "may not be rapid, but it is satisfactory. The principles of the science are well understood "and their value acknowledged. The principal want is that of funds. It is a matter of diffi-"culty to remedy the defects of old huts, of old lines, and of objectionable sites. Something "may be done, and is being done; but in many cases entire re-construction alone will meet the "requirements of the case."

9. *Water-supply.*—No chemical account is given of the water used by Native troops. It is generally reported as good and sufficient; but at some stations both quality and quantity are materially influenced by atmospheric conditions.

The station where improvement in this prime element of health is most dwelt on is Secunderabad, where it is stated that "on account of the scanty rainfall the water-supply in "all the wells in the regimental lines, as well as those in the cantonment, has been very defi-"cient, and may be expected to be very much more so as the season advances. Means have "been taken by deepening all wells to improve the supply, and, in some instances, with success. "But until some scheme is adopted to supply water from the Hoosain Saugor tank to the town "of Secunderabad in seasons of drought, a like scarcity will always exist." Whether this tank is the best source of supply would of course be subject of careful inquiry, but the facts may be received in proof that the health of troops (so far as water is concerned) at this large station depends upon the amount of rainfall, and that no sufficient provision has hitherto been made to provide the lines with wholesome water. It may, moreover, be asked whether to this want is not to be attributed some of the cholera and enteric fever mortality at this station.

10. (1.) The facts regarding the comparative exemption from cholera of Native troops during a great epidemic among the civil population appear to justify the opinion of the Surgeon-General already cited as to the effect of even imperfect sanitation in diminishing the intensity of cholera, while the reports themselves show that much good has been done in attention to conservancy and general sanitary improvement of lines.

(2.) That, nevertheless, the great parevalence of proxysmal fevers, and the account given in the reports of the state of the drainage of lines, huts, and compounds, and the habits of sepoys of sleeping near the ground level, appear to point to the necessity of providing better surface drainage by shallow-sectioned impervious surface drains, and improving huts and compounds, as a necessary step in reducing the amount of these fevers.

(3.) That the water-supply of Secunderabad and other stations, where deficiency exists in dry weather, should be improved as soon as possible.

(4.) It is scarcely necessary to enter into further details of sanitary condition at these Native stations. The cardinal defects are evidently those connected with the drainage of lines and compounds, and structural defects in the huts themselves. If the conservancy arrangements are well attended to, and lines and compounds kept clean, while the drainage defects are remedied and the huts improved in cases where new lines are not contemplated, it may be safely predicted that Native troops will continue to enjoy comparative immunity from epidemics, and that the chief inefficiency causes, namely, fevers, rheumatic affections, and bowel diseases, will soon show a marked reduction in amount.

4th June 1878.

B & R
Mily works

№ 4356 W Public Works Department.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the 14th Nov. 1878.

Read the following :—

From

The Govt of India (M.C. Nos 1471-76. No W d/22 Oct/78)

Communicated to
Superintending Engineers
in continuation of GO.
№ 1923 W of the 3rd Dec.
1877 for early report
of the action, if any,
taken by District Engineers
upon that order.

Supg. Engineers Dept. 27-11-78
Military Dept.

Ch 1229

Govt. of {1878} Madras.

PUBLIC WORKS.

To The Sup'g Engineers

Dated 15

Issued

Read. Encl.

G. O. 14 Nov 1878. No. 4356 W

Nos 174 & 175-

Hnt. of native Soldiers in India — Memorandum by the Army Sanitary Commission for 1876 in regard to the insanitary condition of the — cantonments & Lapsing Engrs for early report

Encl in Regr.