Public Works (1897) Department.

G.O., No. 155465

DATED 9 June 97

[Despatch Abstract.]

Bacteriological Investigation: Bom: Public Dept. orders that the Govt. of India be addressed on the Question of creating a new appointment for the conduct of — &c, and of providing an additional Medical Officer for the purpose, Comptr. & Offices of the Prvd.

[P.W. 25. 5,000—30-11-96.]

K 9.6.97

Indexed. 15/6

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
	741	C Tble	6.2.97				

FURTHER PAPERS.

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

Public Works (1897) Department

Current No: 5038

Government {1897} of Madras.

PUBLIC.

No 741 C 4/6-2-97
527 C 4/27-1-97
4567 C 4/3-12-96
3506 C 4/3-10-96
3507 C 4/3-10-96
2275 W 4/10-8-96

Recd. 21-5- 1897.
Regd.

Enclosures

Spare copies 10

G.O., No. 512, 5th May 1897.

B No: 1554 W 4 9.6.97

Communicated to
Offices of the P. W. Dept.

MAY.

26/5/97

Ch

Ch. S. for I.
C. S. for Rs
Supdg Engr
S. S. on the Duty
C.A. to Govt
S.S. to Ch. A. Dy

Bacteriological Investigations.

Ordering that the Government of India be addressed on the question of creating a new appointment for the conduct of —, &c., and of providing an additional medical officer for the purpose.

O.R.S. 1/8
R 31/5

GOVERNMENT OF MADRAS.

PUBLIC DEPARTMENT.

Read—again the following paper:—

G.O., No. 714, Public, dated 8th July 1896.

Abstract.—Calling for information from the Surgeon-General, &c., regarding the measures to be adopted for bacteriological investigation in this Presidency; and addressing the Government of India on the subject.

Read—the following papers:—

G.O., Mis. No. 3364, Revenue, dated 19th August 1896.

Read—the following Proceedings of the Board of Revenue (Land Revenue), Mis. No. 3691, dated 11th August 1896, on endorsement of the Revenue Department, Mis. No. 2991, dated 27th July 1896, referring to the Board of Revenue for report with reference to paragraph 4 of G.O., No. 714, Public, dated 8th July 1896:—

Resolution—Mis. No. 3691, dated 11th August 1896.

The Board in this department has no suggestion to offer on paragraph 4 of G.O., No. 714, Public, dated 8th July 1896, communicated with the Revenue Department order read above.

Order—Mis. No. 3364, Revenue, dated 19th August 1896.

Recorded.

(True Extract.)

(Signed) L. DAVIDSON,
Ag. Under Secy. to Govt.

To the Public Department.

G.O., Mis. No. 3524, Revenue, dated 1st September 1896.

Read—the following Proceedings of the Board of Revenue (Separate Revenue), Mis. No. 3481, dated 19th August 1896, on endorsement * of the Revenue Department on G.O., No. 714, Public, dated 8th July 1896:—

* G.O., Mis. No. 2991, dated 27th July 1896.

Resolution—Mis. No. 3481, dated 19th August 1896.

The Board begs leave to report that no investigations of the kind referred to in paragraph 4 of the Government Order read above are required to be made for the departments under this branch of the Board.

Order—Mis. No. 3524, Revenue, dated 1st September 1896.

Recorded.

(True Extract.)

(Signed) L. DAVIDSON,
Ag. Under Secy. to Govt.

To the Public Department.

G.O., Mis. No. 1796 L., dated 30th September 1896.

Read—letter from the Public Department, dated 18th September 1896, requesting an early reply to G.O., No. 714, Public, dated 8th July 1896, regarding bacteriological researches in the Madras Presidency.

Order—Mis. No. 1796 L., dated 30th September 1896.

The Public Department will be informed that no reply is called for from this department.

(True Extract.)

A. T. ARUNDEL,
for *Chief Secretary.*

To the Public Department.

Proceedings of the Board of Revenue (Revenue Settlement, Land Records and Agriculture), dated 4th November 1896, Mis. No. 5472.

Read—again G.O., No. 714, Public, dated 8th July 1896, and the following Board's Reference Order thereon, dated 18th August 1896:—

Referred to the Superintendent, Civil Veterinary Department, for full report as to the work which might be required for the Civil Veterinary Department if the suggested bacteriologist were appointed in the way of the practical investigation of animal diseases and the training of subordinates.

2. It must be noted that a special bacteriological laboratory for the investigation of animal diseases has already been established by the Government of India.

(Signed) R. V. SRINIVASIAR,
Secretary.

Read—also the following letter from the Superintendent, Civil Veterinary Department, dated 12th October 1896, No. 1176:—

With reference to Board's Proceedings, Mis. No. 4893, dated 8th October 1896, I have the honour to report that the Proceedings * and G.O., No. 714, dated 8th July 1896, were referred to the Inspector-General, Civil Veterinary Department, for his opinion, and it is herewith attached.

* Government Reference No. 6740 of 1896.

2. I am unable to say definitely, until more details of the working of the scheme are to hand, what can be done in the way of the practical investigation of animal diseases and the training of subordinates by the suggested bacteriologist. Personally speaking, I think it would be an excellent thing to have a bacteriologist on the spot, as investigations of outbreaks of diseases could be so much more easily and quickly carried out than by sending specimens to the Imperial bacteriologist.

3. I presume by the subordinates mentioned the stock inspectors are meant. It would be a very good thing if they were trained to the proper use of the microscope, but for the knowledge to be of any practical use they will each have to be supplied with expensive microscopes, &c., and that, with some men undergoing this course of instruction (in Madras or elsewhere) and some possibly at Bombay Veterinary College, the number of stock inspectors will be greatly decreased and the work of the Bacteriological Survey will be obstructed to a certain extent.

4. The scheme, if carried out, will be of great assistance in investigating animal diseases such as anthrax, rinderpest (especially about which disease really very much is not bacteriologically known); kumaree also.

5. Until, however, as suggested by the Assistant to the Inspector-General, Civil Veterinary Department, a workable scheme is prepared, I cannot give a full report as to the work which might be required for the Civil Veterinary Department.

Resolution—dated 4th November 1896, Mis. No. 5472.

The report of the Superintendent, Civil Veterinary Department, will be submitted for the information of Government.

2. In the Board's opinion, a professional bacteriologist would find ample scope for investigating rinderpest and other cattle diseases in this Presidency, and such study is much required. The Imperial bacteriologist is, however, it is believed, at present studying the disease.

3. As to the training of veterinary subordinates, the Board does not consider that there can be much scope in this Presidency until a school of practical Veterinary science has been founded, and even then it is doubtful how far such training would be of value to men such as could be trained therein.

(True Copy and Extract.)

(Signed) R. V. SRINIVASIAR,
Secretary.

To the Secretary to Government, Revenue Department.
„ Superintendent, Civil Veterinary Department.

Endorsement in the Revenue Department, No. 4656, dated 18th November 1896.

Transferred to the Public Department.

(Signed) L. DAVIDSON,
Ag. Under Secy. to Govt.

From Surgeon-Major-General C. SIBTHORPE, F.R.C.P.I., Surgeon-General with the Government of Madras, to the Chief Secretary to Government, dated Madras, 7th November 1896, No. 516.

With reference to G.O., No. 714, Public, dated the 8th July 1896, on bacteriology, I have the honour to report that on its receipt I referred it to the Director of Public Instruction and asked him to call on the Professors of Hygiene and Chemistry to report on the points raised in it, to submit it with their reports to the Council of the Medical College and to return the correspondence with his remarks and observations. I now attach (Appendix I) true copies of the answers.

2. I also attach (Appendix II) letter, No. 746, dated the 28th July 1896, from the Chemical Examiner to Government which was returned to him with your endorsement, No. 1534, dated the 3rd August 1896, to be resubmitted through me.

3. With reference to paragraph 4 of the Government Order under reference, the following replies are submitted to the queries therein made :—

(i) The first twelve or eighteen months of the expert's time should be taken up in studying the methods suitable in Southern India and in training his staff. I would suggest that no work should be sent to him except by the Surgeon-General, the Principal Medical Officer, Madras Army, the Sanitary Commissioner to Government and the Chemical Examiner.

(ii) It would be impossible to give a definite answer to this without going into great detail; but the examination of air, soils, excreta would form a great portion of his work.

(iii) Will be answered by the Sanitary Board. As will be seen above, I do not propose that the Sanitary Board should send him any work.

(iv) In my opinion, the Chemical Examiner could not take any of this work. It would, I consider, be a mistake for the Professor of Hygiene, even if he was relieved of the charge of a certain number of beds (which I consider should be done on its own merits), to be called upon to perform the duties of a trained bacteriologist, as it is clear to me that it is most desirable that the officer who has the teaching of hygiene in the college should have some practical experience in sanitation in India and should have had opportunities of studying the habits of the people, which means that he

should be always an officer of some years' service. It is most essential that the Bacteriologist should be a highly-trained scientific man with, if possible, a developed scientific mind and that he should be well up in the most recent methods of research. He should have been working at the science continuously. It would, I feel sure, be an absolute waste of money to appoint any officer now in the service to these duties and to give him short leave to study up the methods under any one, either in India or in Europe.

(v) I consider the bacteriologist should be allowed an assistant—a locally trained medical man holding a University qualification—and that his pay should be the same as the other assistants in the college which is now under consideration and will probably be the rate of pay as an Assistant Surgeon with a teaching allowance.

He should also be allowed one intelligent attendant on Rs. 12 a month.

4. I consider the Government Bacteriologist should be —

(i) An officer of the Indian Medical Service and that the post should be added to the cadre as a List I appointment.

(ii) That the Right Honourable the Secretary of State should select a duly qualified man on the advice of the University or Collegiate authorities in Great Britain.

(iii) That the pay should be fixed at the grade pay of his rank with an allowance of Rs. 300 a month from date of joining his appointment for the first five years, and after that as a major professorship under G.O.G.G., No. 370, dated the 4th April 1867, with house-rent from date of arrival in Madras.

(iv) This officer should be required to go through the course at Netley and then should be permitted to spend three or four months in some selected laboratory in England or on the Continent.

(v) On arrival in India he should be sent on duty for a month to Agra to Mr. Hankin to study his methods.

(vi) He should be exempted from the rule that requires officers of the Indian Medical Service to do two years' military duty before being employed in the Civil departments.

(vii) He should be permitted to expend a sum not exceeding £100 in Europe on laboratory equipment, which should be sent out for him to the Medical College.

(viii) He should work in the hygienic laboratory of the Medical College and should be provided with special rooms for himself and his assistant.

(ix) He should teach bacteriology to a class in the Medical College during the session.

(x) During the recess he should be permitted to carry on his researches in Kóttagiri or Ootacamund and be allowed his travelling expenses up and down.

(xi) He should be placed in the same position as regards Government as the Chemical Examiner now holds as regards his ordinary work, and under the Director of Public Instruction as regards his duties in the Educational department.

(xii) He should agree to serve in his special appointment for not less than five years, and in the event of his subsequently wishing to revert to the ordinary duties of the profession, he should be placed at the disposal of the Military department and not considered eligible for any permanent Civil Medical appointment until he has completed two years' military duty.

5. With reference to paragraph 5 of the Government Order, the Professor of Hygiene was at the time acting as Chemical Examiner to Government and was not in a position to give a reliable report.

6. With reference to paragraph 6 of the Government Order, I consider that an officer could get an equally good training here in the laboratory of the Chemical Examiner as was done under G.O., Mis. No. 1392, dated 23rd June 1884, which would save the travelling expenses. If Government will sanction such an officer's pay and allowances for a period of six months, I will inquire what junior officers are willing to go through the training and select one.

APPENDIX I.

Copy of a letter from the Director of Public Instruction, Madras, to the Surgeon-General with the Government of Madras, No. 11473, dated the 24th October 1896.

With advertence to your reference of Current No. 658—1, dated the 27th July 1896, and endorsement on Current No. 2215—5, dated the 10th August 1896, I have the honour to forward, as requested therein, the opinions of the Professors of Chemistry and Hygiene as well as those of the Council of the Medical College in regard to the institution of bacteriological researches in connection with that college, and to state that I concur with the opinions expressed by the College Council. I would add that in the event of the Professor of Hygiene being appointed Government Bacteriologist and Lecturer in Bacteriology, the incumbent of the combined appointment—who, it is presumed, will be a commissioned medical officer—should not be disturbed from the college for a period of not less than five years, and that it is necessary that one other officer of the Indian Medical Service should have been previously required to undergo bacteriological training at Agra and Calcutta so as to be in a position to succeed the Professor of Hygiene, either permanently or temporarily, at short notice.

2. The enclosures to your references under reply are herewith returned.

Copy of a Memorandum from the Principal, Medical College, Madras, to the Director of Public Instruction, dated the 6th October 1896, No. M.-1137.

I have the honour to give below the resolutions of the College Council on the subject passed at the last meeting:—

"The Council is of opinion—

"1. That it would be impossible for the Professor of Chemistry, who is also Chemical Examiner to Government, to perform in addition the duties of Government Bacteriologist or undertake any bacteriological work.

"It is of opinion—

"2. That the Professor of Hygiene should be appointed Government Bacteriologist and Lecturer on Bacteriology in the Medical College, Madras.

"3. That it is essential to the satisfactory working of the duties of Professor of Hygiene and Bacteriology that the incumbent should have no hospital duties to perform.

"4. That in the event of this proposal receiving the sanction of Government, the Professor of Hygiene should be sent to Agra for six months to work under Mr. Hankin in bacteriology and bacteriological chemistry."

2. The reports from the Professors of Hygiene and Chemistry are also attached.

Copy of a letter from the Professor of Chemistry, Medical College, Madras, to the Principal, Medical College, dated the 4th September 1896.

I have the honour to report that G.O., No. 714, Public, dated 8th July 1896, was communicated by Government to me as Chemical Examiner, and that I have already furnished the information called for by Government. In that letter I stated that the Chemical Examiner's time is already fully occupied with analytical and teaching duties, and that the nature of the Chemical Examiner's duties and the materials associated with medico-legal analyses would be prejudicial to accurate bacterial observations being carried on in the Chemical Examiner's laboratory.

2. As Professor of Chemistry I have to devote two hours daily during the winter and the summer sessions to class-teaching besides the best part of an hour daily which has to be devoted to directing the preparation of class demonstrations, &c. The chemical laboratory of the college is not equipped for teaching bacteriology, and, even if it were, it would be impossible for the Professor of Chemistry to take any part in the teaching of bacteriology, because (1) he could not well do so without detriment to his duties as Chemical Examiner, (2) he could not be expected to be expert enough to teach a class as well as to conduct investigations in two such totally different branches of study.

3. Personally, I would not presume to undertake any share in the teaching of bacteriology or in investigating bacteriological questions without a thorough and systematic training in the subject over and above the training in general methods with which most of us are more or less acquainted. Even granting that this training was supplied, I believe that it would be impossible for one person to perform both chemical and bacteriological duties efficiently without one or other branch of his work suffering. The thing is too stupendous for one person in the present advanced state of both sciences.

4. The Hygiene department of the college is equipped with suitable materials and a staff which is ready and even quite anxious to begin bacteriological work; and the development of the subject would most appropriately proceed from that side of the college rather than from the Chemical department.

Copy of a letter from the Professor of Hygiene, to the Director of Public Instruction, Madras, dated the 26th August 1896.

In accordance with the order contained in your No. 8139, dated 31st July 1896, I have the honour to report as follows:—

Since taking up the duties of this appointment in September 1890, I have at every available opportunity discussed the matter under consideration and have shown again and again the urgent need that exists for a Professor of Hygiene able to devote himself entirely to the teaching and investigation of this subject. From amongst this correspondence I may select for reference two letters, separated by a period of four years, in which I carefully defined the duties and responsibilities of such an appointment. The first letter * is alluded to in the report of the Medical Reorganization Committee (pages 15, 29). Quite lately, with the permission of the late Principal, I brought up the subject before the Council of the Medical College in a carefully-prepared memorandum accompanied, for convenience, by a summary of its contents. A copy of that summary is attached to this letter. The complete "statement" and the resolution † passed by the Council of the Medical College thereon are believed to be before the Government at the present time.

* To the Principal, Medical College, dated 21st January 1892.

† No. 5. *Vide* Proceedings, dated 25th February 1896.

Taking the points raised in G.O, No. 714, Public, dated 8th July 1896, as far as possible in order and under the same numerical headings:—

I have, in the letters referred to above, endeavoured to state with clearness and precision what are the actual requirements of the case, but will now attempt to condense the matter into its smallest possible limits.

2. It is essential both on educational and scientific grounds—(2) (i), (ii) and (iii) of G.O., No. 714—that some one be appointed at once to organise and conduct the hygienic department of the Medical College, as fully explained in my "statement" to the College Council (*vide* attached summary).

3. This appears to me to be answered by paragraph 2. I have shown in the above quoted "statement" (*vide* summary attached) that it is neither necessary nor desirable to wait for the entire reorganization of the Medical College before instituting these changes; indeed, the correspondence quoted in G.O., No. 714, seems, by its general tone, to negative the question of such further indefinite delay.

4. The chief point requiring emphasis under this heading is that, before the scientific aspects of the scheme can be rigidly classified and the duties of the bacteriologist stated in a cut and dry fashion, at least eighteen months or two years of preliminary work is necessary for the study of the "methods" of cultivation and investigation suitable to Southern India, and for the training of the laboratory staff. There is, therefore, more than sufficient work for the Professor of Hygiene to do, apart from his increasing educational duties, were he to commence to-morrow with no more definite orders than to ascertain the bacteriological methods suitable to Southern India and to study and report upon the different micro-organisms met with.

Taking the sub-headings in this paragraph, I have the honour to observe that—

(i) The "practical analyses" should only be undertaken at the request of the Sanitary Commissioner for several reasons which space prevents my giving in detail. In urgent cases, such as poisoning by tinned or decaying food, &c., no doubt the Professor of Hygiene could make special "analyses" (*i.e.*, bacteriological enquiries) for the Chemical Examiner, if requested to do so.

(ii) Would answer itself practically in time. Doubtless the Sanitary Commissioner would admit the possibility of articles of food, of soil, of air, of excretal matters, of clothing &c., requiring examination from time to time, but having regard to the technical nature of the subject, it does not seem possible to amplify it without unduly extending this report.

(iii) The amount required will only be limited by the time available. It is certain that, as indicated above, the so-called "general and theoretical researches" must be carried on for some considerable time before the answering of "purely local requirements" becomes possible. To attempt to limit the duties to such local requirements without corresponding general research is to attempt the impossible if the reports are to be of any value. The case is analogous with the exception of any other department, *e.g.*, that of Forestry. If no one had ever studied the bamboo practically as to its species, growth, percentage composition, &c., in Southern India, enquiries as to the suitable kinds for local growth, the best available soil, the amount of silica in the stem and so on could certainly not be answered.

(iv) This has been fully answered in my two former letters referred to. The Chemical Examiner, as I stated in my letter of 21st January 1892 to the Principal after officiating in that appointment, has certainly not got the time to take up such questions, more especially in the present untouched state of this matter. As to the other point, I beg to state once more, as clearly as possible, that the Professor of Hygiene cannot possibly do hospital or any other work in the morning and laboratory work thereafter. Laboratory work (not merely class-teaching) and

hospital work are as trying, if not more so, than any other work performed by Europeans in India, and it is hopeless to imagine that they can be combined. Besides, the mere number of beds does not make much difference to the medical officer—within limits—only to the patients. The former can profitably occupy his morning over twenty cases, or can hurry, as he must do, over one hundred.

(v) The additional (subordinate) establishment required for a start would be *nil*. In any case, the subsequent additions would be very small. However the present salary of the Assistant to the Professor of Hygiene (Rs. 100 and 150 consolidated) would have to be altered to that of the other college assistants. It would be quite impossible to get a suitable man otherwise. As regards the Professor of Hygiene, the essential of the appointment is that it must be a permanent one, in which case the pay would have to be arranged on the same plan as in the case, *e.g.*, of the Chemical Examiner. He would not be permitted private practice, I presume, nor do I think he should be allowed to take it.

5. I have carefully explained the circumstances attending the matter herein referred to in a communication quoted from by the Surgeon-General on page 7 of G.O., No. 714, Public, but I may put it more plainly by saying that the acting Professor, or myself had I been there, could not possibly have submitted a report of any value. Even given the ability and equipment, bacteriological work requires continuous application and a laboratory in full working order before anything valuable in the way of "reports" can be attempted. If there is a good laboratory to draw upon for supplies of sterilised culture, material, &c., something can be attempted slowly by outside workers. Under other conditions, failure or mistaken conclusions are the usual results. In any case the samples sent would have been of small value under the existing conditions of collection, transit, &c. In any important case it is quite necessary for the Laboratory Superintendent or other expert to see the locality and collect the samples himself. In some cases it is even necessary for the cultivation experiments to be commenced at the actual place of infection, if errors are to be avoided.

6. I am only too anxious to go to Agra and Calcutta, and especially between the months of October and April (as suggested by the Government of India, *vide* G.O., No. 714 Public, page 8.) in order to learn all that can be learnt from the experts in charge of those laboratories with reference to bacteriology in general and Indian bacteriology in particular.

Copy of the Summary of Statement referred to in paragraph 1 of the accompanying letter from the Professor of Hygiene, dated the 26th August 1896.

Institution of Degree of Licentiate in Sanitary Science in Madras University.—Serious practical difficulties in obtaining the special instruction for the degree have prevented candidates coming forward; also no sufficient encouragement nor inducements. Lately, greater interest in the degree has been manifested. One candidate took it in 1895, and several persons have made personal enquiries to me regarding the means of study for the degree.

2. *Demand for a Museum of Practical Hygiene since* 1883, *which has received the cordial support of all officials.*—It is *not* a costly demand as shown in paragraph 9.

3. *Duties how much increased.*—Up to 1890, they consisted in a six months' course during the winter session. Since then, the laboratory has been built and equipped at the cost of much hard work; and the present duties comprise the original six months' course of systematic lectures, a summer practical course to the students and, since 1895, a three months' course to the Sanitary Inspectors' class, and the general supervision of the laboratory and staff.

4. It is quite certain that no one can carry on hospital duties in the morning and deliver lectures and superintend laboratory work all day, especially in the tropics; but if any work is to be done in the laboratory, either by the Professor or such applicants as the Health Officer for Madras, qualified medical men and others, it is equally certain that I must be present for personal work, for supervision and assistance and for instructions where necessary.

5. The work is in all directions tending towards expansion, both qualitatively and quantitatively, and on educational grounds alone there is more than sufficient work to keep the Professor of Hygiene occupied. Also, as stated above, if he has to lecture and thereafter be in the laboratory during the day, he certainly cannot perform hospital duties in the morning.

6. Again, there is no chance of his arranging for and conducting practical excursions to bazaars, parcharies, sewage works, rubbish depôts, &c., unless he has more time, and the excursions themselves must take place in the morning.

7. *Recapitulation of Duties from an educational point of view*—

(1) One systematic course } To students of Medical College.
(2) One practical course }
(3) One systematic course—To Sanitary Inspectors' class.
(4) Practical excursions for both classes. (At present the Sanitary and Deputy Sanitary Commissioners undertake these for the Sanitary Inspectors' class as a favour, and because the Professor of Hygiene has not the time.)

(5) General superintendence of teaching in the laboratory in the case of individual workers.

(6) Planning, equipping and maintaining of a Museum of Practical Hygiene. There is no room for the models already on hand and no use in attempting a proper collection of local food products, &c.

8. *The Scientific Aspect of the Question, so-called.*—The urgent need for such work in India is now more fully recognised officially. Examples given of the work to be done.

9. *Possible Objections*—

(*a*) Administrative—None that are really reasonable or insuperable.

(*b*) Financial—Something must be done and whether an additional officer is to be added to the sanctioned code or not is not for the writer to determine. The work that is being done and that remains to be done is of practical importance and utility, much beyond some other sanctioned educational work, and if a sacrifice of something is necessary, it should not be in the direction of medical education. The plan proposed—viz., the utilization of an already existing laboratory and staff—is very much cheaper than any other and entails no permanent expense save that due to the separation of the Professorship from hospital duties.

10. Seeing that everything is ready to hand, there is no need for delay on the ground of dislocation of present arrangements or of some future scheme of reconstitution. More students and the sanitation of the Presidency suffer alike from the present arrangements.

APPENDIX II.

From Surgeon-Major J. L. VanGeyzel, M.B., F.I.C., F.C.S., Chemical Examiner, Madras, to the Chief Secretary to Government, dated Ootacamund, 28th July 1896, No. 746.

With reference to paragraph 4, sub-head (iv), of G.O., No. 714, Public, dated 8th July 1896, I have the honour to state for the information of Government that the Chemical Examiner's time is already fully occupied with analytical and teaching duties, and further that the nature of his duties would not permit of his undertaking more than the ordinary *quantitative bacteriological examination.* This is a test which has been applied to drinking-water and its value lies exclusively in its use as a test of the efficiency of *filter beds* when applied to the same water at regular intervals. Its applicability, however, is greatly limited by the circumstances under which water examinations are usually made by the Chemical Examiner. I explained these points more fully in my remarks on this subject in my annual report for last year. Briefly, the period which has elapsed between the sampling of the water and its examination bacteriologically, the temperature at which the sample has been kept, and other circumstances, very largely modify the multiplication of bacteria. To obtain reliable results the sample of water must be sown in the culture medium very soon after it is drawn, otherwise this test cannot possibly be of any value. For this purpose the bacteriologist must be on the spot, or the culture medium must be entrusted to a competent examiner who happens to be there. I should attach no value whatever to the numerical results obtained by the quantitative bacteriological examination of a water when that water has been collected by a municipal peon in unsterilised vessels, conveyed for days stowed away in a train or steamer, as constantly happens, at temperatures which would be favourable to the rapid growth and death of micro-organisms. Recognising the value of this test, however, I recently suggested to the Inspector-General of Prisons that medical officers of jails should carry out this test themselves at regular intervals as a test of the efficiency of the jail filters, and accordingly he has issued a circular to this effect, containing Mr. Hankin's instructions as to the method of carrying out the test. Under the circumstances just explained the Chemical Examiner himself could not perform such work with any hope of producing reliable results, except perhaps in the case of waters in Madras town itself, unless he travels like the Chemical Examiner and Bacteriologist at Agra does. If, however, Government decides to appoint an officer to undertake bacteriological examinations in Madras, I beg to suggest that such examinations required for Madras town itself would best be discharged by him. It would add only a comparatively infinitesimal amount to his current bacteriological duties, while it will leave the Chemical Examiner to his legitimate work, which is "chemical" and not "bacteriological." Further, as the Government of India has observed in its Resolution, printed in Madras G.O., No. 990, Public, dated 2nd December 1895, "the character of the materials associated with medico-legal analyses would be prejudicial to exact bacteriological observations."

2. With reference to the remarks of Government in paragraph 5 of the order, I have the honour to state that ten samples of water were sent from Bangalore and they were examined chemically and also bacteriologically, but only the quantitative bacteriological test was performed. Even the value of this test was considerably discounted by the fact that the precautions as to collection and packing of water intended for a bacteriological examination had been neglected. It is difficult to believe that the Residency Surgeon, who forwarded these samples, can have joined in the "extreme surprise" which the Bangalore Sanitary Board has expressed in its complaint, when his own part in the play consisted in seriously expecting a bacteriological investigation to be made of water which he had collected in unsterilised bottles and packed in a

way which cannot but have seriously raised the question as to whether the cholera microbe, if it had been found, had not after all been accidentally sown in the water through his neglect of precautions against its introduction by infected hands, infected bottles and corks which had been used instead of glass stoppers, &c.

3. No attempt was made, however, to isolate and identify particular micro-organisms (such as cholera microbe), because this is a task which no one but a trained bacteriologist "working continuously" can attempt. The final opinion in case of doubts as to the identity of any particular micro-organism must be given by the bacteriologist who has handled and worked with the particular microbe, has observed its peculiarities, and can with confidence apply the necessary tests for its identification. Such an expert did not exist in Madras or in this Presidency as far as the Chemical Examiner was aware. When it is remembered that, in the history of the recent precautions taken in England against the importation of cholera, the opinion arrived at in many cases by Dr. Klein, one of the foremost bacteriologists living, was that in the material (not water, but dejecta of suspicious cases) subjected to his examination he could only certify to the presence of a micro-organism which was "undistinguishable" from the cholera microbe, Government will, I trust, be in a position to understand that what the Bangalore Board wanted—viz., an authoritative opinion as to whether the water was infected with the causative organism of cholera—was not obtainable in Madras.

4. When the reference from Bangalore was made to this office, my *locum tenens* (Dr. Robertson) was at the time also acting Professor of Hygiene, and he undertook and performed the whole examination of the water to the best of his ability under all the circumstances related above, and so there was no separate reference made to the Hygiene department from this office. Even had the permanent Professor of Hygiene been here, who is reported to have the ability and the equipment, Government will, I trust, be pleased to observe that a reference to him would not have been more effective, since he himself remarks that he cannot undertake investigations of this nature because "he has not the time" and he could not under present circumstances produce "a report for the accuracy of which he would care to stand sponsor."

From Surgeon-Lieutenant-Colonel W. G. KING, M.B., C.M., D.P.H., Sanitary Commissioner for Madras, to the Chief Secretary to Government, dated Fort St. George, 30th November 1896, No. 2229-S.

With reference to paragraph 4 (ii) of G.O., No. 714, Public, dated 8th July 1896, I have the honour to forward herewith a memorandum on the subject therein referred to.

Enclosure.

Memorandum as to Bacteriological Investigations in the Madras Presidency, by the Sanitary Commissioner for Madras.

Reference Paragraph* 1.—I submit that the difficulty experienced in giving an opinion in this matter is not due to absence of recognition of what is requisite, but to meeting requirements in a manner that shall be approved by Government as to expenditure.

* All references are to paragraphs of G.O., No. 714, Public, dated 8th July 1896.

2. In my letter to Government, No. 253-S., dated 10th February 1896, I explained that my ideal would be the building of a Central Vaccine Institute for supply of the whole Presidency with lymph preserved by any process that might be approved by Government, and attaching thereto an officer who should be its Superintendent as well as hold the post of Government Bacteriologist. The vaccine institute would therefore have attached to it a bacteriological laboratory.

3. The great future of bacteriology as a practical science must in great part lie in its meeting the fast-growing requirements of serum therapeutics. An institute, therefore, that will not only issue animal vaccine cultivated with the perfection that modern hygiene and bacteriological methods can secure but also antitoxins that should prove of the highest value in the hands of the ordinary medical practitioner for combating small-pox, tetanus, bubonic plague, snake-bite, diphtheria, puerperal fever, and, it may be shortly, typhoid fever, and be also a centre where anti-cholera inoculation and anti-hydrophobia inoculation could be practised, would confer more widespread public benefit upon the Presidency at large than could be in the power of any single institution under Government, educational or medical. To some it may not appear there need be any connection between the founding of a vaccine institute and the appointment of a bacteriologist. It seems to me, however, that the moment Government decided to use animal lymph to the exclusion of the humanized variety for vaccination, the scheme I have suggested became at once the most economical and effective.

4. This Presidency may, year after year, attempt to secure animal vaccination under the various systems of petty depôts now relied upon or of direct transmission to calves for fresh lymph cultivation under vaccinators devoid of the requisite education; but the system cannot otherwise than ultimately give place to that I have above sketched, as public opinion becomes more educated to the necessity there exists for correct methods. The frequent demands received from local authorities to approve of this and that scheme which has been excogitated locally to meet very obvious difficulties encountered sufficiently prove that the organization of the Vaccination department and its method of work are behind the times and that this *restlessness* is the result. This opinion is not founded upon mere theory but on experience worked out by me, under Government instructions at Government expense, in 1891-92. The accuracy of the data obtained at that time has been fully verified in practice by the success of the Mysore Government Institute. Granted then that a vaccine institute is a necessary corollary of the determination to use animal vaccination, it follows that an officer possessed of bacteriological knowledge would be the best description of Superintendent to appoint; granted the presence of a bacteriologist, his services for the public good would be greatly facilitated by his using animals that would be at his disposal after employment for vaccination (for immunization against one disease does not imply immunization against another) or animals not so used, with the object of taking advantage of the special accommodation and nature of the staff employed for vaccination purposes; granted that the most suitable age for calves for vaccine inoculation be (contrary to European practice) when verging on the second year, there would be secured at a period when by further keeping on pasture—which would be a necessary adjunct of an institute—cattle breeding with select specimens in connection with the supply of troops with meat, and dairy farming, could be followed profitably, in view of the first cost having already been debited to other heads.* To found such an institute would mean an expenditure upon buildings that would be but slight when compared with the amounts spent ungrudgingly year by year by Government for buildings for higher educational purposes.

* For the latter purposes, the proximity of the proposed model farm in Coimbatore district would have facilitated mutual support.

5. With Coimbatore and Salem districts close at hand whence to obtain calves, and with the facility offered by the future Nilgiris Railway, a suitable site could have been selected on the lower elevations of the Nilgiris; and there are doubtless other suitable localities in the Presidency. The educational requirements of students could have been met under such a scheme by relieving (*vide* suggestions contained in paragraph 3 of the Government order under reference) the Professor of Hygiene *of a certain number* of beds in his function of Assistant Physician, so as to enable him to give *routine* instructions in the existing Medical College laboratory, whilst only students or post-graduates who showed the capability of making bacteriology a speciality not a mere part of a routine curriculum would proceed to the combined bacteriological and vaccine institute.

6. *Reference Paragraph* 4.—If any scheme less ambitious than the above be adopted, as suggested in my letter, No. 253-S., dated 10th February 1896, I consider that the officer appointed for bacteriological purposes should perform—(1) "The present duties of the Professor of Hygiene in the Medical College, which would necessarily include the teaching of bacteriology, theoretically and practically, in a laboratory already existing; (2) the training of the future class of Sanitary Inspectors; and (3) routine bacteriological investigations for the Sanitary department."

7. I do not conceive it would be necessary to appoint separate individuals as Professors of Bacteriology and Hygiene, respectively; one officer under this smaller scheme would suffice. The complete withdrawal of the care of beds in the hospital from the Professor of Hygiene would necessitate a redistribution of duty in connection with the General Hospital, but I am led to believe from paragraph 3 of the Government order under reference that some such scheme is already under contemplation. To enter into any suggestion on this point would lead me beyond my province into matters strictly medical. I can only say that the combination of the functions of Professor of Hygiene and of the Bacteriologist is feasible and presents certain economical characteristics.

8. It would be impossible from lack of time at disposal for the Chemical Examiner to undertake any duties in connection with bacteriology. Even if he had time, it must be remembered, although there is some convenience in associating the two sciences, *they have practically nothing in common.*

9. The opinion that the duties of the Professor of Hygiene and of a bacteriologist cannot be united arises from what I believe to be an exaggerated idea of the importance of teaching bacteriology to students, and, consequently, of the time that would be so occupied. As a fact, there is very little in bacteriology *to be taught.* If only the amount of knowledge gained from being taught were taken into account, the tyro of six weeks' standing would not compare badly with the specialist who had devoted his life to the work. The bacteriologist proper is only evolved after years of dearly-bought experience as to how easily human judgment may be misled as to minute similarities and dissimilarities of form, and how readily a single error of commission or omission may stultify the labour of lengthened periods. When bacteriologists differ in opinion— and this they do very largely—the verdict lies, not upon certain details that could

be gained by book knowledge or teaching, but on experience as to manipulation and appreciation of form. If this simple statement be accepted as correct—and, in my opinion, it cannot be open to doubt—there naturally follows the query as to what is the scope of utility in medical education of bacteriology.

10. There is an ill-defined idea abroad that this infantile science is so indispensable that some great results that have hitherto not been reaped may be expected from its being taught to the ordinary medical student; that in some way or other the Presidency will soon have an army of bacteriologists at work in its interests. Yet, when the student is taught physics, chemistry, botany, zoology or geology, it is well understood that not one in a thousand will become a specialist. The utmost that will occur from their absorbing certain great facts in these sciences is that when in contact with their professional work, they will be able to interpret the various factors influencing results more readily. Thus, after undergoing an elaborate course of quantitative and qualitative chemistry, all that is expected of the general practitioner is that he should be able to apply a few simple tests and comprehend why certain drugs are incompatible. Similarly, after having gone through a course of bacteriology, there is ensured a full belief in the microbial theory of disease, and, consequently, in surgical and medical practice and in the application of hygienic measures, the full necessity for precautions against microbial infection is recognized. A man so trained will not use a filthy lancet for vaccination nor neglect antiseptic precautions when called upon to perform the smallest surgical operation, nor, when he works as a sanitarian, will he be satisfied with sanitary works so constructed that they are "good enough" only when not subjected to strain, or when contrasted with the grade of luxury formerly known to the country. Indeed, it has been claimed by good authority that the teaching of the ordinary student bacteriology has much the same influence in securing that details shall not be neglected as factors in obtaining total results as teaching Euclid has in general education. And, here, I must ask that the scope of bacteriology be not confused with the fast-growing applicability of simple microscopical research in elucidation of matters clinical, pathological and sanitary. For this work, there is infinitely more scope in the life of the ordinary practitioner than for bacteriology proper.

11. In short, all that can be done by the bacteriologist in the way of *teaching* would be to give, say, six lectures illustrated by exhibition of cultivations and supervision of practical work by students during one hour for twenty days per annum. Now and again from the midst of these students will be found one who shows a special aptitude for bacteriology: such a man would be given facilities for practical work on his own lines or by aiding the bacteriologist as a demonstrator. But he would not require one atom more theoretical teaching than the ordinary student. He would have to carve out his own way to knowledge. Even were the actual small part in medical education I have laid down for bacteriology incorrectly stated, and were it possible for each raw student, by the professor devoting more time to him, to become a capable bacteriologist, of what use would this *rara avis* be? Hundreds of men in Great Britain have now undergone prolonged courses of instruction in bacteriology; but is Great Britain proportionately richer in bacteriological results? No; the public and the Sanitary department of the British Government look to a very select few for opinions—indeed, so select that practically but one voice in England at the present moment gives its verdict. Nor could any other result be expected, unless it were possible to multiply bacteriological laboratories with specialists attached indefinitely.

12. In my opinion, therefore, the tendency to regard so fixedly the teaching of bacteriology as the great point to be subserved is likely to obscure the plain fact that if teaching be added to the duties of the bacteriologist, it will form but a light task, and that the chief use to a Government and a people of a bacteriologist is with reference to disease prevention in all its branches.

13. The proper place, therefore, for the bacteriologist is, not as an officer of the Educational department, but of the Sanitary department subject to being lent to the Educational department for the service described.

14. *Reference Paragraph* 4 (ii).—There is no article of food—fluid or solid, animal or vegetable—that may not require examination for microbes inimical or beneficial to man. There is no secretion or excretion, or part of the organized whole of the lower animals or man, that may not require search. Air itself and everything penetrable by air demand attention. In fact, there is little on the earth or in the earth or its surroundings that may not require scrutiny by the bacteriologist in the course of investigation of facts supporting sanitary investigations.

15. Presuming the instance of a population suffering from cholera possessed of but two sources—a well and a river—for water-supply, the sanitarian may believe that the medium of spread is water, but owing to contamination having taken place under circumstances unknown, he is in doubt whether it be the well or river water that is at fault. The only course open would be to watch the results of infection so as to exclude the contaminated source. In an institution where a disease resembling cholera has suddenly appeared, the medical authorities may declare the disease to have all the symptoms of ptomaine, or arsenical, poisoning. A bacteriological examination might in both cases settle the difficulty in time and probably save many lives. A fever attacks a locality that whilst having much of the malarial type still bears resemblance in some of the cases to typhoid; or, again, with the fever may appear swellings resembling bubonic plague. Identification of the typhoid or plague bacillus in either case would decide the diagnosis. In dealing

with a free population subject to not one but numerous sanitary errors, the sanitarian might have a long search and much "piecing" together of testimony before he could decide that such and such milk, water, raw vegetable, or shell-fish was the medium of infection. A town possessed of an irreproachable water-supply and good filter-beds is attacked with cholera or typhoid fever; there is no history of contamination but certain imperfections of the sanitary engineering work explain how it was possible for entry of the unfiltered water to have occurred. Identification of typhoid or cholera bacilli in the unfiltered water would explain the whole matter. The employés of dealers in skins become suddenly attacked with fever and pneumonia, others with carbuncles in exposed parts; the sellers of the skins declare, in reply to the sanitarian's query, that the skins are not those from animals dead of anthrax; but the bacteriologist can readily prove the presence of anthrax spores on them.

16. It must not be conceived that in speaking thus, I personally believe that the evidence adduced by the bacteriologist is infallible or that he is the authority *to decide* sanitary questions; as a rule, the utmost performed by him is to confirm the presumptive evidence gathered by the sanitarian. As a fact, unfortunately, it has been proved in disastrous fashion that specifically contaminated water has been pronounced by experienced bacteriologists as fit for potable purposes. The bacteriologist in these matters is, however, a distinct aid to the sanitarian in advising as to early identification of pathogenic microbes; indeed, a Sanitary department in the present day unaided by a bacteriologist is in as indefensible a position as if not provided with the aid of an expert chemist. These statements will sufficiently explain my remark, which Government desired should be amplified, as to the "aiding of sanitary precautions by the early identification of well-known microbes."

17. Again, in affording guidance as to the grade of perfection to which sanitary efforts should extend, investigations by the bacteriologist would be of great utility in determining the life-saving value of sanitary works that have been, or may be, executed by Government for the collection, storage, purification or distribution of public water-supplies. Bacteriological investigation would not only exhibit the value of work already fulfilled, but would serve the important purpose of calling attention to modifications that may be requisite before the occurrence of epidemics demonstrated where protection from ingress of pathogenic microscopical life had not been arranged for with requisite completeness on the "good enough" theory that finds ready acceptance with the laity, on the erroneous supposition that economy is subserved or that "half a loaf is better than none," &c. To determine with safety the rival merits of suggested water-supply sources, the fullest information is desirable. It frequently happens that the choice of a certain source to the neglect of another involves vast expenditure. In this case, a statement of the results of bacteriological examination under varying conditions in addition to the present system of chemical analysis, *when both are read in the light afforded by a sanitary survey*, can afford data of much utility. When such information proved that a water could not be entirely relied upon as to freedom from specific contamination, much information could be obtained, before deciding to use or reject it, by employing experimentally on a small scale chemical or biological methods (and various forms of sanitary engineering apparatus in connection with them) having definite ends of purification in view that might be applicable in practice on a large scale. Only by checking the results of such experiments by bacteriological and chemical examination could any opinion of moment be arrived at. Not only could the best class of treatment be thus decided upon, but the various modes of putting them into practice could be tested and positively determined. In the numerous questions implicated in the disposal of sewage and sewage effluents by purification, filtration and various modes of sewage-farming, the opinion of the bacteriologist would be of importance in demonstrating how far expenditure for securing high grades of purification only obtainable by complicated and expensive modes would be requisite. Indeed, I consider that the employment of a bacteriologist of proved competency in connection with the application of sanitary engineering methods would not only conduce to increased efficiency but serve the best interests of economy of public funds.

18. *Reference Paragraph* 4 (v).—If the Professor of Hygiene were relieved from his work as Assistant Physician, under the arrangement suggested in paragraph 3 of the Government Order, it would suffice to provide him with a whole time Assistant of the Civil Assistant Surgeon class and on the same scale of pay. A skilled student as demonstrator should receive Rs. 50 per month as an honorarium during the bacteriologist's pleasure. Two men of the Attender class, and one peon, should suffice for establishment. Granting that the laboratory were in complete order, contingencies ought to be covered by Rs. 1,000 per annum.

19. *Reference Paragraph* 4 (i).—There is scarcely any department of Government that might not be expected from time to time to require bacteriological examinations to be conducted on its behalf. The Board of Revenue might demand opinions upon diseased agricultural products; the Jail department on articles of food and water; the Veterinary department might demand protective vaccines or the identification of pathogenic germs peculiar to the lower animals; the Abkári department might enquire as to the significance of certain unfavourable changes in the course of manufacture of alcoholic preparations; the Vaccine department might require the identification of the causative agent of deterioration of vaccine during cultivation or storage or a pronouncement of its freedom from injurious microbes; the Medical service the identification of typhoid, tubercular, cholera and other pathogenic microbes in excretions of patients, and opinions

as to the purity of "vaccines" and "antitoxins" received from other sources the Engineering department might wish to know the cause of decay of wood under unusual conditions or the discolouration of walls. Of the public, at times the dairy farmer, alarmed as to the flavour of butter or cheese, may wish to know the cause; the manufacturer of vegetable dyes as to their improvement, or cause of the inferiority during manufacture. The wide range of utility to the Sanitary department has already been discussed. Medical officers attached to jails would require quarterly supplies of agar-agar; other officers might demand similar supplies for their own investigations. If anti-cholera inoculation be adopted in this Presidency, the bacteriologist would be expected to make the systematic issue of vaccines.

30th November 1896. (Signed) W G. KING, Surgn.-Lt.-Col.,
Sanitary Commissioner for Madras.

No. 4567-C.

Memorandum.

With reference to memorandum, No. 2479, Public, dated 26th November, and in continuation of memorandum, No. 3507-C., Public Works, dated 3rd October 1896, the undersigned has the honour to state that replies to clauses (i) and (ii), paragraph 4, of G.O., No. 714, Public, dated 8th July 1896, have not been received from the Superintending Engineers, II and V Circles, to whom urgent reminders have been sent. The Superintending Engineers, I, IV and VI Circles, and the Chief Engineer for Irrigation, have no suggestions to make, and the Superintending Engineer, III Circle, and the Superintending Engineer on special duty, Tanjore, do not know of any article besides water for which bacteriological analysis is likely to be required in the Public Works Department. The Consulting Engineer for Railways adds the item, soil. The Consulting Architect, in a letter, No. 4397, dated 30th November 1896, copy of which is enclosed, makes what appear to be some valuable suggestions, to which attention is invited. The undersigned has nothing to add to the Consulting Architect's remarks, and with reference to clause (v), paragraph 4, of the Government Order, has the honour to state that no additional establishment would be required in the Public Works Department for the purpose of the proposed reform.

2. If the Superintending Engineers, II and V Circles, make any suggestions of importance, the purport of their replies will be communicated.

Madras, (Signed) D. McNEIL CAMPBELL, Col., R.E.,
3rd December 1896. *Secretary to Government, P.W.D.*

To the Public Department.

Enclosure.

Letter from G. S. T. HARRIS, Esq., Consulting Architect to the Government of Madras, No. 4397, dated 30th November 1896.

With reference to your No. 3506-C., dated the 3rd October 1896, I have the honour to inform you that, in addition to the bacteriological examination of waters, that of sewage in all forms might be taken up and intimately gone into and considered, and the results put upon a satisfactory basis with regard to its economic and hygienic application under various conditions.

2. Then as to building materials and their liability to contamination with specific microbe is a subject of vital importance, its usefulness as a means to an end when the construction is under consideration of a hospital, a jail, an asylum, a hall, or any other structure, private or public, in which crowds may assemble or numbers dwell, is so evident as to hardly call for mention; but the consideration of the best means of furthering this object is a practical one, and it is to be determined how far this department, which is the constructional side, can assist the party of research. For instance, I am responsible for a large number of hospitals in different parts of India, and my actual knowledge as to the mephitic properties of wall linings for wards, &c., is absolutely incomplete. I am not able to declare whether, under given climatic conditions, wooden, cemented or tiled walls should be preferred, or whether tiled, asphalted or earthern floors should be laid down. I am aware these matters are more or less determined on in Europe, but it is doubtful whether they efficiently apply to India under her sun and in her climate.

3. It appears to me that small sections carefully cut out from the walls or floors and ceilings of existing and long-tenanted hospitals, wards, prisons, cells, stables, &c., might with advantage be submitted for examination to the bacteriological laboratory.

4. Apart from the question of pure bacteriology, there is an infinite number of matters relating to buildings and building materials about which our knowledge is of the scantiest, and

which can only be settled by careful experiment undertaken in connection with a hygienic laboratory. Such, for example, are the relative absorptive powers of the different materials for heat and the rate with which the latter is again radiated and conducted therefrom, the rate of absorption of moisture by them and its retention, their capillary powers, &c.

5. For example, there is no doubt that the teak buildings in Burma, even in the very hottest months, cool down within an hour of sunset, while the pukka buildings in the same place remain hot throughout the night, and I have no doubt that the laterite roads in Madras are less heated and retain less heat than do those which are granite macadamized.

6. The relative coolness of buildings coloured white, grey, red, ginger-coloured, &c., might also be investigated.

7. The proper means of ventilation of every style of building should be carefully experimented upon in the laboratory and elsewhere by one trained in the methods of modern hygiene, and these would yield results of the highest value. For instance, I have in some hospitals applied to the wards through and through nether ventilation by conduits driven beneath the floors which were grated, and these have been much approved by medical officers, but it is not a method which is general.

Proceedings of the Sanitary Board, No. 68-S., dated 23rd January 1897.

Read—the following papers:—

G.O., No. 714, Public, dated 8th July 1896.

Endorsement by the Sanitary Commissioner, No. 433-S.B., dated 13th October 1896.

Proceedings of the Sanitary Board, No. 242-S., dated 13th November 1896.

Letter from the Sanitary Commissioner, No. 2276-S., dated 30th November 1896.

Resolution.

In paragraph 4 (iii) of G.O., No. 714, Public, dated 8th July 1896, the Government called for information as to the amount of work that would be required of a bacteriologist by the Sanitary Board in connection with actual local requirements apart from general and theoretical researches.

2. The Board has had an opportunity of perusing a copy of the memorandum of the Sanitary Commissioner on the subject, which was laid before Government on the 30th November 1896, and is of opinion that the remarks in paragraphs 15 to 17 of that paper sufficiently indicate the amount and nature of the assistance which a bacteriologist might be expected to afford the Sanitary Board.

(True Extract.)

(Signed) R. PARSONS,
Secretary, Sanitary Board.

To the Chief Secretary to Government, Public Department.

Memorandum, in the Public Works Department, No. 527 C., dated 27th January 1897.

Read—the following papers:—

From Lieutenant-Colonel C. C. RAWSON, R.E., Superintending Engineer, V Circle, dated 5th December 1896, No. 125 W.C.

With reference to your memorandum, No. 3506 C., dated 3rd October 1896, I have the honour to state that, in addition to the bacteriological examination of water for drinking purposes, I think that it would be well to examine the bacteria or fungi which cause dry rot in timber with a view to its prevention, also occasionally the water used for feeding boilers requires examination, there has been great trouble at the boiler of the engine of the workshops at the College of Engineering owing, it is believed, to the presence of sewage in the feed-water. The mixture of sewage water which is usually found in the river Cooum might, I think, be subjected to careful bacteriological examination to settle, if possible, the question as to whether the smell from it during the hot weather is dangerous to human life.

From Major W. L. C. BADDELEY, R.E., Superintending Engineer, II Circle, dated 6th January 1897, No. 499 G.L.

In reference to memorandum, No. 3506 C., dated 3rd October 1896, I have the honour to report that no practical analyses are required for the Public Works Department and the only article that may require bacteriological examination is the water in the Kistna canals during epidemics of cholera.

Memorandum—No. 527 C., dated 27th January 1897.

Copies forwarded to the Public Department, in continuation of this office memorandum, No. 4567 C., dated 3rd December 1896.

(Signed) D. McNEIL CAMPBELL, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Officiating Under Secretary to the Government of India, Home Department (Medical), dated Calcutta, 10th December 1896, No. 1091.

ABSTRACT.—Inquiring when the final orders of the Government of Madras may be expected on the question of arranging locally for the bacteriological examination of specimens of water.

Letter—R. No. 1322, dated 21st December 1896, to the Secretary to the Government of India, Home Department (Medical).

With reference to Mr. Nathan's letter, No. 1091, dated the 10th instant, I am directed to state that complete replies have not yet been received to G.O., No. 714, Public, dated 8th July last, a copy of which was forwarded with Mr. Price's letter No. 715 of that date. They have again been called for and a further communication will be addressed to you as soon as they are received.

(Signed) A. T. ARUNDEL,
Ag. Chief Secretary.

ORDER—No. 512, Public, dated 5th May 1897.

From the papers read above it is clear that, while there is large scope for a Bacteriologist in this Presidency, it is impossible to provide satisfactorily for the conduct even of routine bacteriological examinations without setting apart for the purpose the services of an officer who can devote himself continuously to the subject. Under present conditions such an officer is not available. The Government of India will therefore be addressed on the question of creating a new appointment and providing an additional medical officer for this purpose.

2. The following letter will be despatched :—

[Here enter letter No. 513, Public, dated 5th May 1897.]

(True Extract.)

A. Thumbuswamy.
for *Chief Secretary.*

To the Surgeon-General.
„ Sanitary Commissioner.
„ Sanitary Board.
„ Chemical Examiner.
„ Revenue Department.
„ Public Works Department.
„ Local and Municipal Department.

Exd. C. M. Thumbuswamy.

Government {1897} of Madras.

PUBLIC.

Recd. }1897. *Enclosures*

Regd. *Spare copies*

G.O., No. 512, 5th May 1897.

MAY.

Bacteriological Investigations.

Ordering that the Government of India be addressed on the question of creating a new appointment for the conduct of —, &c., and of providing an additional medical officer for the purpose.

GOVERNMENT OF MADRAS.

PUBLIC DEPARTMENT.

Read—again the following paper:—

G.O., No. 714, Public, dated 8th July 1896.

Abstract.—Calling for information from the Surgeon-General, &c., regarding the measures to be adopted for bacteriological investigation in this Presidency; and addressing the Government of India on the subject.

Read—the following papers:—

G.O., Mis. No. 3364, Revenue, dated 19th August 1896.

Read—the following Proceedings of the Board of Revenue (Land Revenue), Mis. No. 3691, dated 11th August 1896, on endorsement of the Revenue Department, Mis. No. 2991, dated 27th July 1896, referring to the Board of Revenue for report with reference to paragraph 4 of G.O., No. 714, Public, dated 8th July 1896:—

Resolution—Mis. No. 3691, dated 11th August 1896.

The Board in this department has no suggestion to offer on paragraph 4 of G.O., No. 714, Public, dated 8th July 1896, communicated with the Revenue Department order read above.

Order—Mis. No. 3364, Revenue, dated 19th August 1896.

Recorded.

(True Extract.)

(Signed) L. DAVIDSON,
Ag. Under Secy. to Govt.

To the Public Department.

G.O., Mis. No. 3524, Revenue, dated 1st September 1896.

Read—the following Proceedings of the Board of Revenue (Separate Revenue), Mis. No. 3481, dated 19th August 1896, on endorsement * of the Revenue Department on G.O., No. 714, Public, dated 8th July 1896:—

* G.O., Mis. No. 2991, dated 27th July 1896.

Resolution—Mis. No. 3481, dated 19th August 1896.

The Board begs leave to report that no investigations of the kind referred to in paragraph 4 of the Government Order read above are required to be made for the departments under this branch of the Board.

Order—Mis. No. 3524, Revenue, dated 1st September 1896.

Recorded.

(True Extract.)

(Signed) L. DAVIDSON,
Ag. Under Secy. to Govt.

To the Public Department.

G.O., Mis. No. 1796 L., dated 30th September 1896.

Read—letter from the Public Department, dated 18th September 1896, requesting an early reply to G.O., No. 714, Public, dated 8th July 1896, regarding bacteriological researches in the Madras Presidency.

Order—Mis. No. 1796 L., dated 30th September 1896.

The Public Department will be informed that no reply is called for from this department.

(True Extract.)

A. T. ARUNDEL,
for *Chief Secretary.*

To the Public Department.

Proceedings of the Board of Revenue (Revenue Settlement, Land Records and Agriculture), dated 4th November 1896, Mis. No. 5472.

Read—again G.O., No. 714, Public, dated 8th July 1896, and the following Board's Reference Order thereon, dated 18th August 1896:—

Referred to the Superintendent, Civil Veterinary Department, for full report as to the work which might be required for the Civil Veterinary Department if the suggested bacteriologist were appointed in the way of the practical investigation of animal diseases and the training of subordinates.

2. It must be noted that a special bacteriological laboratory for the investigation of animal diseases has already been established by the Government of India.

(Signed) R. V. SRINIVASIAR,
Secretary.

Read—also the following letter from the Superintendent, Civil Veterinary Department, dated 12th October 1896, No. 1176:—

With reference to Board's Proceedings, Mis. No. 4893, dated 8th October 1896, I have the honour to report that the Proceedings * and G.O., No. 714, dated 8th July 1896, were referred to the Inspector-General, Civil Veterinary Department, for his opinion, and it is herewith attached.

* Government Reference No. 6740 of 1896.

2. I am unable to say definitely, until more details of the working of the scheme are to hand, what can be done in the way of the practical investigation of animal diseases and the training of subordinates by the suggested bacteriologist. Personally speaking, I think it would be an excellent thing to have a bacteriologist on the spot, as investigations of outbreaks of diseases could be so much more easily and quickly carried out than by sending specimens to the Imperial bacteriologist.

3. I presume by the subordinates mentioned the stock inspectors are meant. It would be a very good thing if they were trained to the proper use of the microscope, but for the knowledge to be of any practical use they will each have to be supplied with expensive microscopes, &c., and that, with some men undergoing this course of instruction (in Madras or elsewhere) and some possibly at Bombay Veterinary College, the number of stock inspectors will be greatly decreased and the work of the Bacteriological Survey will be obstructed to a certain extent.

4. The scheme, if carried out, will be of great assistance in investigating animal diseases such as anthrax, rinderpest (especially about which disease really very much is not bacteriologically known); kumaree also.

5. Until, however, as suggested by the Assistant to the Inspector-General, Civil Veterinary Department, a workable scheme is prepared, I cannot give a full report as to the work which might be required for the Civil Veterinary Department.

Resolution—dated 4th November 1896, Mis. No. 5472.

The report of the Superintendent, Civil Veterinary Department, will be submitted for the information of Government.

2. In the Board's opinion, a professional bacteriologist would find ample scope for investigating rinderpest and other cattle diseases in this Presidency, and such study is much required. The Imperial bacteriologist is, however, it is believed, at present studying the disease.

3. As to the training of veterinary subordinates, the Board does not consider that there can be much scope in this Presidency until a school of practical Veterinary science has been founded, and even then it is doubtful how far such training would be of value to men such as could be trained therein.

(True Copy and Extract.)

(Signed) R. V. SRINIVASIAR,
Secretary.

To the Secretary to Government, Revenue Department.
" Superintendent, Civil Veterinary Department.

Endorsement in the Revenue Department, No. 4656, dated 18th November 1896.

Transferred to the Public Department.

(Signed) L. DAVIDSON,
Ag. Under Secy. to Govt.

From Surgeon-Major-General C. SIBTHORPE, F.R.C.P.I., Surgeon-General with the Government of Madras, to the Chief Secretary to Government, dated Madras, 7th November 1896, No. 516.

With reference to G.O., No. 714, Public, dated the 8th July 1896, on bacteriology, I have the honour to report that on its receipt I referred it to the Director of Public Instruction and asked him to call on the Professors of Hygiene and Chemistry to report on the points raised in it, to submit it with their reports to the Council of the Medical College and to return the correspondence with his remarks and observations. I now attach (Appendix I) true copies of the answers.

2. I also attach (Appendix II) letter, No. 746, dated the 28th July 1896, from the Chemical Examiner to Government which was returned to him with your endorsement, No. 1534, dated the 3rd August 1896, to be resubmitted through me.

3. With reference to paragraph 4 of the Government Order under reference, the following replies are submitted to the queries therein made :—

(i) The first twelve or eighteen months of the expert's time should be taken up in studying the methods suitable in Southern India and in training his staff. I would suggest that no work should be sent to him except by the Surgeon-General, the Principal Medical Officer, Madras Army, the Sanitary Commissioner to Government and the Chemical Examiner.

(ii) It would be impossible to give a definite answer to this without going into great detail; but the examination of air, soils, excreta would form a great portion of his work.

(iii) Will be answered by the Sanitary Board. As will be seen above, I do not propose that the Sanitary Board should send him any work.

(iv) In my opinion, the Chemical Examiner could not take any of this work. It would, I consider, be a mistake for the Professor of Hygiene, even if he was relieved of the charge of a certain number of beds (which I consider should be done on its own merits), to be called upon to perform the duties of a trained bacteriologist, as it is clear to me that it is most desirable that the officer who has the teaching of hygiene in the college should have some practical experience in sanitation in India and should have had opportunities of studying the habits of the people, which means that he

should be always an officer of some years' service. It is most essential that the Bacteriologist should be a highly-trained scientific man with, if possible, a developed scientific mind and that he should be well up in the most recent methods of research. He should have been working at the science continuously. It would, I feel sure, be an absolute waste of money to appoint any officer now in the service to these duties and to give him short leave to study up the methods under any one, either in India or in Europe.

(v) I consider the bacteriologist should be allowed an assistant—a locally trained medical man holding a University qualification—and that his pay should be the same as the other assistants in the college which is now under consideration and will probably be the rate of pay as an Assistant Surgeon with a teaching allowance.

He should also be allowed one intelligent attendant on Rs. 12 a month.

4. I consider the Government Bacteriologist should be —

(i) An officer of the Indian Medical Service and that the post should be added to the cadre as a List I appointment.

(ii) That the Right Honourable the Secretary of State should select a duly qualified man on the advice of the University or Collegiate authorities in Great Britain.

(iii) That the pay should be fixed at the grade pay of his rank with an allowance of Rs. 200 a month from date of joining his appointment for the first five years, and after that as a major professorship under G.O.G.G., No. 370, dated the 4th April 1867, with house-rent from date of arrival in Madras.

(iv) This officer should be required to go through the course at Netley and then should be permitted to spend three or four months in some selected laboratory in England or on the Continent.

(v) On arrival in India he should be sent on duty for a month to Agra to Mr. Hankin to study his methods.

(vi) He should be exempted from the rule that requires officers of the Indian Medical Service to do two years' military duty before being employed in the Civil departments.

(vii) He should be permitted to expend a sum not exceeding £100 in Europe on laboratory equipment, which should be sent out for him to the Medical College.

(viii) He should work in the hygienic laboratory of the Medical College and should be provided with special rooms for himself and his assistant.

(ix) He should teach bacteriology to a class in the Medical College during the session.

(x) During the recess he should be permitted to carry on his researches in Kóttagiri or Ootacamund and be allowed his travelling expenses up and down.

(xi) He should be placed in the same position as regards Government as the Chemical Examiner now holds as regards his ordinary work, and under the Director of Public Instruction as regards his duties in the Educational department.

(xii) He should agree to serve in his special appointment for not less than five years, and in the event of his subsequently wishing to revert to the ordinary duties of the profession, he should be placed at the disposal of the Military department and not considered eligible for any permanent Civil Medical appointment until he has completed two years' military duty.

5. With reference to paragraph 5 of the Government Order, the Professor of Hygiene was at the time acting as Chemical Examiner to Government and was not in a position to give a reliable report.

6. With reference to paragraph 6 of the Government Order, I consider that an officer could get an equally good training here in the laboratory of the Chemical Examiner as was done under G.O., Mis. No. 1392, dated 23rd June 1884, which would save the travelling expenses. If Government will sanction such an officer's pay and allowances for a period of six months, I will inquire what junior officers are willing to go through the training and select one.

APPENDIX I.

Copy of a letter from the Director of Public Instruction, Madras, to the Surgeon-General with the Government of Madras, No. 11473, dated the 24th October 1896.

With advertence to your reference of Current No. 658—1, dated the 27th July 1896, and endorsement on Current No. 2215—5, dated the 10th August 1896, I have the honour to forward, as requested therein, the opinions of the Professors of Chemistry and Hygiene as well as those of the Council of the Medical College in regard to the institution of bacteriological researches in connection with that college, and to state that I concur with the opinions expressed by the College Council. I would add that in the event of the Professor of Hygiene being appointed Government Bacteriologist and Lecturer in Bacteriology, the incumbent of the combined appointment—who, it is presumed, will be a commissioned medical officer—should not be disturbed from the college for a period of not less than five years, and that it is necessary that one other officer of the Indian Medical Service should have been previously required to undergo bacteriological training at Agra and Calcutta so as to be in a position to succeed the Professor of Hygiene, either permanently or temporarily, at short notice.

2. The enclosures to your references under reply are herewith returned.

Copy of a Memorandum from the Principal, Medical College, Madras, to the Director of Public Instruction, dated the 6th October 1896, No. M.-1137.

I have the honour to give below the resolutions of the College Council on the subject passed at the last meeting:—

"The Council is of opinion—

"1. That it would be impossible for the Professor of Chemistry, who is also Chemical Examiner to Government, to perform in addition the duties of Government Bacteriologist or undertake any bacteriological work.

"It is of opinion—

"2. That the Professor of Hygiene should be appointed Government Bacteriologist and Lecturer on Bacteriology in the Medical College, Madras.

"3. That it is essential to the satisfactory working of the duties of Professor of Hygiene and Bacteriology that the incumbent should have no hospital duties to perform.

"4. That in the event of this proposal receiving the sanction of Government, the Professor of Hygiene should be sent to Agra for six months to work under Mr. Hankin in bacteriology and bacteriological chemistry."

2. The reports from the Professors of Hygiene and Chemistry are also attached.

Copy of a letter from the Professor of Chemistry, Medical College, Madras, to the Principal, Medical College, dated the 4th September 1896.

I have the honour to report that G.O., No. 714, Public, dated 8th July 1896, was communicated by Government to me as Chemical Examiner, and that I have already furnished the information called for by Government. In that letter I stated that the Chemical Examiner's time is already fully occupied with analytical and teaching duties, and that the nature of the Chemical Examiner's duties and the materials associated with medico-legal analyses would be prejudicial to accurate bacterial observations being carried on in the Chemical Examiner's laboratory.

2. As Professor of Chemistry I have to devote two hours daily during the winter and the summer sessions to class-teaching besides the best part of an hour daily which has to be devoted to directing the preparation of class demonstrations, &c. The chemical laboratory of the college is not equipped for teaching bacteriology, and, even if it were, it would be impossible for the Professor of Chemistry to take any part in the teaching of bacteriology, because (1) he could not well do so without detriment to his duties as Chemical Examiner, (2) he could not be expected to be expert enough to teach a class as well as to conduct investigations in two such totally different branches of study.

3. Personally, I would not presume to undertake any share in the teaching of bacteriology or in investigating bacteriological questions without a thorough and systematic training in the subject over and above the training in general methods with which most of us are more or less acquainted. Even granting that this training was supplied, I believe that it would be impossible for one person to perform both chemical and bacteriological duties efficiently without one or other branch of his work suffering. The thing is too stupendous for one person in the present advanced state of both sciences.

4. The Hygiene department of the college is equipped with suitable materials and a staff which is ready and even quite anxious to begin bacteriological work; and the development of the subject would most appropriately proceed from that side of the college rather than from the Chemical department.

Copy of a letter from the Professor of Hygiene, to the Director of Public Instruction, Madras, dated the 26th August 1896.

In accordance with the order contained in your No. 8139, dated 31st July 1896, I have the honour to report as follows:—

Since taking up the duties of this appointment in September 1890, I have at every available opportunity discussed the matter under consideration and have shown again and again the urgent need that exists for a Professor of Hygiene able to devote himself entirely to the teaching and investigation of this subject. From amongst this correspondence I may select for reference two letters, separated by a period of four years, in which I carefully defined the duties and responsibilities of such an appointment. The first letter* is alluded to in the report of the Medical Reorganization Committee (pages 15, 29). Quite lately, with the permission of the late Principal, I brought up the subject before the Council of the Medical College in a carefully-prepared memorandum accompanied, for convenience, by a summary of its contents. A copy of that summary is attached to this letter. The complete "statement" and the resolution† passed by the Council of the Medical College thereon are believed to be before the Government at the present time.

* To the Principal, Medical College, dated 21st January 1892.

† No. 5. *Vide* Proceedings, dated 25th February 1896.

Taking the points raised in G.O, No. 714, Public, dated 8th July 1896, as far as possible in order and under the same numerical headings:—

I have, in the letters referred to above, endeavoured to state with clearness and precision what are the actual requirements of the case, but will now attempt to condense the matter into its smallest possible limits.

2. It is essential both on educational and scientific grounds—(2) (i), (ii) and (iii) of G.O., No. 714—that some one be appointed at once to organise and conduct the hygienic department of the Medical College, as fully explained in my "statement" to the College Council (*vide* attached summary).

3. This appears to me to be answered by paragraph 2. I have shown in the above quoted "statement" (*vide* summary attached) that it is neither necessary nor desirable to wait for the entire reorganization of the Medical College before instituting these changes; indeed, the correspondence quoted in G.O., No. 714, seems, by its general tone, to negative the question of such further indefinite delay.

4. The chief point requiring emphasis under this heading is that, before the scientific aspects of the scheme can be rigidly classified and the duties of the bacteriologist stated in a cut and dry fashion, at least eighteen months or two years of preliminary work is necessary for the study of the "methods" of cultivation and investigation suitable to Southern India, and for the training of the laboratory staff. There is, therefore, more than sufficient work for the Professor of Hygiene to do, apart from his increasing educational duties, were he to commence to-morrow with no more definite orders than to ascertain the bacteriological methods suitable to Southern India and to study and report upon the different micro-organisms met with.

Taking the sub-headings in this paragraph, I have the honour to observe that—

(i) The "practical analyses" should only be undertaken at the request of the Sanitary Commissioner for several reasons which space prevents my giving in detail. In urgent cases, such as poisoning by tinned or decaying food, &c., no doubt the Professor of Hygiene could make special "analyses" (*i.e.*, bacteriological enquiries) for the Chemical Examiner, if requested to do so.

(ii) Would answer itself practically in time. Doubtless the Sanitary Commissioner would admit the possibility of articles of food, of soil, of air, of excretal matters, of clothing &c., requiring examination from time to time, but having regard to the technical nature of the subject, it does not seem possible to amplify it without unduly extending this report.

(iii) The amount required will only be limited by the time available. It is certain that, as indicated above, the so-called "general and theoretical researches" must be carried on for some considerable time before the answering of "purely local requirements" becomes possible. To attempt to limit the duties to such local requirements without corresponding general research is to attempt the impossible if the reports are to be of any value. The case is analogous with the exception of any other department, *e.g.*, that of Forestry. If no one had ever studied the bamboo practically as to its species, growth, percentage composition, &c., in Southern India, enquiries as to the suitable kinds for local growth, the best available soil, the amount of silica in the stem and so on could certainly not be answered.

(iv) This has been fully answered in my two former letters referred to. The Chemical Examiner, as I stated in my letter of 21st January 1892 to the Principal after officiating in that appointment, has certainly not got the time to take up such questions. more especially in the present untouched state of this matter. As to the other point, I beg to state once more, as clearly as possible, that the Professor of Hygiene cannot possibly do hospital or any other work in the morning and laboratory work thereafter. Laboratory work (not merely class-teaching) and

hospital work are as trying. if not more so, than any other work performed by Europeans in India, and it is hopeless to imagine that they can be combined. Besides, the mere number of beds does not make much difference to the medical officer—within limits—only to the patients. The former can profitably occupy his morning over twenty cases, or can hurry, as he must do, over one hundred.

(v) The additional (subordinate) establishment required for a start would be *nil*. In any case, the subsequent additions would be very small. However the present salary of the Assistant to the Professor of Hygiene (Rs. 100 and 150 consolidated) would have to be altered to that of the other college assistants. It would be quite impossible to get a suitable man otherwise. As regards the Professor of Hygiene, the essential of the appointment is that it must be a permanent one, in which case the pay would have to be arranged on the same plan as in the case, *e.g.*, of the Chemical Examiner. He would not be permitted private practice, I presume, nor do I think he should be allowed to take it.

5. I have carefully explained the circumstances attending the matter herein referred to in a communication quoted from by the Surgeon-General on page 7 of G.O., No. 714, Public, but I may put it more plainly by saying that the acting Professor, or myself had I been there, could not possibly have submitted a report of any value. Even given the ability and equipment, bacteriological work requires continuous application and a laboratory in full working order before anything valuable in the way of "reports" can be attempted. If there is a good laboratory to draw upon for supplies of sterilised culture, material, &c., something can be attempted slowly by outside workers. Under other conditions, failure or mistaken conclusions are the usual results. In any case the samples sent would have been of small value under the existing conditions of collection, transit, &c. In any important case it is quite necessary for the Laboratory Superintendent or other expert to see the locality and collect the samples himself. In some cases it is even necessary for the cultivation experiments to be commenced at the actual place of infection, if errors are to be avoided.

6. I am only too anxious to go to Agra and Calcutta, and especially between the months of October and April (as suggested by the Government of India, *vide* G.O., No. 714 Public, page 8,) in order to learn all that can be learnt from the experts in charge of those laboratories with reference to bacteriology in general and Indian bacteriology in particular.

Copy of the Summary of Statement referred to in paragraph 1 of the accompanying letter from the Professor of Hygiene, dated the 26th August 1896.

Institution of Degree of Licentiate in Sanitary Science in Madras University.—Serious practical difficulties in obtaining the special instruction for the degree have prevented candidates coming forward; also no sufficient encouragement nor inducements. Lately, greater interest in the degree has been manifested. One candidate took it in 1895, and several persons have made personal enquiries to me regarding the means of study for the degree.

2. *Demand for a Museum of Practical Hygiene since* 1883, *which has received the cordial support of all officials.*—It is *not* a costly demand as shown in paragraph 9.

3. *Duties how much increased.*—Up to 1890, they consisted in a six months' course during the winter session. Since then, the laboratory has been built and equipped at the cost of much hard work; and the present duties comprise the original six months' course of systematic lectures, a summer practical course to the students and, since 1895, a three months' course to the Sanitary Inspectors' class, and the general supervision of the laboratory and staff.

4. It is quite certain that no one can carry on hospital duties in the morning and deliver lectures and superintend laboratory work all day, especially in the tropics; but if any work is to be done in the laboratory, either by the Professor or such applicants as the Health Officer for Madras, qualified medical men and others, it is equally certain that I must be present for personal work, for supervision and assistance and for instructions where necessary.

5. The work is in all directions tending towards expansion, both qualitatively and quantitatively, and on educational grounds alone there is more than sufficient work to keep the Professor of Hygiene occupied. Also, as stated above, if he has to lecture and thereafter be in the laboratory during the day, he certainly cannot perform hospital duties in the morning.

6. Again, there is no chance of his arranging for and conducting practical excursions to bazaars, parcharies, sewage works, rubbish depôts, &c., unless he has more time, and the excursions themselves must take place in the morning.

7. *Recapitulation of Duties from an educational point of view*—

(1) One systematic course } To students of Medical College.
(2) One practical course }
(3) One systematic course—To Sanitary Inspectors' class.
(4) Practical excursions for both classes. (At present the Sanitary and Deputy Sanitary Commissioners undertake these for the Sanitary Inspectors' class as a favour, and because the Professor of Hygiene has not the time.)

(5) General superintendence of teaching in the laboratory in the case of individual workers.

(6) Planning, equipping and maintaining of a Museum of Practical Hygiene. There is no room for the models already on hand and no use in attempting a proper collection of local food products, &c.

8. *The Scientific Aspect of the Question, so-called.*—The urgent need for such work in India is now more fully recognised officially. Examples given of the work to be done.

9. *Possible Objections*—

(*a*) Administrative—None that are really reasonable or insuperable.

(*b*) Financial—Something must be done and whether an additional officer is to be added to the sanctioned code or not is not for the writer to determine. The work that is being done and that remains to be done is of practical importance and utility, much beyond some other sanctioned educational work, and if a sacrifice of something is necessary, it should not be in the direction of medical education. The plan proposed—viz., the utilization of an already existing laboratory and staff—is very much cheaper than any other and entails no permanent expense save that due to the separation of the Professorship from hospital duties.

10. Seeing that everything is ready to hand, there is no need for delay on the ground of dislocation of present arrangements or of some future scheme of reconstitution. More students and the sanitation of the Presidency suffer alike from the present arrangements.

APPENDIX II.

From Surgeon-Major J. L. Vangeyzel, M.B., F.I.C., F.C.S., Chemical Examiner, Madras, to the Chief Secretary to Government, dated Ootacamund, 28th July 1896, No. 746.

With reference to paragraph 4, sub-head (iv), of G.O., No. 714, Public, dated 8th July 1896, I have the honour to state for the information of Government that the Chemical Examiner's time is already fully occupied with analytical and teaching duties, and further that the nature of his duties would not permit of his undertaking more than the ordinary *quantitative bacteriological examination.* This is a test which has been applied to drinking-water and its value lies exclusively in its use as a test of the efficiency of *filter beds* when applied to the same water at regular intervals. Its applicability, however, is greatly limited by the circumstances under which water examinations are usually made by the Chemical Examiner. I explained these points more fully in my remarks on this subject in my annual report for last year. Briefly, the period which has elapsed between the sampling of the water and its examination bacteriologically, the temperature at which the sample has been kept, and other circumstances, very largely modify the multiplication of bacteria. To obtain reliable results the sample of water must be sown in the culture medium very soon after it is drawn, otherwise this test cannot possibly be of any value. For this purpose the bacteriologist must be on the spot, or the culture medium must be entrusted to a competent examiner who happens to be there. I should attach no value whatever to the numerical results obtained by the quantitative bacteriological examination of a water when that water has been collected by a municipal peon in unsterilised vessels, conveyed for days stowed away in a train or steamer, as constantly happens, at temperatures which would be favourable to the rapid growth and death of micro-organisms. Recognising the value of this test, however, I recently suggested to the Inspector-General of Prisons that medical officers of jails should carry out this test themselves at regular intervals as a test of the efficiency of the jail filters, and accordingly he has issued a circular to this effect, containing Mr. Hankin's instructions as to the method of carrying out the test. Under the circumstances just explained the Chemical Examiner himself could not perform such work with any hope of producing reliable results, except perhaps in the case of waters in Madras town itself, unless he travels like the Chemical Examiner and Bacteriologist at Agra does. If, however, Government decides to appoint an officer to undertake bacteriological examinations in Madras, I beg to suggest that such examinations required for Madras town itself would best be discharged by him. It would add only a comparatively infinitesimal amount to his current bacteriological duties, while it will leave the Chemical Examiner to his legitimate work, which is "chemical" and not "bacteriological." Further, as the Government of India has observed in its Resolution, printed in Madras G.O., No. 990, Public, dated 2nd December 1895, "the character of the materials associated with medico-legal analyses would be prejudicial to exact bacteriological observations."

2. With reference to the remarks of Government in paragraph 5 of the order, I have the honour to state that ten samples of water were sent from Bangalore and they were examined chemically and also bacteriologically, but only the quantitative bacteriological test was performed. Even the value of this test was considerably discounted by the fact that the precautions as to collection and packing of water intended for a bacteriological examination had been neglected. It is difficult to believe that the Residency Surgeon, who forwarded these samples, can have joined in the "extreme surprise" which the Bangalore Sanitary Board has expressed in its complaint, when his own part in the play consisted in seriously expecting a bacteriological investigation to be made of water which he had collected in unsterilised bottles and packed in a

way which cannot but have seriously raised the question as to whether the cholera microbe, if it had been found, had not after all been accidentally sown in the water through his neglect of precautions against its introduction by infected hands, infected bottles and corks which had been used instead of glass stoppers, &c.

3. No attempt was made, however, to isolate and identify particular micro-organisms (such as cholera microbe), because this is a task which no one but a trained bacteriologist "working continuously" can attempt. The final opinion in case of doubts as to the identity of any particular micro-organism must be given by the bacteriologist who has handled and worked with the particular microbe, has observed its peculiarities, and can with confidence apply the necessary tests for its identification. Such an expert did not exist in Madras or in this Presidency as far as the Chemical Examiner was aware. When it is remembered that, in the history of the recent precautions taken in England against the importation of cholera, the opinion arrived at in many cases by Dr. Klein, one of the foremost bacteriologists living, was that in the material (not water, but dejecta of suspicious cases) subjected to his examination he could only certify to the presence of a micro-organism which was "undistinguishable" from the cholera microbe, Government will, I trust, be in a position to understand that what the Bangalore Board wanted—viz., an authoritative opinion as to whether the water was infected with the causative organism of cholera—was not obtainable in Madras.

4. When the reference from Bangalore was made to this office, my *locum tenens* (Dr. Robertson) was at the time also acting Professor of Hygiene, and he undertook and performed the whole examination of the water to the best of his ability under all the circumstances related above, and so there was no separate reference made to the Hygiene department from this office. Even had the permanent Professor of Hygiene been here, who is reported to have the ability and the equipment, Government will, I trust, be pleased to observe that a reference to him would not have been more effective, since he himself remarks that he cannot undertake investigations of this nature because "he has not the time" and he could not under present circumstances produce "a report for the accuracy of which he would care to stand sponsor."

From Surgeon-Lieutenant-Colonel W. G. KING, M.B., C.M., D.P.H., Sanitary Commissioner for Madras, to the Chief Secretary to Government, dated Fort St. George, 30th November 1896, No. 2229-S.

With reference to paragraph 4 (ii) of G.O., No. 714, Public, dated 8th July 1896, I have the honour to forward herewith a memorandum on the subject therein referred to.

Enclosure.

Memorandum as to Bacteriological Investigations in the Madras Presidency, by the Sanitary Commissioner for Madras.

*Reference** *Paragraph* 1.—I submit that the difficulty experienced in giving an opinion in this matter is not due to absence of recognition of what is requisite, but to meeting requirements in a manner that shall be approved by Government as to expenditure.

* All references are to paragraphs of G.O., No. 714, Public, dated 8th July 1896.

2. In my letter to Government, No. 253-S., dated 10th February 1896, I explained that my ideal would be the building of a Central Vaccine Institute for supply of the whole Presidency with lymph preserved by any process that might be approved by Government, and attaching thereto an officer who should be its Superintendent as well as hold the post of Government Bacteriologist. The vaccine institute would therefore have attached to it a bacteriological laboratory.

3. The great future of bacteriology as a practical science must in great part lie in its meeting the fast-growing requirements of serum therapeutics. An institute, therefore, that will not only issue animal vaccine cultivated with the perfection that modern hygiene and bacteriological methods can secure but also antitoxins that should prove of the highest value in the hands of the ordinary medical practitioner for combating small-pox, tetanus, bubonic plague, snake-bite, diphtheria, puerperal fever, and, it may be shortly, typhoid fever, and be also a centre where anti-cholera inoculation and anti-hydrophobia inoculation could be practised, would confer more widespread public benefit upon the Presidency at large than could be in the power of any single institution under Government, educational or medical. To some it may not appear there need be any connection between the founding of a vaccine institute and the appointment of a bacteriologist. It seems to me, however, that the moment Government decided to use animal lymph to the exclusion of the humanized variety for vaccination, the scheme I have suggested became at once the most economical and effective.

4. This Presidency may, year after year, attempt to secure animal vaccination under the various systems of petty depôts now relied upon or of direct transmission to calves for fresh lymph cultivation under vaccinators devoid of the requisite education; but the system cannot otherwise than ultimately give place to that I have above sketched, as public opinion becomes more educated to the necessity there exists for correct methods. The frequent demands received from local authorities to approve of this and that scheme which has been excogitated locally to meet very obvious difficulties encountered sufficiently prove that the organization of the Vaccination department and its method of work are behind the times and that this *restlessness* is the result. This opinion is not founded upon mere theory but on experience worked out by me, under Government instructions at Government expense, in 1891–92. The accuracy of the data obtained at that time has been fully verified in practice by the success of the Mysore Government Institute. Granted then that a vaccine institute is a necessary corollary of the determination to use animal vaccination, it follows that an officer possessed of bacteriological knowledge would be the best description of Superintendent to appoint; granted the presence of a bacteriologist, his services for the public good would be greatly facilitated by his using animals that would be at his disposal after employment for vaccination (for immunization against one disease does not imply immunization against another) or animals not so used, with the object of taking advantage of the special accommodation and nature of the staff employed for vaccination purposes; granted that the most suitable age for calves for vaccine inoculation be (contrary to European practice) when verging on the second year, there would be secured at a period when by further keeping on pasture—which would be a necessary adjunct of an institute—cattle breeding with select specimens in connection with the supply of troops with meat, and dairy farming, could be followed profitably, in view of the first cost having already been debited to other heads.* To found such an institute would mean an expenditure upon buildings that would be but slight when compared with the amounts spent ungrudgingly year by year by Government for buildings for higher educational purposes.

* For the latter purposes, the proximity of the proposed model farm in Coimbatore district would have facilitated mutual support.

5. With Coimbatore and Salem districts close at hand whence to obtain calves, and with the facility offered by the future Nilgiris Railway, a suitable site could have been selected on the lower elevations of the Nilgiris; and there are doubtless other suitable localities in the Presidency. The educational requirements of students could have been met under such a scheme by relieving (*vide* suggestions contained in paragraph 3 of the Government order under reference) the Professor of Hygiene *of a certain number* of beds in his function of Assistant Physician, so as to enable him to give *routine* instructions in the existing Medical College laboratory, whilst only students or post-graduates who showed the capability of making bacteriology a speciality not a mere part of a routine curriculum would proceed to the combined bacteriological and vaccine institute.

6. *Reference Paragraph* 4.—If any scheme less ambitious than the above be adopted, as suggested in my letter, No. 253-S., dated 10th February 1896, I consider that the officer appointed for bacteriological purposes should perform—(1) "The present duties of the Professor of Hygiene in the Medical College, which would necessarily include the teaching of bacteriology, theoretically and practically, in a laboratory already existing; (2) the training of the future class of Sanitary Inspectors; and (3) routine bacteriological investigations for the Sanitary department."

7. I do not conceive it would be necessary to appoint separate individuals as Professors of Bacteriology and Hygiene, respectively; one officer under this smaller scheme would suffice. The complete withdrawal of the care of beds in the hospital from the Professor of Hygiene would necessitate a redistribution of duty in connection with the General Hospital, but I am led to believe from paragraph 3 of the Government order under reference that some such scheme is already under contemplation. To enter into any suggestion on this point would lead me beyond my province into matters strictly medical. I can only say that the combination of the functions of Professor of Hygiene and of the Bacteriologist is feasible and presents certain economical characteristics.

8. It would be impossible from lack of time at disposal for the Chemical Examiner to undertake any duties in connection with bacteriology. Even if he had time, it must be remembered, although there is some convenience in associating the two sciences, *they have practically nothing in common.*

9. The opinion that the duties of the Professor of Hygiene and of a bacteriologist cannot be united arises from what I believe to be an exaggerated idea of the importance of teaching bacteriology to students, and, consequently, of the time that would be so occupied. As a fact, there is very little in bacteriology *to be taught*. If only the amount of knowledge gained from being taught were taken into account, the tyro of six weeks' standing would not compare badly with the specialist who had devoted his life to the work. The bacteriologist proper is only evolved after years of dearly-bought experience as to how easily human judgment may be misled as to minute similarities and dissimilarities of form, and how readily a single error of commission or omission may stultify the labour of lengthened periods. When bacteriologists differ in opinion— and this they do very largely—the verdict lies, not upon certain details that could

be gained by book knowledge or teaching, but on experience as to manipulation and appreciation of form. If this simple statement be accepted as correct—and, in my opinion, it cannot be open to doubt—there naturally follows the query as to what is the scope of utility in medical education of bacteriology.

10. There is an ill-defined idea abroad that this infantile science is so indispensable that some great results that have hitherto not been reaped may be expected from its being taught to the ordinary medical student; that in some way or other the Presidency will soon have an army of bacteriologists at work in its interests. Yet, when the student is taught physics, chemistry, botany, zoology or geology, it is well understood that not one in a thousand will become a specialist. The utmost that will occur from their absorbing certain great facts in these sciences is that when in contact with their professional work, they will be able to interpret the various factors influencing results more readily. Thus, after undergoing an elaborate course of quantitative and qualitative chemistry, all that is expected of the general practitioner is that he should be able to apply a few simple tests and comprehend why certain drugs are incompatible. Similarly, after having gone through a course of bacteriology, there is ensured a full belief in the microbial theory of disease, and, consequently, in surgical and medical practice and in the application of hygienic measures, the full necessity for precautions against microbial infection is recognized. A man so trained will not use a filthy lancet for vaccination nor neglect antiseptic precautions when called upon to perform the smallest surgical operation, nor, when he works as a sanitarian, will he be satisfied with sanitary works so constructed that they are "good enough" only when not subjected to strain, or when contrasted with the grade of luxury formerly known to the country. Indeed, it has been claimed by good authority that the teaching of the ordinary student bacteriology has much the same influence in securing that details shall not be neglected as factors in obtaining total results as teaching Euclid has in general education. And, here, I must ask that the scope of bacteriology be not confused with the fast-growing applicability of simple microscopical research in elucidation of matters clinical, pathological and sanitary. For this work, there is infinitely more scope in the life of the ordinary practitioner than for bacteriology proper.

11. In short, all that can be done by the bacteriologist in the way of *teaching* would be to give, say, six lectures illustrated by exhibition of cultivations and supervision of practical work by students during one hour for twenty days per annum. Now and again from the midst of these students will be found one who shows a special aptitude for bacteriology: such a man would be given facilities for practical work on his own lines or by aiding the bacteriologist as a demonstrator. But he would not require one atom more theoretical teaching than the ordinary student. He would have to carve out his own way to knowledge. Even were the actual small part in medical education I have laid down for bacteriology incorrectly stated, and were it possible for each raw student, by the professor devoting more time to him, to become a capable bacteriologist, of what use would this *rara avis* be? Hundreds of men in Great Britain have now undergone prolonged courses of instruction in bacteriology; but is Great Britain proportionately richer in bacteriological results? No; the public and the Sanitary department of the British Government look to a very select few for opinions—indeed, so select that practically but one voice in England at the present moment gives its verdict. Nor could any other result be expected, unless it were possible to multiply bacteriological laboratories with specialists attached indefinitely.

12. In my opinion, therefore, the tendency to regard so fixedly the teaching of bacteriology as the great point to be subserved is likely to obscure the plain fact that if teaching be added to the duties of the bacteriologist, it will form but a light task, and that the chief use to a Government and a people of a bacteriologist is with reference to disease prevention in all its branches.

13. The proper place, therefore, for the bacteriologist is, not as an officer of the Educational department, but of the Sanitary department subject to being lent to the Educational department for the service described.

14. *Reference Paragraph* 4 (ii).—There is no article of food—fluid or solid, animal or vegetable—that may not require examination for microbes inimical or beneficial to man. There is no secretion or excretion, or part of the organized whole of the lower animals or man, that may not require search. Air itself and everything penetrable by air demand attention. In fact, there is little on the earth or in the earth or its surroundings that may not require scrutiny by the bacteriologist in the course of investigation of facts supporting sanitary investigations.

15. Presuming the instance of a population suffering from cholera possessed of but two sources—a well and a river—for water-supply, the sanitarian may believe that the medium of spread is water, but owing to contamination having taken place under circumstances unknown, he is in doubt whether it be the well or river water that is at fault. The only course open would be to watch the results of infection so as to exclude the contaminated source. In an institution where a disease resembling cholera has suddenly appeared, the medical authorities may declare the disease to have all the symptoms of ptomaine, or arsenical, poisoning. A bacteriological examination might in both cases settle the difficulty in time and probably save many lives. A fever attacks a locality that whilst having much of the malarial type still bears resemblance in some of the cases to typhoid; or, again, with the fever may appear swellings resembling bubonic plague. Identification of the typhoid or plague bacillus in either case would decide the diagnosis. In dealing

with a free population subject to not one but numerous sanitary errors, the sanitarian might have a long search and much "piecing" together of testimony before he could decide that such and such milk, water, raw vegetable, or shell-fish was the medium of infection. A town possessed of an irreproachable water-supply and good filter-beds is attacked with cholera or typhoid fever; there is no history of contamination but certain imperfections of the sanitary engineering work explain how it was possible for entry of the unfiltered water to have occurred. Identification of typhoid or cholera bacilli in the unfiltered water would explain the whole matter. The employés of dealers in skins become suddenly attacked with fever and pneumonia, others with carbuncles in exposed parts; the sellers of the skins declare, in reply to the sanitarian's query, that the skins are not those from animals dead of anthrax; but the bacteriologist can readily prove the presence of anthrax spores on them.

16. It must not be conceived that in speaking thus, I personally believe that the evidence adduced by the bacteriologist is infallible or that he is the authority *to decide* sanitary questions; as a rule, the utmost performed by him is to confirm the presumptive evidence gathered by the sanitarian. As a fact, unfortunately, it has been proved in disastrous fashion that specifically contaminated water has been pronounced by experienced bacteriologists as fit for potable purposes. The bacteriologist in these matters is, however, a distinct aid to the sanitarian in advising as to early identification of pathogenic microbes; indeed, a Sanitary department in the present day unaided by a bacteriologist is in as indefensible a position as if not provided with the aid of an expert chemist. These statements will sufficiently explain my remark, which Government desired should be amplified, as to the "aiding of sanitary precautions by the early identification of well-known microbes."

17. Again, in affording guidance as to the grade of perfection to which sanitary efforts should extend, investigations by the bacteriologist would be of great utility in determining the life-saving value of sanitary works that have been, or may be, executed by Government for the collection, storage, purification or distribution of public water-supplies. Bacteriological investigation would not only exhibit the value of work already fulfilled, but would serve the important purpose of calling attention to modifications that may be requisite before the occurrence of epidemics demonstrated where protection from ingress of pathogenic microscopical life had not been arranged for with requisite completeness on the "good enough" theory that finds ready acceptance with the laity, on the erroneous supposition that economy is subserved or that "half a loaf is better than none," &c. To determine with safety the rival merits of suggested water-supply sources, the fullest information is desirable. It frequently happens that the choice of a certain source to the neglect of another involves vast expenditure. In this case, a statement of the results of bacteriological examination under varying conditions in addition to the present system of chemical analysis, *when both are read in the light afforded by a sanitary survey*, can afford data of much utility. When such information proved that a water could not be entirely relied upon as to freedom from specific contamination, much information could be obtained, before deciding to use or reject it, by employing experimentally on a small scale chemical or biological methods (and various forms of sanitary engineering apparatus in connection with them) having definite ends of purification in view that might be applicable in practice on a large scale. Only by checking the results of such experiments by bacteriological and chemical examination could any opinion of moment be arrived at. Not only could the best class of treatment be thus decided upon, but the various modes of putting them into practice could be tested and positively determined. In the numerous questions implicated in the disposal of sewage and sewage effluents by purification, filtration and various modes of sewage-farming, the opinion of the bacteriologist would be of importance in demonstrating how far expenditure for securing high grades of purification only obtainable by complicated and expensive modes would be requisite. Indeed, I consider that the employment of a bacteriologist of proved competency in connection with the application of sanitary engineering methods would not only conduce to increased efficiency but serve the best interests of economy of public funds.

18. *Reference Paragraph* 4 (v).—If the Professor of Hygiene were relieved from his work as Assistant Physician, under the arrangement suggested in paragraph 3 of the Government Order, it would suffice to provide him with a whole time Assistant of the Civil Assistant Surgeon class and on the same scale of pay. A skilled student as demonstrator should receive Rs. 50 per month as an honorarium during the bacteriologist's pleasure. Two men of the Attender class, and one peon, should suffice for establishment. Granting that the laboratory were in complete order, contingencies ought to be covered by Rs. 1,000 per annum.

19. *Reference Paragraph* 4 (i).—There is scarcely any department of Government that might not be expected from time to time to require bacteriological examinations to be conducted on its behalf. The Board of Revenue might demand opinions upon diseased agricultural products; the Jail department on articles of food and water; the Veterinary department might demand protective vaccines or the identification of pathogenic germs peculiar to the lower animals; the Abkári department might enquire as to the significance of certain unfavourable changes in the course of manufacture of alcoholic preparations; the Vaccine department might require the identification of the causative agent of deterioration of vaccine during cultivation or storage or a pronouncement of its freedom from injurious microbes; the Medical service the identification of typhoid, tubercular, cholera and other pathogenic microbes in excretions of patients, and opinions

as to the purity of "vaccines" and "antitoxins" received from other sources the Engineering department might wish to know the cause of decay of wood under unusual conditions or the discolouration of walls. Of the public, at times the dairy farmer, alarmed as to the flavour of butter or cheese, may wish to know the cause; the manufacturer of vegetable dyes as to their improvement, or cause of the inferiority during manufacture. The wide range of utility to the Sanitary department has already been discussed. Medical officers attached to jails would require quarterly supplies of agar-agar; other officers might demand similar supplies for their own investigations. If anti-cholera inoculation be adopted in this Presidency, the bacteriologist would be expected to make the systematic issue of vaccines.

30th November 1896. (Signed) W. G. KING, Surgn.-Lt.-Col.,
Sanitary Commissioner for Madras.

No. 4567-C.

Memorandum.

With reference to memorandum, No. 2479, Public, dated 26th November, and in continuation of memorandum, No. 3507-C., Public Works, dated 3rd October 1896, the undersigned has the honour to state that replies to clauses (i) and (ii), paragraph 4, of G.O., No. 714, Public, dated 8th July 1896, have not been received from the Superintending Engineers, II and V Circles, to whom urgent reminders have been sent. The Superintending Engineers, I, IV and VI Circles, and the Chief Engineer for Irrigation, have no suggestions to make, and the Superintending Engineer, III Circle, and the Superintending Engineer on special duty, Tanjore, do not know of any article besides water for which bacteriological analysis is likely to be required in the Public Works Department. The Consulting Engineer for Railways adds the item, soil. The Consulting Architect, in a letter, No. 4397, dated 30th November 1896, copy of which is enclosed, makes what appear to be some valuable suggestions, to which attention is invited. The undersigned has nothing to add to the Consulting Architect's remarks, and with reference to clause (v), paragraph 4, of the Government Order, has the honour to state that no additional establishment would be required in the Public Works Department for the purpose of the proposed reform.

2. If the Superintending Engineers, II and V Circles, make any suggestions of importance, the purport of their replies will be communicated.

Madras, (Signed) D. McNEIL CAMPBELL, Col., R.E.,
3rd December 1896. *Secretary to Government, P.W.D.*

To the Public Department.

Enclosure.

Letter from G. S. T. HARRIS, Esq., Consulting Architect to the Government of Madras, No. 4397, dated 30th November 1896.

With reference to your No. 3506-C., dated the 3rd October 1896, I have the honour to inform you that, in addition to the bacteriological examination of waters, that of sewage in all forms might be taken up and intimately gone into and considered, and the results put upon a satisfactory basis with regard to its economic and hygienic application under various conditions.

2. Then as to building materials and their liability to contamination with specific microbe is a subject of vital importance, its usefulness as a means to an end when the construction is under consideration of a hospital, a jail, an asylum, a hall, or any other structure, private or public, in which crowds may assemble or numbers dwell, is so evident as to hardly call for mention; but the consideration of the best means of furthering this object is a practical one, and it is to be determined how far this department, which is the constructional side, can assist the party of research. For instance, I am responsible for a large number of hospitals in different parts of India, and my actual knowledge as to the mephitic properties of wall linings for wards, &c., is absolutely incomplete. I am not able to declare whether, under given climatic conditions, wooden, cemented or tiled walls should be preferred, or whether tiled, asphalted or earthern floors should be laid down. I am aware these matters are more or less determined on in Europe, but it is doubtful whether they efficiently apply to India under her sun and in her climate.

3. It appears to me that small sections carefully cut out from the walls or floors and ceilings of existing and long-tenanted hospitals, wards, prisons, cells, stables, &c., might with advantage be submitted for examination to the bacteriological laboratory.

4. Apart from the question of pure bacteriology, there is an infinite number of matters relating to buildings and building materials about which our knowledge is of the scantiest, and

which can only be settled by careful experiment undertaken in connection with a hygienic laboratory. Such, for example, are the relative absorptive powers of the different materials for heat and the rate with which the latter is again radiated and conducted therefrom, the rate of absorption of moisture by them and its retention, their capillary powers, &c.

5. For example, there is no doubt that the teak buildings in Burma, even in the very hottest months, cool down within an hour of sunset, while the pukka buildings in the same place remain hot throughout the night, and I have no doubt that the laterite roads in Madras are less heated and retain less heat than do those which are granite macadamized.

6. The relative coolness of buildings coloured white, grey, red, ginger-coloured, &c., might also be investigated.

7. The proper means of ventilation of every style of building should be carefully experimented upon in the laboratory and elsewhere by one trained in the methods of modern hygiene, and these would yield results of the highest value. For instance, I have in some hospitals applied to the wards through and through nether ventilation by conduits driven beneath the floors which were grated, and these have been much approved by medical officers, but it is not a method which is general.

Proceedings of the Sanitary Board, No. 68-S., dated 23rd January 1897.

Read—the following papers:—

G.O., No. 714, Public, dated 8th July 1896.

Endorsement by the Sanitary Commissioner, No. 433-S.B., dated 13th October 1896.

Proceedings of the Sanitary Board, No. 242-S., dated 13th November 1896.

Letter from the Sanitary Commissioner, No. 2276-S., dated 30th November 1896.

Resolution.

In paragraph 4 (iii) of G.O., No. 714, Public, dated 8th July 1896, the Government called for information as to the amount of work that would be required of a bacteriologist by the Sanitary Board in connection with actual local requirements apart from general and theoretical researches.

2. The Board has had an opportunity of perusing a copy of the memorandum of the Sanitary Commissioner on the subject, which was laid before Government on the 30th November 1896, and is of opinion that the remarks in paragraphs 15 to 17 of that paper sufficiently indicate the amount and nature of the assistance which a bacteriologist might be expected to afford the Sanitary Board.

(True Extract.)

(Signed) R. PARSONS,
Secretary, Sanitary Board.

To the Chief Secretary to Government, Public Department.

Memorandum, in the Public Works Department, No. 527 C., dated 27th January 1897.

Read—the following papers:—

From Lieutenant-Colonel C. C. RAWSON, R.E., Superintending Engineer, V Circle, dated 5th December 1896, No. 125 W.C.

With reference to your memorandum, No. 3506 C., dated 3rd October 1896, I have the honour to state that, in addition to the bacteriological examination of water for drinking purposes, I think that it would be well to examine the bacteria or fungi which cause dry rot in timber with a view to its prevention, also occasionally the water used for feeding boilers requires examination, there has been great trouble at the boiler of the engine of the workshops at the College of Engineering owing, it is believed, to the presence of sewage in the feed-water. The mixture of sewage water which is usually found in the river Coum might, I think, be subjected to careful bacteriological examination to settle, if possible, the question as to whether the smell from it during the hot weather is dangerous to human life.

From Major W. L. C. BADDELEY, R.E., Superintending Engineer, II Circle, dated 6th January 1897, No. 499 G.L.

In reference to memorandum, No. 3506 C., dated 3rd October 1896, I have the honour to report that no practical analyses are required for the Public Works Department and the only article that may require bacteriological examination is the water in the Kistna canals during epidemics of cholera.

Memorandum—No. 527 C., dated 27th January 1897.

Copies forwarded to the Public Department, in continuation of this office memorandum, No. 4567 C., dated 3rd December 1896.

(Signed) D. McNEIL CAMPBELL, Colonel, R.E.,
Secretary to Government, P.W.D.

From the Officiating Under Secretary to the Government of India, Home Department (Medical), dated Calcutta, 10th December 1896, No. 1091.

ABSTRACT.—Inquiring when the final orders of the Government of Madras may be expected on the question of arranging locally for the bacteriological examination of specimens of water.

Letter—R. No. 1322, dated 21st December 1896, to the Secretary to the Government of India, Home Department (Medical).

With reference to Mr. Nathan's letter, No. 1091, dated the 10th instant, I am directed to state that complete replies have not yet been received to G.O., No. 714, Public, dated 8th July last, a copy of which was forwarded with Mr. Price's letter No. 715 of that date. They have again been called for and a further communication will be addressed to you as soon as they are received.

(Signed) A. T. ARUNDEL,
Ag. Chief Secretary.

ORDER—No. 512, Public, dated 5th May 1897.

From the papers read above it is clear that, while there is large scope for a Bacteriologist in this Presidency, it is impossible to provide satisfactorily for the conduct even of routine bacteriological examinations without setting apart for the purpose the services of an officer who can devote himself continuously to the subject. Under present conditions such an officer is not available. The Government of India will therefore be addressed on the question of creating a new appointment and providing an additional medical officer for this purpose.

2. The following letter will be despatched :—

[Here enter letter No. 513, Public, dated 5th May 1897.]

(True Extract.)

J. F. PRICE,
Chief Secretary.

No 1554 W&S 9.6.97
Communicated to officers of the P.W.D.
(Sd) D. McN. C.

To the Surgeon-General.
„ Sanitary Commissioner.
„ Sanitary Board.
„ Chemical Examiner.
„ Revenue Department.
„ Public Works Department.
„ Local and Municipal Department.

Exd. C. M. Thumbuswamy.

Ch: Engr for Irrign
C. E. for Rys
S. Es.
S. E. on spl. duty
C. A. to Govt.
E. E. Lt. H. Dn.