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MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

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Not to be folded or roughly handled

Proceedings of the Madras Government, Public Works Department,

20th June 1866.

No. 418. Read the following Proceedings of the Madras Government in the Public Department, dated 31st May 1866, No. 547 :—

Read the following letter from the Secretary to the Government of India, Public Works Department, (Military Works), to the Chief Secretary to the Government of Fort Saint George, dated Fort William, 31st March 1866, No. 364 M.

1. I am directed to acknowledge the receipt of your letter No. 143, dated 8th February 1866, to the address of the Secretary to Government of India, in the Home Department, forwarding the Proceedings of the Madras Government with regard to the experimental manufacture of gas for lighting Fort Saint George.

2. With reference thereto, I am to forward, for the information of the Madras Government, copy of a Resolution* by the Government of India, in this Department, in which such steps as

* Nos. ⁵⁵⁴⁻⁶₃₇₀₃ dated 8th August 1864. have been already taken towards the introduction of gas in Military Stations in this Presidency are described, various details of cost, &c., being entered into.

3. In this Resolution the views of the Government of India on the general subject are stated, and the course which it is proposed to follow, in view to the extension of the system to other Military Stations, laid down.

4. His Excellency in Council thinks that the information supplied in this Resolution may be of some assistance to the Government of Madras in the solution of a question of great importance on which few data applicable to this country are available.

5. It will be observed in the first place, that whilst it is anticipated by the Government of Madras that the cost per gas burner will be considerably less than that of an ordinary oil-lamp, the cost in this Presidency is expected to be from one and a half times to twice as great, the difference in cost being compensated for, by the large increase of the illuminating power, which may be estimated at from two to two and a half times that of the oil-lamp.

6. This difference in the estimates of probable cost leads to a comparison between the burners which are used in Fort William and those in use in Fort Saint George.

7. The former, it will be observed, are of two classes, consuming respectively 5 cubic feet and 3 cubic feet per hour. Two-thirds of each class burn for 10 hours, and the remainder for 3 hours every night.

8. The burners used in Fort Saint George are reported to consume only 8 cubic feet in 12 hours.

9. From the Reports received from Commanding Officer of a Regiment in the Fort, it is apparent that this is insufficient, and although the burners in use in Fort William may consume more gas than is absolutely necessary, some nearer approach to their rate of consumption would appear to be desirable in Fort Saint George.

10. I am further directed to draw the attention of the Madras Government to the rate at which gas is procured at Fort William, and that at which it is estimated that it can be obtained at Dinapoor, both of which are considerably less than that which is being paid at Madras.

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11. In conclusion, I am to observe that a large expenditure is now contemplated by the Madras Government in the extension to the whole Fort of the present gas burners. The grounds on which this extension is proposed are, to a great extent, economical, the calculation of results in a financial point of view being based on the supposition that the cost of a gas burner is Rupees 2 per mensem, whilst that of an oil-lamp is Rupees 3-8 per mensem.

12. The papers submitted show that the calculations of rates have varied considerably from time to time, and also that burners as at present adopted do not afford that increased comfort to the soldier which should be ensured by the introduction of gas. The Officer Commanding a Regiment in the Fort complains that the men have to read by their own lamps in consequence of the faintness of the gas light.

13. Under these circumstances, the Governor General in Council requests that, before any fresh work of this nature is put in hand, a project may be drawn up and submitted by the Government of Madras to the Secretary of State for his orders after consultation with Gas Engineers in England, as ordered in the Resolution sent herewith, for the Stations of Rawul Pindee and Dinapoor.

14. The Report should be accompanied by a full report of the present gas works, with explanatory drawings, showing the details of the gas manufactory, the existing mains, &c., so that final orders can be passed without further reference.

15. A copy of the Report should, I am to add, be submitted for the information of the Government of India.

ENCLOSURE to Public Works No. 364 M of 1866.

Nos. 551, 552, dated 8th August 1864

Resolution.—By the Government of India, Public Works Department.

Read letter No. 3,968, dated 5th September 1861, from Secretary to Government of Bengal, Department Public Works, to Secretary to Government of India, Public Works Department.

Letter No. 3,615, dated 8th October 1861, from Secretary to Government of India, Department Public Works, to Secretary to Government of Bengal, Department Public Works.

Demi-official Memorandum dated 27th November 1862, and Estimate from H. Prince, Esq., C. E., to Under Secretary to Government of India, Department Public Works.

Letter and Estimate, dated 26th May 1863, from Secretary Oriental Gas Company, to H. Prince, Esq.

Project of Lieutenant-Colonel A. Robertson, for lighting the European Infantry Barracks at Rawul Pindee with oil gas (*deposited*).

Memorandum dated 15th October 1862, by the Quarter Master General of the Army, on the number of lights allowed to a Regiment of European Infantry, and the daily consumption of oil.

1. RESOLUTION.—His Excellency the Governor General in Council observe that the barracks in Fort William are the only Military buildings in the Bengal Presidency which are lighted with gas. Here coal gas is supplied by the Oriental Gas Company at a rate of Rupees 5 per 1,000 cubic feet, which rate includes cost of mains of branches to the several buildings, of wastages of gas by leakage, of establishments for lighting and cleaning lamps; in fact, of all charges, except those for interior fittings, and these latter appear to have amounted to about Rupees 88 per burner. Two classes of burners are used, the first class consuming five, and the second class three cubic feet of gas per hour; and about two-thirds of each class are kept alight for ten hours, and the remaining one-third for three hours only.

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2. His Excellency in Council further observes that two approximate estimates have been prepared.—the one by Mr. H. Prince, C. E., of the Department of Public Works, and the other by the Manager of the Oriental Gas Company,—of the cost of introducing coal gas into the Military Cantonment at Dinapoor, and that the results of the two estimates are nearly the same viz:—

	Mr. Prince's Estimate.	Oriental Gas Co.'s Estimate.
Outlay on works including mains, fittings, plant...	Rupees 80,000	Rupees 89,000
Cost of Gas	„ 7 per 1,000 c. ft.	13s. 7½d. per 1,000 c. ft.

The cost of gas, or rather the rate at which it can be supplied, includes a charge of 10 per cent. on the outlay on works, and all charges for establishment, repairs, wear and tear, &c., &c., and the same classes of burners are proposed as those used in Fort William.

3. Lastly, His Excellency observes that an estimate has been prepared by Lieutenant-Colonel A. Robertson, for lighting the barracks of one European Regiment at Rawul Pindee with oil gas. In this estimate, the outlay on works and fittings is set down at Rupees 18,771, and the cost of gas at Rupees 13-6 per 1,000 cubic-feet; but this latter rate only includes charges for wood and oil, and if those for interest on outlay, wastage, establishments, wear and tear, &c., &c., be added, the rate will no doubt be raised to Rupees 20 per 1,000 cubic feet. Colonel Robertson has assumed very moderate rates for the items of his estimate, still the rate for the manufactured gas is high; but it must be borne in mind that the illuminating power of oil gas is to that of coal gas as 3 to 1, so that, according to the present data, the cost of oil gas at Rawul Pindee, and that of coal gas at Dinapoor, would be nearly the same. It is also to be observed that Major Robertson proposes burners of only about one-third the capacity of those in use at Calcutta.

4. From a Return received from the Quarter Master General of the Army, it would appear that, according to the present imperfect arrangements for lighting barrack buildings with the commonest description of oil lamps, the consumption of oil per diem averages 16 seers for a Regiment of British Infantry. The average cost of this quantity may be set down at Rupees 5, and probably a similar amount will represent the cost of establishment, of lamps, wicks, &c., &c.; so that the total cost of lighting barracks for a Regiment may be set down at Rupees 10 per diem.

5. If, for each of the oil lamps detailed in the Quarter Master General's Return, a gas burner be substituted, and the rates of consumption per burner, and the number of hours of illumination, be assumed, as on the Fort William and Dinapoor schemes, then the consumption of gas per diem will be about 3,000 cubic feet of coal gas, or 1,000 cubic feet oil gas; the cost of which will be according to—

Fort William rate...	... ..	Rupees 15 per diem
Dinapoor „ ... ..	... ..	„ 21 „
Rawul Pindee „ ... ..	... ..	„ 20 „

On the whole, it may be assumed that, allowing in both cases for an equal number of lights and for gas burners of the capacities above noted, the cost of gas for all India will be from two to two and a half times greater than that of the present oil lights; but that, if illuminating power be taken into consideration, the cost of gas will be very much less than that of oil lights.

6. The foregoing calculations relate only to the number of lights according to present authorized scale; but looking to the proposed extension of barrack accommodation, and to the present imperfect system of lighting, a greater number of lights may possibly be required in future. In this view, therefore, and with the classes of burners already specified, 4,000 cubic feet of coal gas, costing Rupees 30 a day, may, perhaps, be a more correct allowance for consumption per Regiment per diem. The present cost being Rupees 10 only per diem, there would be an additional charge of £ 2 per diem, or £ 730 per annum for each Regiment; or, say, for 70 Regiments £ 51,000, equal to about five lakhs per annum. On the other hand, it is not improbable that the sizes of the Fort William burners are considerably in excess of what will be found really essential, and that economy in this respect may be effected by adopting the scale which has been established in English barracks after long experience.

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7. The Government of India is satisfied that something must be done towards greatly improving the present system of lighting barrack buildings; and although the foregoing data are very imperfect, they appear to afford sufficient grounds for leading to the inference, that gas which has been adopted almost universally elsewhere, should also be introduced into all Indian Military Cantonments. Wherever coal can be procured at moderate cost, it seems obvious that coal gas will be more economical than oil gas, and this will be the case in many stations. To arrive at a practical conclusion as to the probable cost of lighting with coal gas, it will be desirable to make an experiment at some convenient station where coal will certainly be the cheapest source of supply, and His Excellency in Council considers that Dinapoor is a suitable one at which to test the coal gas.

8. Mr. Prince's project should therefore be re-considered in detail, and plans prepared, showing on a sufficiently large scale, the position of all the buildings to be lighted, and the probable positions of the mains and service pipes. Such further plans, with sections of the buildings to be lighted, should also be given, as will admit of the Gas Engineers, who will have to provide the apparatus, being able to form an opinion as to how many lights will be necessary, and how the pipes shall be arranged.

9. The primary object being the lighting of barrack buildings, the project should show separately:—

1st.—What would be essential for this alone.

2nd.—What extension would be likely to be desirable in the way of road-lamps, &c., &c.

As regard this second part of the scheme, a specific statement should be made as to the existence of any fund that could pay for road gas lights; also whether there is reason to think that private persons would take the gas at reasonable rates. If this be not shown to be likely, the project should be restricted to the first part.

10. The design being completed, as well as the information of the local officers will admit, it should be sent to the Secretary of State, with a request that it may be submitted to an experienced Gas Engineer in England, and that the needful steps may be taken for obtaining the plant to be sent out with an intelligent person to superintend the execution of the works.

11. Before setting the design as to the detail of lights, the War Department should be requested to see that the number is adjusted to what is considered suitable for barracks in England, as to number of burners and sizes of jets; also, that no buildings are supplied for which, under the English barrack system, provision is not made. The time allowed for the gas to continue burning in England, in each class of buildings should also be carefully noted.

If, at any time hereafter, the Government of India desire to extend the lighting, it can be done, but to commence with a very strict attention to economy will be essential.

In this duty of correcting the design sent from India, the co-operation of some officer of Indian experience, with the English Gas Engineer, will be desirable.

12. But as coal gas will not be procurable every where, the provision of oil gas will probably be necessary at many stations, if gas is to be used at all. From Lieutenant-Colonel Robertson's estimate, it seems likely that oil gas may be supplied at moderate prices; but this question is one that can only be fully tested by a trial, which should be made, if, on further enquiry, the cost does not seem excessive, and the results are otherwise encouraging. His Excellency in Council therefore considers that a project should be prepared for some station where coal will almost certainly never be available, and where oil may be expected to be procured at reasonable cost, and that Rawul Pindee seems a good place to select for the purpose, unless the Local Government would desire the trial to be made at some other station.

13. Lieutenant-Colonel Robertson's project should be revised, as explained, with regard to the Dinapoor project, and like information prepared to send to England for further scrutiny there.

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In dealing with this scheme, the Secretary of State might be asked to consider the propriety of obtaining Lieutenant-Colonel Robertson's co-operation, as he has given much attention to oil gas, and any needful preparatory experiments might be made in England. The gas apparatus should probably be designed to obtain the gas from oil seeds of all sorts, without the necessity for extracting the oil in liquid form, as well as from animal fat; but in these respects the result of further enquiries must be awaited. The superior illuminating power of oil gas should, of course, receive due attention in the working out of the details of the scheme, both in the way of direct experiment as to the degree to which it may in practice be relied upon, and as to the reduced dimensions of the various parts of the apparatus, pipes, &c.

14. Finally, His Excellency in Council observes that, as some time must obviously elapse before any practical result can be obtained from the measures now proposed, it is desirable that the question of the existing system of lighting barracks may receive present attention in the Military Department with a view to considering, whether some of the improved cheap oil, or other lamps of the present day, might not at once be introduced in barracks in supersession of the existing very imperfect oil lights.

ORDER.—Ordered, that a copy of the above Resolution be forwarded to the Government of Bengal, in view to the Dinapoor project being worked out.

Ordered also, that a copy of the Resolution be forwarded to the Government of the Punjab, with reference to the orders regarding the project for Rawul Pindee.

Ordered also, that copy be forwarded to the Military Department, with reference to the concluding paragraph.

Ordered that the foregoing letter, together with the previous papers on the subject, be transferred to the Public Works Department, in view to all further matters connected with the question being there considered.

(True Extract.)

(Signed) A. J. ARBUTHNOT,
Chief Secretary.

No. 419. ORDER THEREON, 20th June 1866, No. 1,920.

MILITARY WORKS, No. 26.

1. These papers will be communicated to the Superintending Engineer of the 4th Division and to the Superintendent of the Gas Works.

2. Captain Goddard will prepare in conjunction with Doctor Wyndowe a project for the extension and completion of those works, and will submit it to Government with a full report of the present works and of the proposed additions, accompanied by plans and explanatory drawings to show the gas manufactory in all its details. Doctor Wyndowe's attention will be requested to the observations contained in paragraphs 5 to 12 of Colonel Dickens' letter.

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3. As proper coal gas burners have been substituted for the unsuitable burners that were in use when the last somewhat unfavorable report of the lighting of the Barracks was made, it is desirable that a further report should now be obtained, and the Officer Commanding the Regiment in Garrison will accordingly be requested, through the Military Department, to favor Government with one.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the Superintending Engineer, 4th Division.
" Superintendent of Gas Works.
" Military Department.

Exd. S. T. Augustin.

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No. 111. Read the following letter from Assistant Surgeon S. J. WYNDOWE, M. D., Superintendent, Gas Works, to the Honorable A. J. ARBUTHNOT, Chief Secretary to Government, Fort Saint George; dated Madras, 10th April 1865, No. 20.

In reporting, for the information of His Excellency the Governor in Council, the completion of the alterations at the Gas Works necessary for substituting Coal, in place of Oil, for the manufacture of gas, and the success of the experiment, I have the honor to submit a Memorandum showing how this result has been obtained, with a Statement of actual expenditure during the past three months, and an estimate of what the probable cost to Government will be when the lighting with Coal gas is extended throughout the whole Fort.

2. This result might have been laid before Government three months ago, had I not deemed it advisable to thoroughly test the successful working of the experiment before reporting to Government upon it.

MEMORANDUM.

Referring to Mr. Mayer's Memorandum, dated 5th May 1864, and Government Order thereupon, dated 25th May 1864, No. 589, the additions required at the Gas Works for making coal instead of oil gas are therein stated to be near completion. Certain alterations, &c., however, still remained to be effected. On the 28th May 1864, I took over charge of the works.

2. The state of the works at that date, as detailed in Mr. Mayer's Memorandum, were—

1st.—The purifiers had not worked as well as was contemplated.
2nd.—The Condensing Apparatus had been improperly constructed, and was not sufficiently extensive.

3rd.—It was found the retorts would not stand the high temperature required for the conversion of coal into gas.

3. The remedies for the 1st and 2nd defects had already been suggested by Mr. Mayer, and merely required to be executed. These alterations, with some modifications, have been carried out, and found to be perfectly successful, the purification being all that can be desired, and the condensation satisfactory. The 3rd cause of want of success, viz., the fusing of the retorts, has also been corrected; so that it is now no longer necessary to procure these retorts from England as suggested by Mr. Mayer—it having been found that, when properly set, the retorts made at the Mint are able to bear the degree of heat necessary, in fact one of them has been continuously employed for three months.

4. In reporting the completion of these alterations, and the success of the experiment, it remains therefore merely necessary to briefly recapitulate the changes effected, to shew how the sums sanctioned by Government for these alterations have been expended, and estimate, as far as possible, from the experience of the last three months, the actual expense to Government incurred by this improved means of lighting the Barracks.

5. The machinery and fittings for the manufacture of oil gas were erected by Mr. Faulkner for a contract price of 12,000 Rupees. They comprize:—1st, Apparatus for the generation of the gas; 2ndly, Bells and Tanks for its storage; 3rdly, a Meter regulator, mains, pipes, and fittings for its distribution and burning. The two latter were (except as regards burners) equally applicable to the storage and distribution of coal gas, the alterations required being for the generation and purification of the gas. For this purpose, Government, in its Order, No. 348, dated 18th March 1862, sanctioned an outlay of Rupees 2000. The Apparatus includes a bench of retorts, four in number, set in a furnace constructed so as to admit of a powerful draught; (2) an Hydraulic main with pipes, connecting it with the retorts and condenser; (3) a vertical condensing apparatus; and (4) Apparatus for purification, consisting of a scrubber, an iron purifier, and a lime purifier. Upon these alterations a sum of Rupees 3470-14-6, as detailed in Appendix A, has been expended; only 1500 Rupees of the sum sanctioned has, how-

ever, been drawn for, the remainder of the expenditure having been met from the current income allowed by Government of Rupees 250 per mensem. An account of this expenditure has been at different periods submitted to the Commissariat Department for audit, and has been duly audited.

6. These alterations have occupied a long time and cost much more than was originally contemplated. In Mr Mayer's letter to the Secretary to Government, dated 14th September 1864, he alludes to the unavoidable difficulties experienced from the want of skilled mechanical labor; and in fact the delay and increased expenditure has been, if not entirely, certainly in a very great measure, occasioned by the exceedingly bad material employed, and defective construction of the work undertaken by Mr. Tonkin, who was originally employed to make the necessary alterations. A reference to Appendix A will show how large a proportion of the total expenditure fell to his share, viz., Rupees 1805-7-0. My predecessor Mr. Mayer, considering the charges exorbitant for such bad workmanship and material, refused to pay his bill; it was subsequently settled by arbitration.—Vide Proceedings of Government, No. 43, dated 4th August 1864.

After these first alterations were completed, it was found the gas was not sufficiently purified particularly from tarry matters. This involved a further delay for the construction of a scrubber to be added to the purifying Apparatus, which now consists of, (1st) a scrubber to remove tarry matters, and (2nd) a purifier containing hydrated per-oxide of iron to remove sulphur compounds, and (3rd) of the usual Lime purifier. This arrangement succeeds well, the gas after passing through this apparatus when tested being found sufficiently pure. The condensing Apparatus also was not sufficiently extensive. All the data procurable being based upon calculations made for colder climates, it was not possible, except from actual experience, to estimate the absolute extent required in this country for perfect condensation. The original length of pipe has been doubled, and, in addition, a temporary Apparatus has been arranged, so as to supply a constant stream of water to the condensing apparatus whilst the gas is passing along it; this is found to answer the purpose required. The remaining cause of increased expenditure and delay in completing the work has been the difficulties experienced in heating the retorts to the required temperature without fusing them. This was originally supposed to depend upon imperfect castings; but further observation shewed it lay really in the defective construction of the furnace by which the retorts were heated, the whole strength of the draught being concentrated at the further end, instead of being equally distributed over the whole of the retorts. The retorts after two attempts have been successfully re-set, protected by fire tiles; and with a proper arrangement of draught holes, the retorts are steadily kept at the required temperature, and although one of them has been constantly employed for three months it is still in good order. A reference to Appendix A will show that this result has not been obtained without some loss; the whole of the original set of four retorts, costing Rupees 407-1-10, having been fused, and of necessity re-placed by new ones.

7. I have entered thus somewhat fully into the history of the past two years, in order to show Government that the delay and increased expenditure in accomplishing the alterations sanctioned in their Proceedings, No. 348, dated 18th March 1862, have been unavoidable under the circumstances. The success of the experiment might have been reported three months ago, had I not deemed it better to thoroughly test the working of the Apparatus, &c., before so doing. The result of the past three months experience has been satisfactory. There is, however, one modification I have introduced, which it is necessary to point out before proceeding to estimate the cost to Government of this improved means of lighting. On the first occasion of lighting the Barracks with coal gas the lights were found to burn dimly. The cause of this was two-fold:—1stly, the only burners available were those originally put up and intended for oil gas, and therefore were smaller in size and had smaller apertures than were required for coal gas, nor could I succeed either at the Mint, or elsewhere, in getting proper burners manufactured—they will have eventually to be imported from England; and, 2ndly, I found the gas, after condensation and purification, when stored in the iron bells, to become so expanded by the heat from the sun's direct rays as to considerably diminish its illuminating power, as also the pressure onwards through the mains when all the compensating weights had been removed. This might in some measure

have been obviated by protecting the bells by means of a thatched covering; but as the works are within the Fort walls, the erection of any thatched building is prohibited. A series of experiments however proved that the admixture of a small quantity of oil with the coal gas obviated this difficulty, and gave a gas of good quality, burning well and being free from impurity. This has answered so well that I would recommend the Government to continue using the mixture; the small quantity of oil required not being likely to raise the price in the market.

8. The actual expense incurred during the past three months is given in Appendix B. These figures shew that during the past three months 1,03,670 cubic feet of gas has been made at a cost for coal, oil, and coke (not including establishment) of Rupees 474, that is 1000 cubic feet of the mixed gas has Rupees 4 9-1. The total expense including establishment has been Rupees 750. The average number of lights burned during the past three months has been 100 $\frac{3}{4}$; the average cost per mensem Rupees 250—or, in round numbers, each light has cost Rupees 2-8-0 per month. For the sake of comparison I have prepared (Appendix C.) a similar Statement of actual expense when oil gas only was made at the works. Herein is shewn that 26,985 cubic feet of gas was made at a cost for oil and coke of Rupees 478-8-11, i. e. 1000 cubic feet of oil gas cost Rupees 17-11-5; the actual expense including establishment being as follows:—average number of lights 103 $\frac{1}{4}$;—average cost per mensem 238-8-4, or, as above, each light cost Rupees 2-5-0 a month.

9. The result, therefore, of actual experience is apparently not so favorable to coal gas as was anticipated—vide Proceedings of Government, Public Department, dated 18th March 1862. It must be considered, however, that as an experiment, and therefore on a small scale only, every thing has been adverse to the coal gas: 1st, the price of coke and coal has increased from 20 to 30 Rupees a ton; 2ndly, to manufacture the small quantity of gas at present required one retort is sufficient, and as a consequence more coke is consumed in heating this single retort than is recovered from the coal distilled; when more gas is burned it will be possible so to set the retorts that two will be heated by one furnace, and therefore twice the quantity of coke recovered from the coals, whilst the coke burned in the furnace remains the same—in fact no expenditure for coke will be required; 3rdly, it is necessary to keep the retorts constantly at the required temperature, a cherry red heat—(When the process of distillation is continuous of course there is no loss on this account, but to supply the small quantity of gas at present required does not necessitate continuous distillation, even with only one retort—so of course here again is a further loss on account of fuel); and, 4th, the work being continued during the night, as well as during the day, and three men being required to charge the retort, two additional firemen have to be entertained. This establishment will be sufficient for lighting the whole Fort.

10. I am confident, however, that if Government consider the experiment satisfactory, and direct the extension of the lighting to the whole Fort, including the Church and private houses, that the advantage to be derived from the employment of Coal gas, both from its superior illuminating power, and also from its economy, will be fully demonstrated. The Fort Engineer has not yet finished his estimate for piping, fittings &c., on account of extensions already sanctioned, so it is not easy for me to estimate, even approximatively, what the cost per light will be when the extensions are fully completed. The following, therefore, must not be accepted as strictly correct, but merely an approximative estimate, based upon the experience of the past three months, of what the cost to Government will be if the lighting be extended to the whole Fort, say burning 500 lights nightly:—

	Rs.
The average consumption of coal per mensem for 100 lights during the past three months has been 3 $\frac{1}{4}$ tons, therefore 500 lights will require 16 $\frac{1}{4}$ tons, and will cost, at 20 Rupees per ton (the price I have since ascertained from the Superintendent of Marine he is able to supply coal for, for Government purposes)...	325
The average consumption of oil, calculated as above, for 500 lights will be 40 Maunds, and cost, at 3 $\frac{1}{2}$ Rupees per Maund...	140
Cost of establishment, as at present, vide Appendix...	91
Total...	556

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or each light will cost Rupees 1-1-9, a result which very closely agrees with Mr. Mayer's estimate quoted in the Proceedings of Government already referred to. It will be observed that this estimate does not include interest on outlay, loss on account of wear and tear, nor pay of Superintendent; these items not being included in the calculations made in the Government Order already quoted, but afterwards deducted—vide paragraph 6.

MADRAS, 10th April 1865.

(Signed) S. J. WINDOWE, M. D.,
Superintendent Gas Works.

A.

Memorandum of expenses incurred for alterations and additions to Gas Works, to adapt them for the manufacture of Coal in place of Oil Gas.

1862.		Rs.	A.	P.
April 30th 1863.	Paid to Mr. Tonkin, for Lime Purifier.....	130	0	0
December 8th 1863.	„ to do. for Hydraulic and Condenser.....	949	7	0
November 5th 1864.	„ to do. for alterations.....	200	0	0
August 15th 1862.	„ balance of above account, as settled by Government Solicitor	526	0	0
July 8th 1863.	„ to the Mint, for 2 cast iron coal Gas Retorts.....	152	9	4
September 25th 1863.	„ to the do. for 2 Elliptical Retorts, &c.....	254	8	6
April 20th 1864.	„ to the do. for 4 coal Gas Retorts and 40 Balance Weights	422	0	0
June 16th 1863.	„ to the do. for additional Pipes and Condenser.....	47	1	9
December 7th 1864.	„ to the Commissary of Ordnance for Scrubber.....	81	10	9
July 13th 1864.	„ to Mr. Boutell, for superintending coal Gas Manufactory..	100	0	0
July 9th	„ to the Gun Carriage Manufactory, for repairing Lime Purifier.....	29	11	2
October 15th 1865.	„ to the do. for do.....	39	4	10
February 18th 1864.	„ to the do. for 1 Brass Cock and Brass Pipe.....	52	8	4
September 2nd 1865.	„ to Engineer for re-setting Retorts.....	71	14	5
January 31st 1862.	„ to do. for do.....	45	6	0
October 3rd 1863.	„ to Moottoosawmy Moodelly, for 9000 thick Wall Bricks....	150	0	5
May 6th 1862.	„ to do. for 800 do.....	16	1	0
July 27th 1862.	„ to Dr. Hunter for 117 Fire Bricks, &c.....	13	8	0
August 9th 1864.	„ to Messrs. Simpson & Co. for 1250 Fire Bricks.....	150	0	0
July 7th	„ for Apparatus for cooling Condenser.....	39	3	0
	Total...	3,470	14	6

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B.

Memorandum of the actual expenses incurred for Coal, Coke, and Oil, including pay of Establishment, during the months of January, February, and March 1865, shewing also the total number of cubic feet of Gas made and consumed.

1865:			Rs.	A.	P.	Rs.	A.	P.
January..	Coal consumed... ..	3 Tons and 580 lbs.	At 25 Rs. per ton..	81	7	6		
	Purchased Coke consumed....	2 „ and 1,320 „	At 25 „ „ „	64	11	8		
	Gained Coke consumed....	1 „ and 2,140 „	.....	...	...	...		
	Total Coke consumed....	4 „ and 1,120 „	.....	...	...	...		
	Oil consumed... ..	7 Maunds...	At Rs. 3½ per Md..	24	8	0		
	Total Cubic feet of Gas made....	29,890	.....	...	...	...		
	Do. of Gas consumed....	26,211	.....	...	...	...		
	Total number of lights burnt....	2,800	.....	...	...	...		
	Pay Abstract of the Establishment. ..	.....	.....	93	0	0	263	11 2
February.	Coal consumed... ..	3 Tons and 30 lbs.	At 25 Rs. per ton..	75	5	4		
	Purchased Coke consumed....	1 „ and 1,110 „	At 25 „ „ „	37	6	8		
	Gained Coke consumed....	1 „ and 1,780 „	.....	...	...	...		
	Total Coke consumed....	3 „ and 650 „	.....	...	...	...		
	Oil consumed... ..	7 Maunds...	At Rs. 3½ per Md..	24	8	0		
	Total Cubic feet of Gas made....	30,660	.....	...	...	...		
	Do. of Gas consumed....	25,840	.....	...	...	...		
	Total number of lights burnt....	2,813	.....	...	...	...		
	Pay Abstract of the Establishment.....	.....	.....	92	0	0	229	3 7
March...	Coal consumed... ..	3 Tons and 1,030 lbs.	At 25 Rs. per ton..	86	7	11		
	Purchased Coke consumed....	2 „ and 40 „	At 25 „ „ „	50	7	2		
	Gained Coke consumed....	2 Tons...	.....	...	...	...		
	Total Coke consumed....	4 „ and 40 „	.....	...	...	...		
	Oil consumed... ..	8½ Maunds...	At Rs. 3½ per Md..	28	14	0		
	Total Cubic feet of Gas made....	33,120	.....	...	...	...		
	Do. of Gas consumed....	30,112	.....	...	...	...		
	Total number of lights burnt....	3,410	.....	...	...	...		
	Pay Abstract of the Establishment.....	.....	.....	91	0	0	256	13 1
	Total...						749	11 10

C.

Memorandum of actual expense incurred on account of Oil and Coke, including pay of Establishment, during the months of September, October, and November, showing also the total number of Cubic feet of Gas made and consumed, and total lights burnt.

1864.				RS.	A.	P.	RS.	A.	P.
September.	Oil consumed...	32½ Maunds.	At Rs. 3-8-0 per Md.	112	14	0			
	Coke do.	1 Ton and 1559 lbs.	At 25 Rs. per ton.	42	6	5			
	Gas produced.	9090 Cubic feet.							
	Gas consumed.	6992 Cubic feet.							
	Total lights burnt	3160.							
October. ...	Oil consumed...	33½ Maunds.	At Rs. 3-8-0 per Md.	118	2	0	234	4	5
	Coke do.	1 Ton and 1675 lbs.	At 25 Rs. per ton.	43	11	1			
	Gas produced.	9187½ Cubic feet.							
	Gas consumed.	8472 Cubic feet.							
	Total lights burnt	3247.							
November.	Oil consumed...	33½ Maunds.	At Rs. 3-8-0 per Md.	116	6	0	240	13	1
	Coke do. ...	1 Ton and 1800 lbs.	At 25 Rs. per ton.	45	1	5			
	Gas produced...	8715 Cubic feet.							
	Gas consumed.	6436 Cubic feet.							
	Total lights burnt	3060.							
Pay abstract of the Establishment.				79	0	0			
Total Rupees...							240	7	5
							715	8	11

No. 112. ORDER THEREON, 20th September 1865, No. 977.

With the letter above recorded, Dr. Wyndowe has submitted a Memorandum, showing the present state of the Gas Works in Fort Saint George, from which it appears that the experiment has been fairly successful, notwithstanding the difficulties which have been experienced, partly from bad workmanship, and partly from the novelty of the experiment, all the data procurable having been based upon calculations made for colder climates. The defects in the retorts brought to notice in Mr. Mayer's Memorandum of the 5th May 1864 have been remedied; it is not, therefore, necessary to procure new retorts from England.

2. The average number of lights burnt in the Barracks during the three months immediately preceding the submission of the Memorandum was 103½, at an average cost for each light of Rupees 2-5-0 per mensem. Dr. Wyndowe estimates that if the experiment be extended to the whole of the Fort, 500 lights being burnt nightly, the cost of each light will be reduced to Rupees 1-1-9 per mensem, or Rupees 556 per mensem for 500 lights. This, however, is exclusive of the interest on the outlay incurred in machinery and fittings, wear and tear, and the salary of the officer in charge, which items, in the Proceedings of Government of the 18th March 1862, were estimated at Rupees 2380 per annum, or Rupees 240 per mensem. In the estimate in question the total cost of the plant was put down at Rupees 24,000. Dr. Wyndowe has not furnished a statement of the aggregate

expenditure incurred in the construction of the works, but from the facts stated in the Memorandum it has probably not been less than Rupees 30,000, which will raise the interest on the outlay to Rupees 1500, and will add Rupees 25 to the monthly charge. At this rate, the cost of 500 lights will be Rupees 556+240+25 = Rupees 821 per mensem, or Rupees 1-10-3 for each light per mensem; the cost for oil lamps, according to the estimate entered in the Proceedings of Government of the 18th March 1862, being Rupees 3-8-0 per mensem.

3. Under these circumstances, the Governor in Council is disposed to extend the lighting to the whole of the Fort, as suggested in the 10th paragraph of Dr. Wyndowe's Memorandum; but before sanctioning the adoption of this course, he desires to be furnished with an accurate Statement of the expenditure actually incurred in the construction of the works, and an estimate of the cost of so extending them as to admit of the whole of the Fort being lighted with coal gas.

4. His Excellency in Council approves of Dr. Wyndowe's recommendation that the admixture of a small quantity of oil with the coal gas should be continued. He would wish, however, with reference to a statement made in a recent report from the President of the Sanitary Commission, to the effect that the lights were so faint that the men could not read by them, to have a definite report on this point from the Officer Commanding the Regiment. This will be called for in the Military Department.

(True Extract).

(Signed) W. H. Muller.
Acting Secretary to Government.

To the Superintendent of Gas Works.
" Military Department.
" Public Works do.

Exd. J. H. Burns.

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Proceedings of the Madras Government, Public Department,
30th August 1861.

No. 222. Read the following letter from JOHN MAYER, Esq., Professor of Chemistry ;
to J. D. SIM, Esq., Acting Chief Secretary to Government, Fort Saint George, dated
21st August 1861.

22/8/61

I have the honor to submit to Government the results of my attempts to reduce the cost of oil gas. This attempt was founded on the well known fact that water gas is a mixture of two gases, hydrogen and carbonic oxide, which are both inflammable though not illuminating. On the other hand it is no less patent to every one conversant with the subject, that oil gas is a mixture of gases some of which are especially rich in carbon, now, as the luminosity of all ordinary inflammable gases depends on the amount of carbon contained, it was reasonable to anticipate that a mixture of the two would be sufficiently illuminating for all ordinary purposes, and as water gas could be had at a nominal cost and as its manufacture required but trifling additions to, and modification of the apparatus in use, it was evident that such a mixture would be economical. Led by these considerations, as well as by the numerous laudatory reports of water gas from Home, I reported to the Honorable Mr. Morehead in Council and on other occasions to him personally, that I hoped by its use to reduce the cost of the material now in use, and in carrying out the idea and putting it fairly to the test of experiment, I was obliged to incur some expense, but no efforts were spared to reduce every item of cost to a minimum; as an example of this case it may be sufficient to state that an old waterpipe was, by some fitting and contrivance, converted into a retort—a figure of the apparatus is appended—a small reverberatory furnace was built, into which the waterpipe retort was fixed, a boiler of the simplest construction to generate the steam was added, these with a small purifier constituted the whole apparatus employed, involving in all an outlay of Rupees 300 as will be seen by Mr. Faulkner's paper appended. The apparatus worked admirably so far as relates to the production of the water gas, but notwithstanding the facility of its production in quantity and its very low cost, I regret to say that it does not answer the expectations entertained, nor fulfil the objects for which it was made, as one measure of it requires to be mixed with not less than three of oil gas to form an illuminating compound; in any larger proportions than these it destroys the luminosity of the oil gas, thus the gain would be reduced to a minimum, and if in addition to the observance of these proportions a larger amount of gas is required for each burner, it becomes evident that there is no economy in its employment. Mr. Faulkner after having in accordance with my suggestions set up the apparatus described, took advantage of the opportunity afforded when trying it experimentally to generate some wood gas, landed highly by some American Writers; both gases were fairly tested by me, mixed in various proportions with oil gas, the results differed so little that it may be briefly stated that what is true of the one is true of the other, i. e. so far as relates to their value as diluents to gas rich in carbon both require the same purification and both reduce the luminosity of the oil gas nearly in the same proportion. It may perhaps be considered right that I should give a short explanation of the use of the apparatus constructed to generate water gas. The retort was a waterpipe of about six feet long and about five inches in diameter; it had at either end a flanch of two inches broad, these were bored for screws, and iron plates similarly bored were fitted to them; the plates and flanches were made air tight by clay lute as required. From the steam generator which was fitted to one end of the furnace above the retort passed a steam pipe which accompanied the retort through the whole length of the furnace and entered it by piercing the plate screwed and luted on to the further end, thus the steam supersaturated by heat entered at one end of the retort (which having been loosely fitted with charcoal and coke and heated up to a bright red heat) ensured the condition for converting the steam (heated so as not to cool down the contents of the retort) into carbonic oxide and hydrogen almost entirely. Some watery vapour, and some small amounts of carbonic acid gas would no doubt be likely to escape conversion, but these would be condensed or absorbed by the purifier from whence the gas would pass on in the usual way to the gas holder. I should not have thought it needful to trouble the Government with these details, had it not been necessary for my own credit as well as on account of the confidence reposed in me with reference to

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30th August 1861.*

these matters to shew that the experiments were conducted in the most careful manner and with due attention to all the conditions required for ensuring success, that this was done is I trust satisfactorily proved from the fact that the water gas was manufactured with the same facility as it would have been in the Laboratory, and though the Government will no doubt regret the failure in this attempt to reduce the cost of the oil gas now employed, it is something to have practically set a question at rest apparently still undecided at Home, and as I venture to think at so small a cost. There is one very important question yet undecided that I am anxious to have tried in a fair and complete manner. I refer to the comparative merits of oil and coal as gas making materials for India. The employment of oil gas in preference to oil itself burned in the old way, may I think be regarded as absolutely and clearly decided in favor of gas inasmuch as the cost of oil gas is in the ratio of one Rupee and a half, to 2 Rupees and a half which is nearly the monthly cost of each oil lamp as shewn by the accounts furnished monthly for the lamp lighting by the Barrack Master. While the number of gas lights is limited to 40, and this number of lights has to bear the expense of the establishment it is clear that the calculation is altogether an unfair one, as this cost has to be distributed over 40 lights, but when the number of lights amounts to 120 which it will shortly do as the fittings for the upstairs rooms are progressing fast, there will not be more than half a Rupee on each light above the actual cost for production; what this actual cost is can readily be seen by reference to the following figures:—95 cubic feet of gas can be made from 1 Rupee 3 Annas worth of oil, and each light consumes per night about 3 cubic feet of gas, now $3 \times 30 = 90$, so that from 1 Rupee 3 Annas to 1 Rupee 11 Annas is the cost of oil gas per month for each light, and the light is infinitely better than that of oil lamps, probably three times as good. Finally when the lights number 400 which may fairly be expected if all the lamps required in the Fort are lighted, the addition will be 2 Annas 8 Pice per month for each light. Thus the gain in favor of the experiments so far as the comparison with oil burned

In the above letter Dr. Mayer seems very clearly to have made out his position of the superiority of gas above oil. Before however taking measures for the employment of gas on a large scale, the Right Honourable the Governor in Council will await the issue of the experiment about to be made for at the Medical College.

in street lamps is concerned, is clearly demonstrated, and that this was the ground on which the experiments were sanctioned; the marginal quotation proves as well as the letter therein referred to, vide pages 35, 36, and 37 of original paper: these experiments also demonstrate the advantages of this mode of lighting for all those stations, whereat coal cannot be had without considerable expense for carriage. Madras being on the sea board and the price of coal having been reduced to 21 or 24 Rupees a ton, instead of 40 as it was when my papers on this subject were submitted to Government, while on the other hand, oil has risen from 32 to 63 Rupees per candy, it will be observed that the conditions in favor of oil as a gas making material no longer exist; how in an oil producing country the price of common lamp oil can be so enormous, as 63 Rupees per candy, is a problem I am altogether unable to solve, but it is a fact that is notorious and undeniable why coal can now be had for 21 or 24 Rupees instead 35 or 40 as it cost in 1858 and in previous years, may be more readily accounted for. Railways have necessarily brought large quantities of coal to India, reduction of price has followed the increased consumption and demand, but whatever may be the reasons, the facts are indisputable and the results are in brief that what was cheap is now dear, and what was dear is now cheap, consequently the conditions under which the experiments were commenced, not only no longer exist, but are actually reversed, and thus approximate to those which obtain at Home, where after several trials coal has been and is preferred on account of economy to oil as a gas making material. It is true that the 12 Rupees a ton for freight is a great drawback; but in spite of this I am of opinion that this question which was then an open one (as the marginal quotation from my original paper shews) should now be put to the only reliable test that of

Experiments of a very precise character are now being carried out, with the view of determining the exact cost of gas made from oil, as this, for reasons about to be detailed, appears to offer the means of illuminating separate buildings and localities at less cost than that made from coal; this however is a point that also demands rigid comparative experiment—Vide page 5.

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experiments, and should the Government desire it I shall be prepared to submit for their approval such arrangements as may be needful for this purpose. With this explanatory statement before them although my effort to reduce the cost of the oil gas by the admixture of water gas have not on this occasion proved successful, I venture to hope that the Government will be pleased to order the payment of Mr. Faulkner's Bill and sanction the projected trial of coal gas provided it can be done without additional charge to the State, which I am prepared to shew.

P. S.—I beg to state that a full exposition of the "results of the experimental manufacture of gas in Fort Saint George" as called for by the Government of India is now in course of preparation.

ORDER THEREON, 30th August 1861, No. 1,258.

No. 223.

In this letter the Professor of Chemistry describes in detail the result of his endeavors to reduce the cost of oil gas by the admixture of water gas.

2. The apparatus employed by Mr. Mayer, though rude, worked well, and water gas was produced with facility at a very low cost. The experiment, however, failed, as it was found that, if mixed with oil gas in larger proportions than 1 to 3, the water gas destroyed the luminosity of the oil gas, and used in that proportion, there is no economy in its employment; a similar experiment with wood gas proved equally unsatisfactory.

3. The Government regret that the result has not been successful; they are, however, fully satisfied that no effort has been wanting on Mr. Mayer's part to attain success, and the experiment was worthy of trial. The cost, viz., Rupees (327-8) three hundred and twenty-seven and Annas eight, incurred on this account is sanctioned.

4. If this sum cannot be met from the funds allotted for his Department in the Budget for 1861-62, Mr. Mayer will, in communication with the Accountant General make the necessary provision in the Supplemental Estimate.

5. Mr. Mayer will be so good as to include these experiments in the report to be furnished by him for transmission to the Government of India.

6. From the comparison entered into by Mr. Mayer the great advantage, in point of economy, to be derived from the employment of gas in lieu of oil, irrespective of its greater brilliancy, is very apparent.

7. The Government will be prepared to consider any arrangements which Mr. Mayer may propose for the trial of coal gas. The great rise of late years in the price of oil renders it very desirable that the relative cost of coal and oil gas should be carefully determined by actual experiment, and this, it would appear, can be done without extra cost to the State.

(Signed) J. D. SIM,

Secretary to Government.

Exd. T. O'Connor.

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*Proceedings of the Madras Government, Public Department,
12th November 1861.*

No. 52. Read the following letter from JOHN MAYER, Esq., Professor of Chemistry; to the Chief Secretary to Government, Fort Saint George, dated 24th September 1861.

In acknowledging the receipt of Government Orders, No. 1,258, under date August 30th 1861, I have the honor to request that you will favor me by submitting my respectful thanks for the manner in which it has pleased the Government to notice my endeavours to reduce the cost of oil gas; I am also grateful for, and proud of, the unabated confidence evinced, by the last paragraph of the Orders in question, which calls on me to state the means, by which, I propose without deranging the present oil gas works, and without putting Government to any extra cost, to erect such further works, as will enable the Government at any future time, to employ either oil or coal for gas making, as may be most economical; the combinations among Native dealers, oilmen, &c., will thus be rendered comparatively harmless. In my letter of 21st ultimo, I have stated what singular changes have occurred in the relative prices of oil and coal, it will therefore only be necessary now, to shew how far the expenses to be incurred to effect the change proposed can be met by the means at command. These at present consist solely of the monthly allowance of Rupees 250 which not only pays for oil, coal, coke and establishment, but for castings, additional fixtures, workmen, &c., &c., this for the year equals 3,000 Rupees, and if a period of 5 years be taken into account, Rupees 15,000. Now the monthly price of 120 oil lamps at the rate paid for by Government, viz., Rupees 2 Annas 8 per each, amounts to Rupees 300, which multiplied by 12 gives 3,600 Rupees yearly, and if again the period of five years be taken, the sum will reach to 18,000 Rupees; thus in five years with only 120 lights burning, the Government will have gained three thousand Rupees and admitting that the original number anticipated within the Fort (400) be in time attained, the gain in five years will be 10,000 Rupees. Up to the present time my attention has been devoted to lighting the Barracks, but should the plan now submitted be sanctioned, every means will in future be adopted, to extend the lighting throughout the Fort; as it needs no argument to prove, that the greater the number of gas lights burnt nightly, the greater the gain to Government. The special number referred to (400) being however both as to time and number an uncertain quantity will not be taken into the present consideration; facts attained, will only be dealt with, and among such facts, (as 73 lights are now burning and the remaining 47 are being put up) we may, I think, fairly reckon 120 lights, the saving on which in five years has been shewn to be Rupees 3,000.

The appended estimate drawn out by Mr. Edwards who put up the gas works in Calcutta and whose great experience in all these matters makes him a most reliable authority, shews that about 6,000 Rupees will be required for the addition to our oil gas works of works adapted to the manufacture of coal gas. Supposing then, for the foregoing reasons that Mr. Edwards' estimate be accepted as correct, the means of meeting it naturally present themselves for consideration, a saving of 3,000 Rupees only can be safely reckoned on, if the outlay be spread over five years; and as the following calculation shews several items not originally thought of, such as interest on the outlay and per-centage, for wear and tear, swell the Dr. side of the account to 22,500.

Estimated Items of Expenditure for the Gas Works, Fort Saint George, during a period of five years.

Outlay...	6,000
Interest at 5 per cent. 300 per annum, for five years...	1,500
Establishment at 70 Rupees per mensem for five years.....	4,200
Materials for gas making for 120 lights at 1 Rupee 4 Annas per light during five years...	9,000
Per-centage for wear and tear at 3 per cent. on the original plant 12,000 for five years..	1,800
	<u>22,500</u>

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Estimated Receipts on account of Gas Works, Fort Saint George, during a period of five years.

Government allowances for five years...	15,000
Estimated saving...	3,000
	<u>18,000</u>
Deficit...	4,500

To meet the deficit above shewn, I would suggest that the sum of 4,000 Rupees be advanced by Government as a loan returnable by yearly instalments of 1,000 Rupees to commence three years after the date (to be specially reported) when the coal gas shall have come into use. With such means placed at my disposal, viz., the advance specified and the present monthly allowance made over to me for five years, I am prepared to undertake the erection of works for the manufacture of coal gas, in addition to those now in use for oil gas making, engaging not only to provide all the necessary apparatus, fittings, &c., and to have them put up, but to pay the Establishment and to keep monthly 120 lights burning or any extra number of similar lights that may be required, charging for the same at the rate of one Rupee four Annas each per month, which is exactly half the price of an oil lamp for the same time. The foregoing Estimates still leave a balance against me, 500 Rupees, without allowing any thing for a working margin which is very necessary in all such undertakings. I am however little fearful on this head as the further saving to be effected by the use of coal within the first three years will I have no doubt suffice to meet all the necessary expenses, as well as to afford the means of returning by instalments the sum now to be advanced on loan to the works. When all accounts have been adjusted after the term of years specified, I shall be prepared to hand over the works to Government together with all the additional fittings and apparatus required for coal gas making, which will have been purchased without any additional outlay and by means of which all future gain will be their own.

In conclusion I think it right to advert to the chance of my being removed from the Presidency on promotion, it is not altogether unlikely that I may be left here, but should it be otherwise, my eldest son who has been for several months past assisting me in supervising the works, keeping the register of the Meter, Governor, Pressure, Gauge, &c., in fact serving a regular Apprenticeship to gas making will be perfectly competent to take charge of the works as well as to carry out all that is required, and therefore with the approval of Government I should in the event of removal transfer to him the charge I have here undertaken, holding myself responsible to Government in any manner approved of, for all that he may do in the execution of the duties so devolving on him.

ESTIMATE FOR GAS WORKS, FORT SAINT GEORGE, MADRAS.

Contents of present Gas Holders.

*Cubic feet 176,71500 each or
do. do. 3534,20000.*

1 Bench of 3 D retorts to carbonize 8,000 cubic feet in 24 hours each...	553
6 Stand and dippers...	400
1 Hydraulic main, 12 inches diameter by 10 feet long, complete...	400
2 dry lime purifier...	600
1 Governor...	360
1 Tar pit...	320
2 Slide Valves...	236
1 Pressure Gauge...	76
2 Sets of Slides for Gas Holders...	80
6 Quart Bottle Syphons...	240
1,000 fire bricks...	80
2 Sets of Grates and doors for furnace...	280
1 Condises...	400
Contingencies...	300
Labour in fixing...	1,500
	<u>Rupees... 5,822</u>

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12th November 1861.*

No. 53. ORDER THEREON, 12th November 1861, No. 1,513.

The Government are satisfied that it would be good economy now to manufacture gas from coal instead of oil, the price of the latter having lately risen greatly while that of the former has equally fallen.

Before however deciding on Mr. Mayer's proposal, they wish for information on the following points:—

- I.—The actual cost of coal gas as compared with oil gas.
- II.—The reason why 1½ Rupees is to be charged for each extra light when 2 Annas 8 Pice was mentioned in Mr. Mayer's letter of the 21st August last, as the cost of oil gas which is dearer than coal gas.
- III.—Whether Mr. Mayer's arrangement includes the cost of pipes and all other expenses for the additional lights, and if not, what the cost of these is likely to be for, say, 400 lights in all.

The Government observe that in the letter printed at page XI of the appendix to the pamphlet on gas, the Chief Engineer states that the apparatus could be made suitable for the use of coal instead of gas, by an expenditure of Rupees 500. Mr. Mayer will communicate with Colonel Horsley and ascertain whether this is really the case. He is also requested to ascertain for what number of oil lights in the Fort, gas lights can be economically substituted, so that full advantage may be taken of the works. The cost of piping and all charges should be stated and also the present expense incurred for oil lamps, which last can be ascertained from the Commissary General.

(Signed) T. PYCROFT,
Chief Secretary.

Exd. F. Cartledge.

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*Proceedings of the Madras Government, Public Department,
7th January 1862.*

No. 13. Read the following letter from JOHN MAYER, Esq., Professor of Chemistry; to the Chief Secretary to Government, Fort Saint George, dated 26th November 1861.

I have the honor to acknowledge the receipt of Proceedings of Government in the Public Department, and Order thereon, 12th November 1861, No. 1,513, calling for certain information before deciding on the proposition submitted in my letter of the 24th September 1861.

I. The actual cost of Coal Gas as compared with Oil.

This question it will be evident can only be answered, on the assumption that the price of Coal will henceforth not exceed the present rate, allowing such assumption, which certainly appears tolerably safe—war with France or America seeming to be the only contingencies likely to raise the market price of Coal—the Estimate will be as follows:

1,000 cubic feet of Oil Gas has cost on the average about 21 Rupees (though lately it has been more;) 1,000 cubic feet of Coal Gas will cost 5 Rupees as nearly as may be; these figures are in the proportion of about 4 to 1, and if these were the only considerations involved, the question would be at once decided; but there are two other items in the account, which tend to alter these proportions materially; considerations which appear sedulously to have been kept out of sight by writers on Coal Gas, or if not kept out of sight altogether, to have been allowed only in part; the first of these considerations is the difference in the illuminating power of the two Gases—the testimony of Drs. Christison, Ure, Knapp and a host of other scientific names is decisive on this point, and however much the fact may be opposed to the interests of numerous writers on this subject, it cannot thus be got rid of, and we cannot avoid admitting with such evidence as I have quoted, that the ratio between the lighting powers of Oil and Coal Gases, stands very closely in the proportion of $2\frac{1}{2}$ to 1. The next consideration referred to, as unnoticed, or scarcely noticed by the class of writers mentioned, is the different quantities of Gas consumed by the burners adapted to Oil and to Coal Gases—nothing is more simple than the proof of this fact, even if the different burners are examined by the naked eye, Organd burners drilled for 12 or 18 places, shew at once that the diameter of each hole in the Coal Gas burner, is much larger than that of the holes in Oil Gas burner, and if the burners be carefully examined by a good magnifier the differences in the diameters of each set of jet holes, can readily be determined—it stands nearly in the ratio of 3 for Coal jets, to 1 for Oil jets—if any further proof were required, it might easily be found by an appeal to the expenditure of each kind of Gas, as recorded by the Meter, but I submit that the manufacture of burners with different sized jet holes is in itself conclusive, and I have no doubt that it will be so regarded by Government; this point, being then recognized as a fact, it will enable me to express in figures, what I believe to be, the true relation as to value and cost between the two Gases, since if 5 be multiplied by 3 we obtain Rupees 15 against 21, and if the late increase of price in Oil be set against the greater luminosity of the Gas obtained from it, this ratio will remain unaltered, and the gain for Coal will be nearly one-third—indeed practically from various considerations with which it is not necessary to trouble the Government, I think this will be found to be a close approximation to the results obtainable by working with Coal instead of Oil.

II. The answer to this enquiry is that experience in working with Oil Gas has demonstrated, that each Gas light costs the Government an average per month about Rupees 1-4-0 *i. e.*, as nearly as possible half the cost of a Cocoanut Oil light per month. Reference to my letter of the 21st August, shews that the sum of Annas 2-8 is the estimated cost of the establishment distributed over 400 lights over and above that of the actual cost of production which is there shewn to be for each light Rupees 1-3-0 and upwards, according to circumstances. The proof of this is sufficiently simple for $400 \times$ by Annas $2\frac{8}{16} \div 16$ gives something more than 66 Rupees, and the cost of the establishment is something under 70 Rupees, so that from Annas 2-8 to Annas 2-10, will really be the cost of the establishment on each light.

III. The arrangement proposed does not include the cost for piping, &c., for additional lights—these expenses, it was intended to meet on the principle that no reduction on the charge for Oil lights should be made till the piping required had been paid for—as an instance of the plan under contemplation the reply sent to the Reverend Mr. Campbell, relative to the ex-

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pense of lighting the Church and School rooms lately built near the South Beach, was to the following effect:—"the expense monthly for Oil lights having been calculated, this sum should be guaranteed to the Government for so many years, probably two, before any reduction on the cost could be allowed, such reduction to be granted as soon as the expense for bringing the piping to the Church had been cleared, all the fittings inside, as is customary elsewhere, to be paid for by the parties taking the Gas—the only gain to them say for the first two years would be the having a much clearer, and better light." This principle appears not only to be just towards all parties, but to be economical, as it would bring in a return of outlay without much loss of time. The remark of the Chief Engineer, to be found at page XI of the Appendix to the pamphlet on Gas, having attracted the attention of Government, I beg to offer such explanation as memory will enable me to supply—that sum having been named by Colonel Horsley in consultation with myself. I believe it referred only to the expenses attendant on the changing of the furnace and retort—and if such prove to be the fact, the sum is no doubt not far from the mark if the price of the fire bricks required be added to it. I beg to append Colonel Horsley's reply to the question, from which the Government will be enabled to see how far my memory has served me with accuracy. I beg also to append a statement of expenses for lighting the whole of the Fort with Oil as shewn by the Commissary General.

The charge for piping will in addition to the work simply be the number of feet required, according to the size of the pipe. I beg to append a scale of charges, but I think that it is scarcely possible without much consideration and calculation aided by a plan of the Fort to furnish the information required as to the length, size and cost of piping.

To enable me to execute this part of the task now assigned to me, I would suggest that Government would be pleased, to direct that some one who is competent from the District or Garrison Engineer's Office may be temporarily placed under my orders. I shall then submit a plan for all the lights in the Fort with their distances from the works together with the size and length of piping required.

No. 14. ORDER THEREON, 7th January 1862, No. 11.

On consideration of the above letter and of the previous correspondence on the subject, His Excellency the Governor in Council is of opinion that the course proposed by Doctor Mayer for defraying the expense attendant on the introduction of Coal Gas, viz., by an advance repayable and by giving him a contract for five years, is complicated, and would be found inconvenient. It seems to him that it would be the more simple and the better plan, that—provided the Government are satisfied of the advantage to be derived from the use of Coal Gas—they should themselves bear the expense of the necessary buildings, the establishment, cost of Coal and all other actual charges, and that Doctor Mayer should be remunerated by a fixed allowance for his time and trouble in the management of the undertaking.

2. It is observed that the cost of the additional works to adapt the present Gas works to the use both of Coal and Oil is Rupees 6,000. The cost of Oil Gas is to Coal Gas as 21 to 15—that is, the former is the dearer by one-third. The cost of each Oil Gas lamp being (exclusive of establishment) Rupee 1 4 Annas per mensem, that of a Coal Gas light will be about 15 Annas or 5 Annas less, which on 120 lamps, the number which have been or are about to be put up, would be Annas $120 \times 5 = 600$ Annas or Rupees 37-8 per mensem. Supposing 400 lights to be burned, the difference monthly between Oil and Coal Gas would be $400 \times 5 = 2,000$ Annas = 125 Rupees. The cost of piping for the additional 280 lights which would of course be common to both Gasses, has yet to be determined, when, the size and length of piping have been settled in reference to the localities of the Fort in which the lights will have to be put up. The cost of an Oil light is said to be double that of an Oil Gas light, or Rupees 2-8 each per mensem. The difference then between the expense of an Oil light and a Coal Gas light would be Rupees 1-9 per mensem, or on 120 lights Rupees 187-8, and on 400 Rupees 625, exclusive however of the interest on the outlay Rupees 6,000 on the additional works for Coal Gas and the cost of their maintenance and repair.

*Proceedings of the Madras Government, Public Department,
7th January 1862.*

3. The Government have recently in an Order of the 12th instant, No. 1,623, directed the Chief Engineer to place at Doctor Mayer's disposal a Subordinate capable of taking distances and levels with a view to enable him to report what number of lamps in the Fort can be economically supplied with Gas and what length of piping will be required. When these have been completed Doctor Mayer will again address Government, stating in detail what is the cost of 120 Oil Gas lights, and of the same number of Coal Gas lights—how many lights in the Fort can economically be supplied with Gas—the cost of such lamps, Oil Gas and Coal Gas respectively, including interest on the outlay for works and piping and allowance for maintenance. The saving over Oil lamps should also be given, Doctor Mayer will also state what he would consider a fair remuneration for the management of the Gas works for himself or any other person, the amount of which must of course constitute a charge upon the undertaking.

(Signed) T. PYCROFT,
Chief Secretary.

Exd. F. Cartledge.

Proceedings of the Madras Government, Public Department,
18th March 1862.

No. 95. Read the following letter from J. E. MAYER, Esq., Professor of Chemistry; to T. PYCROFT, Esq., Chief Secretary to Government, Fort Saint George, dated 20th February 1862.

In accordance with instructions conveyed to me in paragraph 3 of Order No. 11, under date January 7th 1862, I have now the honor to submit for the consideration of His Excellency the Governor in Council, the following details relative to the lighting up of Fort Saint George with Gas.

1st. The plans which accompanies these explanatory statements, shews at a glance the situations and number of lights proposed, it also shews how many of these are old lights and how many new ones.

2nd. The Statement accompanying the Plan, estimates the cost of piping as well as the various sizes and lengths required. Having in all these matters obeyed the orders received, I have the honor to submit the following calculations founded on the data thus afforded.

Previous however to giving these details, it is again needful to draw attention to the still increasing price of Oil; at the outset of the undertaking it was Rupees 32 per candy, it is now 94 Rupees per candy and difficult to be got even at this extravagant figure. Each Oil lamp (cocoanut) it will be found by examination of the Commissariat accounts, now costs as nearly as possible 3½ Rupees per month, this multiplied by 120 lights will equal Rupees 420 per month; the cost of the Oil Gas lights (101 are now lighted) per month is for each light about 2, or multiplied by 120 the cost equals Rupees 240.

The cost of 120 Coal Gas lights will as nearly as possible be 1 Rupee per light per mensem: thus the three expenditures stand one to the other in the following ratio.

	No. of lights.	Rupees.
Oil in Lamps...	120	420
Oil Gas. ...	120	240
Coal Gas. ...	120	120

If the calculation be made on 400 lights then the figures will stand thus for the year.

	No. of lights.	Rupees.
Oil in Lamps...	400	$1,400 \times 12 = 16,800$
Oil Gas...	400	$800 \times 12 = 9,600$
Col Gas...	400	$400 \times 12 = 4,800$

and if these figures be correct, the annual difference would be 4,800 Rupees between Coal and Oil Gases and between Coal Gas and Oil in lamps 12,000 Rupees. Thus it is evident that the calculations are constantly subject to change, those now submitted not being in agreement even with those prepared for submission to the Government of India, nor in accordance with any that have been previously laid before Government, these changes it is obvious are dependent on the increase in the price of Oil.

The number of lamps already burning nightly in the Barracks is 101, but the number sanctioned is 120, and about 120 more it is proposed to light nightly in the Fort and from information obtained from Mr. Smith it appears that about 50 lights are required in the Government Printing Office, thus there will be about 300 lights burned nightly for the service of the Government and the public; besides this number of lights, Church lights and private lights will no doubt bring up the number to 400, and if so the gain in Coal will, it is plain, be amply sufficient to permit of the necessary outlay. Should the Government be anxious from the continued increase of price and the difficulty in obtaining Oil at once to introduce the Coal, I will undertake to give them a good working apparatus at a very small cost on a very simple plan, that I have designed. It will certainly not be so perfect as the apparatus that Mr. Edwards proposed, but the cost will comparatively be very small, and I will guarantee in any way the Government may wish, the efficient working of it. The chief requirements will be purifiers of a simple kind which, I know can be made here, new retorts and some fittings, all which can be cast at the Mint, the

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*Proceedings of the Madras Government, Public Department,
18th March 1862.*

building a new Furnace and the various workmen will be the only items requiring any actual outlay, not more probably than 7 or 8 hundred Rupees. The cost of the purifiers, castings and retorts can be submitted to Government by Contingent Bills as sent in. I submit this plan to the consideration of Government as perhaps the outlay of 5,000 Rupees as proposed by Mr. Edwards, may be deemed a doubtful measure, although a small outlay might readily be incurred for the additional gain to be obtained by the use of Coal. In fact under existing circumstances I should feel it to be wrong in me knowing the large and increasing outlay for Oil, and that which would be required for Coal, with the comparative amounts and values of the respective products, did I not in so far as my humble voice can go, respectfully press these matters on the attention of Government. Interest on the outlay to be incurred, should it be the pleasure of Government to sanction the course now recommended, will be on the original 12,000 Rupees + 2,000 Rupees for alterations and additions, + such amount as may be resolved on for mains and piping required for the whole Fort say Rupees 3,000 for 1 year which will suffice to carry the piping to the Government Office and the Church; the gain on which will about repay the cost in one year. In the 2nd year a similar expenditure will carry the piping over another part of the Fort, the 3rd year will complete the lighting of the Fort and by that time, i. e., 3 years, the outlay for piping should be recovered or nearly so. In this way the interest on outlay would vary during each year in the 1st year, it would be on 17,000 Rupees, in the 2nd on 20,000 and on the 3rd 24,000.

Interest at 5 per cent. on Rupees 17,000 for the 1st year will be 850, and on 20,000 for the 2nd year 1,000, and on 24,000 for the 3rd year 1,200.

The average interest therefore on the whole outlay will be about 1,000 Rupees per annum, while the gain on 400 Coconut Oil lamps would be 12,000 Rupees per annum, and on 400 Oil Gas lamps 4,800 per annum—deduct interest on the whole plant 1,200 per annum, 3,600 remains—deduct again 480 = 2 per cent. for wear and tear, 3,120 will remain, and if an allowance say of 1,000 Rupees per annum be granted for the charge of the works and the management of the whole undertaking, there will still be nearly 2,000 per annum clear gain on the projected changes. While the lights will be increased largely in number, viz., by 27 lights and in power will certainly be at the lowest estimate four times as illuminating as the present lamps, while the cost for the whole Fort will actually be less than it is at present.

In obedience to the expressed wish of the Government I have suggested a certain sum as remuneration, although it would have been more in accordance with my own wish to have left this matter entirely in the hands of the Government.

No. 96.

ORDER THEREON, 18th March 1862, No. 348.

In reply to the call made upon him in the Proceedings of Government 7th January last, No. 11, Mr. Mayer submits his estimate of the expense of lighting the buildings, &c., in the Fort with Coal Gas, as compared with the expense of Oil lamps and of Oil Gas lamps.

2. The cost of each description of light per month is stated to be:

	RS.	A.	P.
1 Oil Lamp...	3	8	0
1 Oil Gas do.....	2	0	0
1 Coal Gas do.	1	0	0

3. It is calculated that ultimately 400 lights will be burned nightly in the Fort. The cost will then be annually—

For Oil Lamps...	400 × 3½ × 12 =	16,800
For Oil Gas do...	400 × 2 × 12 =	9,600
For Coal Gas do...	400 × 1 × 12 =	4,800

4. Thus for the above number of lights, Coal Gas would be cheaper than Oil Gas by Rupees 4,800 and than Oil lamps by Rupees 12,000 a year.

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18th March 1862.*

5. The cost already incurred in the Machinery and fittings that have been put up is Rupees 12,000, to which add Rupees 2,000 for alterations and additions to adapt it to Coal Gas, and Rupees 10,000 for piping, the total cost of the plant will be Rupees 24,000.

Interest on this outlay at 5 per cent. will be	Rupees	1,200
Say 2 per cent. for wear and tear... ..	"	480
For charge of works and management...	"	1,200
		<u>2,880</u>

which deducted from Rupees 4,800, amount saved by use of Coal Gas, leaves a net gain of Rupees 1,920 per annum, the illuminating power of the lights being at the same time largely increased.

7. The advantage to be derived from the use of Coal Gas being thus established, the Government consider it desirable that the scheme should be adopted. Mr. Mayer will accordingly take the necessary steps for carrying it out in communication with the Chief Engineer, who will submit Plans and Estimates of the additions required to the present Gas works, and will take measures for procuring the necessary piping.

8. For the charge of the works and for the general management of the undertaking, the Government resolve to grant a remuneration of Rupees (100) one hundred per mensem. This allowance will therefore be passed to Mr. Mayer so long as he may be in charge. It is observed that Dr. Mayer has hitherto given his assistance in this desirable measure gratuitously at the cost of no small time and trouble. The charge must be regarded as a Military charge and provision made for it by the Controller of Military Finance. It is presumed that it may be met out of the saving to be effected by the use of Coal Gas lights in lieu of Oil lights and Oil Gas lights.

9. It has occurred to Government that the Regimental Mess House might with advantage be lighted with Gas. Mr. Mayer will be good enough to provide accordingly in his general arrangements.

(Signed) T. PYCROFT,
Chief Secretary.

Exd. F. Cartledge.

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*Proceedings of the Madras Government, Public Department,
25th May 1864.*

No. 120. Read the following letter from J. E. MAYER, Esq., Superintendent of Gas Works; to the Chief Secretary to Government, Fort Saint George, dated Madras, 5th May 1864.

I have the honor to submit the enclosed Memorandum, showing the present position of the Gas Works, for the information of His Excellency the Governor in Council; I have also the honor to submit a Statement of expenditure since last audit and of cash in hand, the vouchers for the expenditure are ready to be handed over to my successor who will forward them in the usual way to the Auditor of Commissariat Accounts.

—
MEMORANDUM.

Having been temporarily removed from the Presidency Division, it is no longer possible for me to attend to the Gas Works. This at the present moment is a source of much regret and mortification, as after having given so much attention for years to these works, and after having been so identified with them as to feel deep interest in their success, I am compelled, when close to completion, to hand them over to another; this, however, is not the place to indulge in regrets. My plain duty is to state the position of the works at the present time. They have been found perfectly equal to the manufacture of any quantity of Gas likely to be wanted for the Fort, but from causes I shall immediately advert to, the purifiers have not worked as could be desired; the necessary arrangements for the pipes of the condenser to pass into the water of the box at the bottom of this part of the apparatus alternately and only to a certain depth, having been twice misunderstood, the mistake committed having only been discovered by taking this part of the apparatus to pieces. Measures have, however, been taken for ensuring the necessary accuracy by some additional piping already cast at the Mint, this will ensure a certain amount of washing and condensation which with the aid of the scrubber (a piece of machinery lately added with a view of saving if possible the greater cost of an increased and larger condenser), will I hope effect the object in view; but I must add even with the aid of the scrubber, I am of opinion that the condenser was set up on a too economical scale and must be increased, at least to double the present extent, in order that the Gas may be delivered to the lime purifier wholly free from tar which almost immediately coats the lime and prevents it from acting. I am also of opinion that it will be needful to have the retorts from Home, as they are far more able to stand the high temperature required for Coal Gas making, than the retorts cast here, these are perfectly able to stand the temperature required for converting oil into Gas; but they do not stand that for converting Coal. As an instance, I may mention that the first of the second set of retorts cast here has been used about six times, and it is doubtful if it will stand firing again more than once or twice and this has occurred although every precaution that could be used has been resorted to, restraining by dampers the temperature to a cherry heat and claying up the ash-pit and grate afterwards so as to ensure gradual cooling. These facts lead me to be of opinion that retorts must be had from Home; but in spite of these mechanical difficulties as well as other local drawbacks, I do not entertain one moment's doubt, as to the perfect ultimate success of the works, I am certain that if persevered in, they will ultimately fully repay the cost which after all for Gas works has been extremely small; the greatest possible economy having been practiced throughout. The Gas allowance, as the vouchers furnished show, has been used after paying the establishment in paying for the additional works, and there is still a sum sufficient at call to meet even Mr. Tonkin's excessive charges. In reference to my successor, I beg to submit extracts of letters from Dr. Wyndowe to me, in answer to my inquiry as to whether he felt himself equal to take charge of the works. Dr. Wyndowe has not had much practical experience, but after a good deal of consideration I think that he is more fitted than any other person I can name for the office. Should Dr. Wyndowe not be the person named; I know of no one but the Garrison Engineer who appears to me at all likely to be competent to undertake the charge. I perceive I have omitted to state that the oil Gas works having been worked for more than two years can readily be managed by any one possessing a moderate share of intelligence. General

*Proceedings of the Madras Government, Public Department,
25th May 1864.*

supervision is indeed all that is needed for them, as the Foreman Baupsing (a native possessing special qualifications), fully understands how to work them.
5th May 1864.

(Signed) J. E. MAYER,
Superintendent of Gas Works.

Extracts of letters from Dr. Wyndowe.

Dr. Wyndowe says in his letter of the 30th April 1864, "that if the Government appoint me thereto, I shall do my best," adding that he leaves it to me to speak to his competency.

In his letter of the 1st May 1864, he modestly says that "his not having had practical experience, prevents him from applying to Government for the appointment."

(Signed) J. E. MAYER,
Superintendent of Gas Works.

Account Particulars of Government Gas Works.

RS. A. P.	RS. A. P.
Bills were submitted for adjustment to the Examiner of Commissariat Accounts, up to November 1863.	To Mr. Tonkin in advance... 200 0 0
By receipt as an advance from the Commissary General from December 1863 to May 1864, at 250 Rupees per month... 1500 0 0	„ Servants' wages for March 1864. 79 0 0
Total... 1500 0 0	„ Firewood, &c., for Gas Furnace for April 1864... 2 10 0
	„ Servants' wages for April 1864. 79 0 0
	360 10 0
	Balance in hand... 1139 6 0
	Total... 1500 0 0

(Signed) J. E. MAYER,
Superintendent of Gas Works.

MADRAS, 5th May 1864.

No. 121.

ORDER THEREON, 25th May 1864, No. 584.

With the foregoing letter, Mr. Mayer, adverting to his removal from the Presidency consequent on his appointment to the Southern Division, has submitted a Memorandum showing the present position of the Gas works in the Fort. He states that they have been found perfectly equal to the manufacture of any quantity of gas likely to be wanted for the Fort, but that in consequence of the condenser having been put up on too economical a scale at first, and the retorts which have been made in this country not having been equal to bear, for a continuance, the great heat necessary for the production of Coal gas, the apparatus has not worked so well as could be desired. He is of opinion that the condenser must be increased at least to double the present extent, in order that the gas may be delivered to the Lime purifier wholly free from tar; and he suggests that retorts should be got out from England. Mr. Mayer recommends that Dr. Wyndowe, who has succeeded him in the office of Chemical Examiner and Professor of Chemistry, should be placed in charge of the works.

2. His Excellency the Governor in Council approves of this recommendation. Dr. Wyndowe will draw the same allowance, viz., Rupees 100 per mensem, that was granted to Mr. Mayer for the charge of the works.

3. Before taking steps to procure new retorts from England, the Governor in Council would wish to be informed whether the construction of those made in this

*Proceedings of the Madras Government, Public Department,
25th May 1864.*

country cannot be so improved as to enable them to bear the degree of heat necessary for converting Coal into Gas. Dr. Wyndowe should confer with the Superintendent of the Gun Carriage Manufactory, the Mint Master and any other persons competent to advise him on this point. The Government presume that the necessary improvements are being made to the condenser.

4. The Governor in Council desires, in conclusion, to tender the thanks of Government to Mr. Mayer for the care and attention bestowed by him on these useful works.

(Signed) A. J. ARBUTHNOT,
Chief Secretary.

Exd. T. O'Connor.

*Proceedings of the Madras Government, Public Department,
6th September 1864.*

Read the following:—

No. 27.

No. ^{680E}
3763.

MEMORANDUM.

With reference to your Docket, No. 799, dated 12th July 1864, forwarding Quarterly Statement of references from the Government of India remaining unanswered on the 30th June last, the undersigned begs to draw attention to the fact that one of the references is dated 5th June 1861, (three years back.)

(Signed) A. B. SAMPSON,
PUBLIC WORKS DEPARTMENT,
SIMLA, 13th August 1864.
Asst. Secy. to the Govt. of India.
To the Secretary to the Government of Fort Saint George, P. W. D.

No. 28.

ORDER THEREON, 6th September 1864, No. 1027.

On the 28th June 1861 Mr. Mayer, then in charge of the works, was requested to furnish, for transmission to the Government of India, a Statement showing the results of the experimental manufacture of Gas in Fort Saint George. The call was adverted to in Proceedings of the 30th August following and repeated on the 13th December of the same year; and although it was stated in the postscript to Mr. Mayer's letter of the 21st August that a full exposition of the results of the experiment in question was then in course of preparation, now three years ago, no report has been sent in.

2. The Government of India having recently drawn the attention of this Government to the delay, the Governor in Council requests that Mr. Mayer will immediately explain the cause, submitting at the same time the report required.
(True Extract.)

Signed J. D. Smith
Secretary to Government.

To J. E. Mayer, Esq.
To the Superintendent of Gas Works.

Exd. J. Tulloch.

22268/64

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MILITARY DEPARTMENT.
PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following papers:—

Memorandum from the Quarter Master General, Head Quarters, Ootacamund, 16th October 1865, No. ⁶⁷⁹10,001; to the Secretary to Government, Military Department, Fort Saint George.

Forwarded to Government, with reference to paragraph 2 of Proceedings of Government, No. 3619, dated 28th ultimo.

From the Officer Commanding Her Majesty's 76th Regiment, Fort Saint George, 7th October 1865, No. 348; to the Brigade Major, Centre Division, Madras.

With reference to your letter, No. and date as per margin, calling for a report on the subject of Gas-lights used in the Barracks occupied by

No. 3182, 6th October 1865.

the Regiment under my Command, I have the

honor to state that the lights are useless for the purpose of reading by, being too faint and the burners being fixed too high.

I beg also to state that many of the Non-Commissioned Officers and men furnish themselves with lamps and oil from their own private resources, which they have to use, when they wish to read or write in their Barrack-rooms at night.

Memorandum from the Officer Commanding Centre Division, Fort Saint George, 9th October 1865, No. 3144.

Forwarded to the Deputy Quarter Master General, Fort Saint George, with reference to paragraph 4 of the Order of Government, in the Public Works Department, No. 977 of the 20th September last, communicated in his memorandum No. 9572 of the 4th instant.

ORDER, No. 4032, 30th October 1865.

Ordered to be communicated to the Public Department, with reference to the Order in that Department, No. 977, dated 20th September 1865.

2. It is observed, with advertence to the remark by the Officer Commanding the Regiment, regarding men purchasing lamps and oil from their own private resources, that additional oil was sanctioned for Regimental reading-rooms in Proceedings of Government, No. 3405, dated 26th September 1864.

(True Extract.)

Wm. H. Hamilton
Deputy Secretary to Government.

To the Quarter Master General.

Public Department.

Adjutant General, ...

Controller of Military Accounts, ...

Barrack Master, Presidency, ...

} for information.

Exd. J. E. Cashart

Handled by plans and

P

Copy in a Letter to England
of 5: June to No 10 of 1867.

J. W. 1865 Dept
Pro of Govt for June
No 2263.

Pro. of the Major Cook
in the Pub. Dept

Of 3rd May } 1866.
Recd 1st June }

Qu. 11. No 427.

Transferring
certain correspon-
-dence relative to the
experimental manu-
-facture of gas for
lighting Fort Saint
George -

No 418.

c. 11th June 1866 On 12th

c. 1928 - 20th June 1866.

2263/65

20th June 1866 On 4/5

Pub Works

Public Works Department.

1920

PROCEEDINGS of the MADRAS GOVERNMENT

under date the 20th June 1866

Read the following

Proceedings of the Madras Govt Public Dept
(Here enter No. 427 dated 31st May 1866)

These papers will be
communicated to the *Asst*
Engineer of the *4th Div* and
to the Superintendent of the
Gas Works.

2. Captain Goddard will
prepare in conjunction with
Doctor Wyndolove, a project
for the extension and com-
pletion of these works and
will submit it to Govt.
with a full report of the
present works and of the
proposed additions, accom-
panied by plans and

WGU

explanatory drawing
to show the gas manu-
-factory in all its details.

Doctor Wynolone's attention
will be requested to the
observations contained
in paras 5 to 12 of
Colonel Dickson's letter.

3. As proper coal
gas burners have been
substituted for the in-
-suitable burners that
were in use when the
last somewhat unfavorable
report of the lighting
of the Banacks was
made, it is deemed
that a further report
should

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should now be obtained,
and the Officer Com-
-manding the Regiment
in Ganceon will accord-
-ingly be requested, thro'
the Military Dept.,
to favor Govt with one.

Chb.-

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4

To
1. Engr & Dr
1. Engr of Gas Works
7. Military Dept

Sept. 21st 1880

Copy in a Letter to England
of 5th March No 10 of 1867

P. W. 1866 Department.

Pro: of Govt for India

No. 1920.

PROCEEDINGS OF GOVERNMENT of Madras

20th June 1867

Passing orders on
Pro: of the Government of
India, relative to the
experimental manufacture
of Gas for lighting Fort
Saint George.

A 410-419

11th June 1867