

(1) Number of pages _____

(2) Date of repair _____

(3) Initials of the Referencer _____

MADRAS RECORD OFFICE.

Government of Madras.

Public works **DEPARTMENT.**

G.O. No. 2902	Press
457-58	Mis.
Dated 19 9	1867.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
19th September 1867.*

No. 457. Read the following letter from the Consulting Engineer for Irrigation and Canal Company, to the Secretary to Government, Department Public Works, dated Madras, 30th August 1867, No. 63 :—

From Chief Engineer, No. 635, 13th November 1866, with Agent's Endorsement, No. 316, 20th idem.

To Agent, No. 210, 23rd idem.

" " " 217, 28th "

" " " 281, 26th Feb. 1867.

From " " 462, 8th March "

To " " 299, 18th " "

From " " 485, 25th " "

" " " 231, 22nd Aug. "

To Superintending Engineer, 1st Division, 23rd November 1866, No. 69.

From do. 1st Division, 24th Jan. 1867, No. 258.

To do. 2nd " 23rd Nov. 1866, No. 70.

From do. " 16th Feb. 1867, No. 253.

1 Plan of Lock.

1 Estimate.

1 Comparative Statement.

1. I have the honor to submit, for the consideration and orders of Government, the correspondence, as per margin, on the subject of the dimensions of the locks of the Madras Irrigation and Canal Company's Main Canal.

2. The Chief Engineer, in the letter at the head of the list of correspondence, brought forward a proposition to reduce the size of the locks from 120 by 20 feet to 60 feet by 12 feet, on the ground that, while the latter size would suffice to pass boats of as large dimensions as the trade of the country is likely to require, their cost would be far less than that of the larger locks, while their maintenance would be comparatively inexpensive, and they would be capable of being worked more easily and conveniently.

3. In replying to the Chief Engineer's letter, I pointed out that it would be necessary to obtain the views of the Board on the subject; that it would be very advisable that the financial merits of the proposed reduction should be fully investigated; and that, as regards the locks already commenced, the cost of completing them of the full size and on the reduced scale respectively should be ascertained.

4. At the same time as the Godavery and Kistna Delta Canals were those in this country most likely to have afforded practical experience of the advantages or disadvantages of large locks, I addressed the Superintending Engineers of those Divisions to ascertain their opinions on the subject, as also to find out the dimensions of the boats which had been introduced and profitably employed there.

5. The opinion of the Company's Consulting Engineer in England was communicated to this Office with the Agent's Endorsement, No. 462, and this was shortly followed by the Resolution of the Board of Directors accepting Colonel Smith's recommendation that the size of the locks should be reduced from 120 by 20 to 75 by 15 feet.

6. The Chief Engineer has not been able to make a comparative estimate of the cost of completing the locks of the 6th and 8th Sections as sanctioned, and on a reduced scale, but he has transmitted a plan and estimate for a small lock, and has compared the latter with a lock of the same lift in the 9th Section. This comparison shows that, per square-foot of chamber, the sanctioned full-sized lock would cost Rupees 10½, and the small lock Rupees 14½. On the other hand, the saving on the lock of the smaller size is shown as 8,900 Rupees, or 35 per cent.

Enclosed.

7. The Superintending Engineers of the 1st and 2nd Divisions are both in favor of locks of the same breadth as, but 30 feet longer than, those sanctioned for the Company's canal. They do not enter much into details, but I have no doubt both have been more or less influenced by the fact that inconvenience has been felt wherever any of the locks have been only 15 feet wide, owing to the steamers which could be easily taken through the wider locks being stopped by the smaller.

8. I have myself but little doubt that, looking at the question of the size of the Company's locks only with reference to the largest boat or steamer which will need to pass them, the reduced dimensions which the Board desire to see adopted would suffice. Side-paddle steamers are not necessary, and they are particularly unsuited to canal navigation. Single or twin screws, or water propellers, cause less wash on the banks, and 15 feet beam would be more than ample for vessels of such power as inland traffic would demand. It is also probable that steamers will not, as a rule, be passed through the locks. It will probably be found more convenient to use steamers for haulage on those parts of the canal which are free from locks, and to use other motive power where the locks are numerous. Thus there are 72 miles

File enclosed list of locks and their positions.

* 2 Regulating.

11 Lift.

of free navigation above the first lock.

In the next 20 miles there are to be 13* locks, and little, if any, time would be saved by the use of a steamer on this

part. Then there will be 23 miles without a lock; in the next 29 miles there will be 17 locks, and below this 25 miles of open navigation; then 9 miles to the Pennair with 9 locks. South of the Pennair the length of canal to Cuddapah is only 10 miles, and there will be an entrance lock and one at about the 8th mile, so that it will not be very important whether steamer be used here or not.

9. The next point is the tonnage which a lock 75 by 15 feet would pass. It may be admitted, I think, that a boat 72 feet by 14 feet, with a draught of $3\frac{1}{2}$ feet when loaded, would be large enough to carry any description of merchandize,

and it may be assumed that such a boat would carry 60 tons. As none of the locks have been tried, there is no direct evidence of the time which will be necessary to pass a boat, but if it be supposed that four minutes will be the minimum time, six minutes may in practice be taken as the average time. Also looking at the tendency of Natives, whether in charge of boats or carts, to make up parties of six or eight or a dozen, from which tendency it will happen that there will be many boats to be locked at sometimes, and none perhaps for long intervals, eight hours a day may be taken as the equivalent time during which boats would be steadily passing through the locks. Then $60 \times 10 \times 8 = 4,800$ tons would be the maximum daily capacity of a lock of the reduced size, supposing the boats to be of uniform size, and that size the largest which the lock could conveniently hold.

It would of course most probably happen that a large majority of the boats would not exceed 25 or 30 tons burden; and it is tolerably certain that, unless the Company build all the boats to suit their own locks, many which will find their way on to the canal will be of inconvenient dimensions; thus about 45 by 10 would admit nothing alongside it, and only a very small boat at the end. In this

way the practical maximum capacity of such a lock would become reduced to perhaps 3,000 tons a day. Indeed boats of a size* that four would fill a lock would probably carry not more than 10 tons each, or 40 tons for the four, and with these the maximum daily capacity of the lock would be 3,200 tons.

10. The probable traffic on the canal must at present be a matter of mere conjecture. If the navigation be good; if by the construction of reservoirs it be kept open throughout, or for five-sixths of, the year; if the Company eventually continue their canal from Cuddapah to the coast; there would be hardly any limit to the traffic which such a means of communication would create and be capable of accommodating.

The average daily goods traffic of the Madras Railway for the six months ended 30th June last was 904 tons, so that the smaller-sized lock would suffice to accommodate a traffic more than three times as large as that which has as yet been developed on the Railway; and it may, I think, be safely assumed that until the Company's Canal is carried through to the coast, the demand for water transport will not exceed 1,500 tons a day, for the very simple reason that there would be no means of carrying a larger quantity of goods beyond the canal terminus at Cuddapah.

11. As regards the relative cost of the larger and smaller locks, it may suffice, in the absence of a detailed estimate, to take the Chief Engineer's comparative Statement as the basis of the calculation. That statement gives 8,900 Rupees as the difference of cost of locks of the two kinds for a lift of 12 feet. The rates throughout will need raising, and, as recently in the 9th Section, an addition of 30 per cent. to the masonry estimates has been recommended, probably such an increase will be tolerably near the mark; then $8,900 + 2,670 = 11,570$ Rupees or in round numbers 1,000 Rupees a foot of lift will represent the saving on small sized locks.

The regulating lock at the head of the 6th Section has been nearly completed of the full size, so that need not be taken into account:—

The other eleven locks of the 6th Section have a total lift of	190 feet.
The regulating lock of the 7th Section may be taken as equivalent to a lock of 12 feet lift	12 „
In the 8th Section there will be seventeen locks with a total lift of	177 „
In the 9th Section nine locks, total lift	91 „

470

As, however, some of the locks of the 6th Section have been commenced on the full size, and will have to be completed on that scale under any circumstances, it will be proper to reduce the above total, 470 feet, to 440 feet; and it appears, therefore, that the saving which would be effected by building small instead of full-sized locks

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in the part of the canal above the Pennair, the total length of which is 178 miles, would be 4,40,000 Rupees, and this sum, whether looked upon as Rupees 2,470 a mile for this whole length, or as 4,400 Rupees a mile for the 100 miles of canal in which locks occur, is not of any very great moment. It is also just under three per cent. on the probable cost, 150 lacs, of the 178 miles of canal, while the annual interest on the additional cost of the full-sized locks would be at five per cent., 22,000 Rupees, or £ 2,200.

12. In favor of the larger locks (120 × 20) it may be said that those in other parts of the country, which are one-fourth larger, have not been found too large; that 120 feet × 20 feet will admit four boats of a very convenient size 51 feet × 8½ feet as a charge; that the greater supply of water required for lockage is of no moment except at the two or three locks above the Pennair which are below the last irrigation channel; that when a certain class of work has been decided upon and partly carried out, it is inconvenient to make changes unless there be very strong grounds for alteration; and that while the greatest possible loss arising from adhering to arrangements already sanctioned will be in round numbers some 4,50,000 Rupees, a far larger expense would be needed to convert small locks into large ones, or to obtain by additional locks the same amount of accommodation as the larger ones would afford.

13. On the whole I am inclined to consider that, while it is natural that under present circumstances the Chief Engineer should be anxious to reduce the cost of the works, it is hardly worthwhile to make the modification in the size of the locks which he has proposed, and which the Board have approved. On the other hand, had the smaller locks been brought forward for sanction originally, I should not, with the presumption that they would probably suffice for all probable traffic for at least ten or fifteen years to come, have thought it necessary to recommend the substitution of a larger description of lock.

No. 458.

ORDER THEREON, 19th September 1867, No. 2,902.

IRRIGATION, No. 22.

As the dimensions of the locks to be constructed on the Madras Irrigation and Canal Company's Canal were determined after mature consideration, and the plans and estimates for those works have been sanctioned, and the construction of many of them actually commenced, the Government are unwilling to authorize any deviation from the approved design with the little information that is before them. The locks on the canals in the Northern Deltas, though somewhat greater in length than those to be built on the Company's Canal, but of similar width, are found not to be by any means too capacious, and it is now a matter of regret that those first built at the heads of the canals were not constructed on the same commodious scale. It is probable that a lock 75 feet × 15 feet may accommodate the ordinary traffic of the country, and even steamers of a certain description, but it seems by no means likely that those measurements would afford room for the passage of a steamer large enough to carry, on a light draft of water, engines sufficiently powerful to make the vessel

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of any use as a tug upon a canal with a current such as the Company's will have. The employment of tug steamers appears to be contemplated, and as it is probable that they will require to have considerable power, the Government think it would be very unadvisable to contract the dimensions of the locks merely with a view to a small saving of first cost.

(True Extract.)

(Signed) J. H. M. SHAW STEWART, Major, R. E.,
Under Secretary to Government.

To the Consulting Engineer, for Irrigation and Canal Company with sixteen Enclosures.
,, Manager for do. do.

Exd. S. T. Augustin.

Consulting Engineer's Office
 Irrigation Canal Company
 Madrid, 30th August 1867

N^o 63.

From,

Captain, J. Gallia, M^{re}

Consulting for S. & C. Co.

To,

The Secretary to Government

Department of Pub. Works

Sir,

I have the honor to submit for
 the consideration and orders of Government

From Chief Eng^r N^o 635-13 Nov/66.
 with A^g to Government N^o 316-20 idem.
 To A^g N^o 210-23rd "
 " " " 217-28 "
 " " " 281-26 Feb/67.
 From " " 462-8 March "
 To " " 299-10 "
 From " " 485-25 "
 " " " 231-22 Aug^r "
 To Sup^y Eng^r 1st D^o 23rd Nov/66 N^o 64.
 From " " 1st D^o 26 Jan/67-258.
 To " " 2nd D^o 23 Nov/66-70
 From " " " 16 Feb/67-253

1 Plan of Locks.

1 Estimate.

1 Comparative Statement.

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4. At the same time as the Godavery and Krishna Delta Canals were shown in those countries most likely to have afforded practical experience of the advantages or disadvantages of large locks, I addressed the Superintending Engineers of those Divisions to ascertain their opinions on the subject, as also to find out the dimensions of the boats which had been introduced, and profitably employed, there.

5. The opinion of the Company's Consulting Engineer in England was communicated to this office with the Agent's endorsement No 462, and this was shortly followed by the resolution of the Board of Directors accepting Colonel Smith's recommendation that the size of the

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7. The Superintending Engineers of the 1st and 2nd Divisions are both in favor of locks of the same breadth as but 30 feet longer than, those sanctioned for the Company's Canal. They do not enter much into details, but I have no doubt both have been more or less influenced by the fact that inconvenience has been felt, whenever any of the locks have been only 15 feet wide, owing to the steamers which could be easily taken through the wider locks being stopped by the smaller.

8. I have myself but little doubt that, looking at the question of the size of the Company's locks only with reference to the largest boat or steamer which will need to pass them, the reduced dimensions which the Board desire to be adopted would suffice. Side paddle steamers are not necessary and they are particularly unsuited to canal navigation. Single or twin screws, or water propellers, cause less wash on the banks, and 15 feet beam would be more than ample for vessels of such power as inland traffic would demand. It is also probable that steamers will not, as a rule, be passed through the locks. It will probably be found more convenient to use steamers for haulage on those parts of the canal which are free from locks, and to use other motive power where the locks are numerous. Thus there are 72 miles of free navigation above the 1st lock.

In the next 20 miles there are to be 13 locks, 2 regulating and little, if any, time would be saved by the use of a steamer on this part. Then ^{there} will be 23 miles without a lock; in the next 29 miles there will be 17 locks, and below this 25 miles of open navigation; then 9 miles to the Pennair with 9 locks. South of the Pennair the length of Canal to Cuddapah is only 10 miles and there will

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10. The probable traffic on the Canal must at present be a matter of mere conjecture. If the Navigation be good; if by the construction of reservoirs it be kept open throughout, or for 8^{ths} of, the year; if the Company eventually continue their canal from Cuddapah to the coast, there would be hardly any limit to the traffic which such a means of communication would create and be capable of accommodating. The average daily goods traffic of the Madras Railway

Railway for the 6 months ended 30th June last was 90,000 tons, so that the smaller sized lock would suffice to accommodate a traffic more than 3 times as large as that which has as yet been developed on the Railway; and it may, I think, be safely assumed that until the Company's Canal is carried through to the coast the demand for water transport will not exceed 1000 tons a day for the very simple reason that there would be no means of carrying a larger quantity of goods beyond the canal terminus at Cuddapah.

11. As regards the relative cost of the larger and smaller locks, it may suffice in the absence of a detailed estimate to take the Chief Engineer's Comparative Statement as the basis of the calculation. That Statement gives 8900 Rupees as the difference of cost of locks of the two kinds for a lift of 12 feet. The rates throughout will need raising, and, as recently in the 9th Section an addition of 30 per cent to the Masonry estimates has been recommended, probably such an increase will be tolerably near the mark; thus $8900 + 2670 = 11570$ Rupees or in round numbers 1000 Rupees a foot of lift will represent the saving on small sized locks.

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for the 100 miles of canal in which locks occur,
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which are $\frac{1}{4}$ th larger have not been found too
large; that 120'x20' will admit 4 boats of a
very convenient size 51'x8 $\frac{1}{2}$ ' as a charge;
that the greater supply of water required for
lockage is of no moment except at the 2 or
3 locks above the Pennair which are below
the last irrigation channel; that when a
certain class of work has been decided upon
and partly carried out it is inconvenient to
make changes unless there be very strong
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presumption that they would probably suf-
-fice for all probable traffic for at least
10 or 15 years to come, have thought it neces-
-sary to recommend the substitution of a
larger description of lock.

I have the honor to be

Sir,

Your most obedient servant,

Wm. Mullins, Captain, R.E.

Engineer for L.M. Company.

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PROCEEDINGS of the MADRAS GOVERNMENT.

Under date the 19th Sept 1877

Read the following

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to contract the dimensions
of the locks merely with
a view to a small saving
of first cost —

To the Engineer with sixteen enclosures
a manager

CB

Recd 20/9/67

P. W. 1867. Department.

Proc. of Govt for September

No. 2902

PROCEEDINGS OF GOVERNMENT

Madras

Dated 19th September 1867

*Declining return
Suggestions for the contraction
of the dimensions of locks on
the Madras Irrigation Canal
Company.*

Char. 157-458