

MADRAS RECORD OFFICE.

Government of Madras.

Public DEPARTMENT.

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	111-112	<u>Mis.</u>
Dated	20-9-	1865-

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Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Department,
20th September 1865.*

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 $100\frac{2}{3}$; 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 $103\frac{1}{3}$ —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 $3\frac{1}{2}$ tons, therefore 500 lights will require $16\frac{1}{2}$ 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

Proceedings of the Madras Government, Public Department,
20th September 1865.

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.

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

MADRAS, 10th April 1865.

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.

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

Proceedings of the Madras Government, Public Department,
20th September 1865.

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	3			
	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

Proceedings of the Madras Government, Public Department,
20th September 1865.

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.		...	...	...			
	Pay abstract of the Establishment.			79	0	0			
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.		...	...	...			
	Pay abstract of the Establishment.			79	0	0			
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...				...	...	...	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 2880 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

Proceedings of the Madras Government, Public Department,
20th September 1865.

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).

Acting Secretary to Government.

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

Exd. J. H. Burns.

Public?

Pro: Mad Gov

Read letter from the Capt. Gas Mark
(1810 Sept 1851)

Order thereon 20 September 1851 No 977

With the letter above
recorded. D. Spindow
had submitted a memo-
randum showing the
present state of the
gas works in Fort S. from
from which it appears
the experiment has been
fairly successful, not-
withstanding the difficulties
which have been experienced
partly from bad work-
manship and partly
the novelty of the expe-
ment, all the data pro-
curable having been
based upon calculations
made for colder climate
than now. The
month

AM

JP
see memo

AM

The defects in the reports brought to notice in Mr Mayer's memorandum of the 5th May 1864 have been remedied. It is not therefore necessary to procure new reports from England.

The average number of lights burnt in the barracks during the three months immediately preceding the submission of the memorandum was $103 \frac{34}{71}$ at an average cost for each light of R'2.5- .. per month.

Mr Wyndham estimates that if the ^{experiment} expenditure be extended to the whole of the Fort, 500 lights being burnt nightly, the cost of each light will be reduced to R'1-1-9 ^{per month} or R'556 per month.

Dr McPherson in his (return) report says that the lights are so faint that the men cannot read by them - It may be as well to know how this really is.

Wm

However is exclusive of the interest on the outlay incurred in machinery and fittings, wear & tear and the salary of the Officer in charge, which items in the proceedings of Govt. of the 18th March 1862 were estimated at R'2880 per annum or R'240 per month. In the estimate in question the total cost of the plant was put down at R'24000. Mr Wyndham 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 R'30000. which will raise the interest on the outlay to R'1500 and will add R'2000 the

monthly charge. At this
 rate the cost of 500 lights
 will be $\$556 + 240 + 25$
 $= \$821$ per ^{month} ~~annum~~ or
 $\$1-10-3$ ^{per} ~~annum~~ ^{per} ~~annum~~ ^{per} ~~annum~~
 the cost for oil lamps
 according to the estimate
 entered in the proceedings
 of Govt of M. 18th March
 1862 being $\$3-8$ per
 annum.

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
 Mr Windover's memorandum;
 but before sanctioning the
 adoption of this course
 he desires to be furnished
 with an accurate state-
 ment of the expenditure
 actually incurred in
 the construction of
 the works and an

estimate of the cost of
 extending them as to
 admit of the whole of
 the Fort being lighted
 with coal gas.
 His Excellency in Council
 approves of Mr Windover's
 recommendation that the
 admixture of a small
 quantity of oil with
 the coal gas should
 be continued. &c.

x must with however
~~be ascertained~~
 made with reference
 to a statement made
 in a recent report from
 the Director of the Land
 Commission & the effect of
 the lights was as
 found that in some
 would not need of them
 to have a definite report
 on this point from the
 Officer commanding the
 Regiment. This will be
 collected from the
 Military Dept.

Pro. of the
R. R. 1885-1886

1887

Pro. of the
R. R. 1887-1888

San Francisco

dated 20 Apr 1888

1400-1359-1441-1580

Dr. Wyndham's report
on the present state of
the San Francisco
Saint George's reviewed.