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MADRAS RECORD OFFICE

Government of Madras

Public Works DEPARTMENT

G.O. No.	2050	Press
B.P. No.		Mis.
274-275		
Dated	18 8	18 73

Not to be folded or roughly handled

No. 274. Read the following endorsement of the Chief Engineer for Irrigation, dated Ootacamund, 16th July 1873, No. 429-A:—

From Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, to Lieutenant-Colonel J. F. FISCHER, R.E., District Engineer, Godavery, dated Fort St. George, 18th March 1873, No. 175.

WITH reference to paragraph 5 of G. O., No. 673, of the 3rd instant, I have the honour to forward sketch specifications for two classes of Steamers, the one of about 70, and the other of between 30 and 35 tons, and to request that you will be good enough, at your convenience, to complete the specifications, making whatever alterations may be considered advisable, and to prepare a section of each vessel showing the cabin and other arrangements.

1 Specification.
1 Copy of G. O., No. 1,125, dated 21st April 1871.
1 Tracing of Steamer.

2. I enclose a copy of G. O., No. 1,125, of the 21st April 1871, and the tracing of the steamer obtained by Captain Fraser.

To be returned.

3. The larger steamer is intended for general purposes on the rivers and canals. It should be powerful enough to be used in crossing the rivers at all times, and be capable of towing barges across also, except perhaps during very high freshes in the Kistna. The smaller steamer would be used for towing when the current is moderate, for keeping up communication across the river, and it should be a handy, comfortable, and economical boat for inspection purposes, especially for running up the Godavery when the Upper Godavery works may have to be inspected.

4. You may, if you wish, design the two steamers in a general way. Their lines would probably be modified by the Builder, as very great improvements have in recent years been effected in vessels of this class and tonnage.

5. I attach much importance to the use of compound engines; they have effected a complete revolution with regard to consumption of fuel, and I anticipate that the working expenses of these steamers, if successful, will be so moderate as to admit of their constant use.

6. When in England I had many opportunities of seeing small steamers at work. Some boats are of as small a burden as 7 or 8 tons. The engines are placed about 8 feet from the screw immediately over the screw shaft, and are direct acting. The steam pressure is 40 to 60 lbs., and the engines make 120 to 190 revolutions per minute. A steam ferry-boat which I saw and made use of at Portsea was 50 feet long, 9 feet beam, had engines of the above description, of 10 I.L.P. nominal, boiler tubular and 8 feet long, steam pressure 50 lbs., cylinder 10 inches diameter and 12 inches stroke, and burnt 6 cwt. of coal (Welsh) in 14 hours. The cost of the steamer complete was £750. This vessel had not compound engines; with them the consumption of fuel would probably not have been more than between 3 and 4 cwt. The Navy has steam boats of two descriptions, the smaller called Pinnaces which have one screw, the larger Launches with twin screws; these being for use at sea have a great beam, but some of them are nevertheless very fast.

7. I am anxious that the new steamers, which are now to be obtained from England, should be in all respects thoroughly efficient. A few years ago Builders had not had much experience in the construction of such boats, but now there are hundreds of these vessels performing all sorts of work, and I think that if the requirements of the steamers we want be clearly explained and specified, the results will be satisfactory. I should estimate the cost of the larger vessel at £2,000, and that of the smaller at £1,000.

8. I have suggested that the engines of the larger steamer should be condensing, and as their weight will therefore be considerable, it will be well to place them not too far aft, and as moreover the part of the vessel aft of the engine-room can be conveniently utilized, there is not much object, beyond the shortening of the screw shafts, in putting them far from the centre of the vessel. Taking the length over all at 101 feet the following distribution would seem to be convenient:—

13 feet bow, for capstan, chain-lockers, etc., bulkhead.	
15 „ fore-cabin	do.
7½ „ bed do.	do.
6 „ bath-room	do.
24 „ engines and boilers	do.
26 „ after-cabin	do.

9. The depth of the vessel, or, in other words, the freeboard should be kept as low as may be convenient, for it is advisable that the sill of the cabin windows should not be more than 1 foot or 15 inches above the level of the fixed seats, and the cabin floor with a high freeboard would have to be raised considerably, while no use of the space beneath could be made.

10. All the interior of the vessels should be readily accessible for renewal of the inside paint.

11. When you have matured the specifications, I shall feel obliged by your affording the District Engineer, Kistna, an opportunity of recording any observation he may wish to make, and then the whole of the papers can be sent to me.

General Specification for Steamers for use on the Godavery and Kistna Rivers and on the Delta Canals.

No. 1 STEAMER.

- Dimensions.*— {Length not exceeding 101 feet.
Breadth „ „ 13½ „
- Draught.*—Not exceeding 3 feet.
- Speed.*—At least 10 miles an hour in open, still water, with wood fuel.
- Power of towing should be considerable as the steamer will be required to take two or three barges of 50 tons capacity across the rivers in moderate freshes, and should be capable of towing one such barge at any time. The maximum current may be taken as five miles an hour.
- Engines to be compound condensing, i.e., having high and low pressure cylinders, to be of the very best materials and workmanship, with well balanced moving parts, expansion gearing, etc., and the cylinders to be very carefully packed to prevent radiation. The engine framing to be strong and perfectly rigid. Taking the gross tonnage at 70 tons, the engines should be about 15 H.P. nominal working up to 70 H.P. indicated.

- The boiler should be tubular of very ample capacity for generating steam, the fire grates of much larger area for the wood fuel which will be principally used than would be necessary for coal. Four cwt. of wood may be taken as equivalent to 1 cwt. of steam coal. The boiler to be completely fitted with steam gauge, double safety valves, water gauge, water and steam cocks, etc., and to be proved to three times the intended working pressure. Spare tubes for the boiler to be supplied with it.
- Great steering power will be essential, for, with a barge or barges in tow and a cross current, any defect in this respect might result in the steamer being carried over the weirs and destroyed.
- Mode of propulsion, single or twin screws; probably the latter will be necessary to secure the requisite power with so small a draught.
- Engines and boilers to be placed as far aft as possible consistently with a proper distribution of weights.
- Hull to be of the very best tough iron plate. It is intended to fit up the vessel with cabin, decks, etc., in India, but in order that the most convenient position for bulkheads and deck-beams may be understood, a section showing the general arrangements proposed accompanies this specification. The weight of the decks, cabins, and fittings may be taken at tons.

No. 2 STEAMER.

Dimensions.— {Length, 60 feet.
Breadth, 9 „

Draught.—2'-9".

Speed.—Nine miles in still water.

Tonnage.—30 to 35.

Engine power.—Ten nominal working up to 40 indicated.

Engines.—Compound, direct acting, non-condensing.

Propeller.—Single or twin screw.

Boiler.—Tubular with ample fire grate for burning wood. All fittings complete and spare tubes.

(Signed) JOHN MULLINS, Lieut.-Colonel, R.E.,

Chief Engineer for Irrigation.

18th March 1873.

From Major J. O. HASTED, R.E., District Engineer, Kistna, to Lieutenant-Colonel J. F. FISCHER, R.E., District Engineer, Godavery, dated Camp at Masulipatam, 5th June 1873, No. 49.

I HAVE the honour to return, herewith, the papers* forwarded with your letter, No. 410, dated 5th May, together with a tracing showing what

Papers returned 8
Sketch 1

* 1 Original letter from Chief Engineer for Irrigation, No. 175, of 22nd March 1873.

- 1 Specification.
- 1 Copy of G. O., No. 1,125, of 21st April 1871.
- 1 Tracing of Steamer.
- 1 Plan of River Steamer.
- 1 Estimate of do.
- 1 Plan of Canal do.
- 1 Estimate for do.

8

light when the side venetians have to be closed in bad weather.

2. I have adopted the outline shown in the plan by Messrs. Seath and Co., but I do not wish to give any opinion as to the lines of the boat. The specification states the speed required, and so long as this speed is secured I would leave the lines to be decided by the Builders, who are much better acquainted with the subject than we are. We require as much space as can

*Proceedings of the Madras Government, Public Works Department,
18th August 1873.*

be provided, with a given length, maximum width and speed; and one objection to the outline you have given is that the space is considerably reduced in consequence of the sharpness of the bows.

3. I have little to suggest as to the specification. If space allows the engines should be compound condensing; this probably may be arranged for the larger steamer, the smaller one having non-condensing engines; otherwise the engines should be as simple as possible and capable of easy adjustment, as they are often worked by unskilful hands. The engine framing of our small steamers is generally too weak; it should be very strong to ensure perfect rigidity. There should be a feed-pump capable of being worked by hand, and effective bilgepumps should be attached to the engines; these points perhaps should be mentioned in the specification.

4. The means of propulsion, I think, should be twin screws in a vessel with so small a draught of water, though I am afraid they would be difficult to keep clear when there are weeds in the canals. In this district, however, the weeds are not very troublesome, and the larger steamer at all events would seldom be used on the canals. I notice that in your sketch the position of the screws is not shown, though I conclude you propose to use screws. I am not myself aware of any better means of propulsion than turn-screws; but if any can be devised that would obviate the risk of damage by fouling the screws, it would be a desideratum.

5. I think spare screws should be sent out with each steamer, without them any accident to the screw would lead to the steamer being laid up for some months.

6. The back of the boiler should be placed 3 feet from the iron bulkhead which shuts off the fore-cabins so that it can be examined and painted when necessary.

7. I have the honour to request that copy of this letter and sketch enclosed may be forwarded to the Chief Engineer for Irrigation. I am sorry my reply has been so long delayed; it is owing to the papers having been mislaid when I was out in the district.

From Lieutenant-Colonel J. F. FISCHER, R.E., District Engineer, Godavery, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation and Joint Secretary to Government, Public Works Department, dated Dowlaiswaram, 30th June 1873, No. 1,014.

ADVERTING to your letter of the 18th March last, No. 175, I have the honour to return all its accompaniments, together with an original letter and design for a Steamer prepared by Major Hasted, R.E., and two designs for steamers, one for river and one for canal navigation, prepared by myself.

2. I have sent in estimates for these of the quantity of iron likely to be required, but I have not attempted to prepare any specification, which, I fear, must be left to more competent hands in dealing with English builders, as we have no experience here in such matters. The lines I have adopted are those approved of by Colonel Rundall, and have been found to answer very well in sailing vessels. I do not consider sky-lights should be provided in these vessels as they spoil the deck, admit the sun, and can seldom be kept water-tight. It is very easy to thoroughly ventilate the whole vessel by tube ventilators fixed to the sides. The screw, I consider, should be protected from weeds by having a ring of iron fixed round the well, carrying sharp sword-blades which would cut the weeds without interfering much with the speed of the vessel.

3. In a private letter to me just received, Sir A. Cotton says, he has sent out steamers for the Orissa works, costing only £320 a piece; their dimensions are small, apparently 30 feet in length and 6 feet beam; but as he takes the greatest interest in all matters connected with inland steam navigation, and is well acquainted with several of the best Engineers and Builders in the trade, I beg respectfully to suggest, for the consideration of Government, that these designs be submitted for his opinion in the event of the Government approving of such vessels being obtained for these works.

- 1 Specification.
- 1 Copy of G. O., No. 1,125, dated 21st April 1871.
- 1 Trading of Steamer.
- 1 Original letter from Major Hasted, R.E., No. 49, dated 5th June 1873.
- 1 Plan of Canal Steamer designed by do.
- 2 Do. of Canal and River Steamers designed by Colonel Fischer, R.E.
- 2 Estimates for do. do.

Despatched in two separate covers.

*Proceedings of the Madras Government, Public Works Department,
18th August 1873.*

Probable Estimate for constructing Hull for Godavery Steamer (river).

Particulars.	No.	MEASUREMENT.			Running or square feet.	lbs. per foot.	Total lbs.
		Length.	Breadth.	Thick.			
Iron for ribs	5	20.9	3 x 3	1/4	103.9		
	1	20.7 1/2	3 x 3	1/4	20.7 1/2		
	1	20.7	3 x 3	1/4	20.7		
	1	20.6	3 x 3	1/4	20.6		
	1	20.3	3 x 3	1/4	20.3		
	1	20.1	3 x 3	1/4	20.1		
	1	20.0	3 x 3	1/4	20.0		
	1	19.10	3 x 3	1/4	19.10		
	1	19.8	3 x 3	1/4	19.8		
	1	19.7	3 x 3	1/4	19.7		
	1	19.3	3 x 3	1/4	19.3		
	1	19.1	3 x 3	1/4	19.1		
	1	18.9	3 x 3	1/4	18.9		
	1	18.6	3 x 3	1/4	18.6		
	1	18.2	3 x 3	1/4	18.2		
	1	17.10	3 x 3	1/4	17.10		
	1	17.5	3 x 3	1/4	17.5		
	1	17.0	3 x 3	1/4	17.0		
	1	16.6	3 x 3	1/4	16.6		
	1	16.0	3 x 3	1/4	16.0		
	1	9.10	3 x 3	1/4	9.10		
	1	11.3	3 x 3	1/4	11.3		
	1	12.8	3 x 3	1/4	12.8		
	1	13.10	3 x 3	1/4	13.10		
	1	15.3	3 x 3	1/4	15.3		
	1	16.3	3 x 3	1/4	16.3		
	1	17.2	3 x 3	1/4	17.2		
	1	18.0	3 x 3	1/4	18.0		
	1	18.8	3 x 3	1/4	18.8		
	1	19.2	3 x 3	1/4	19.2		
	1	19.7	3 x 3	1/4	19.7		
	1	20.0	3 x 3	1/4	20.0		
	1	20.3	3 x 3	1/4	20.3		
	1	20.6	3 x 3	1/4	20.6		
	1	20.7	3 x 3	1/4	20.7		
	1	20.9	3 x 3	1/4	20.9		
	...	326.0	3 x 3	1/4	326.0		
	...	177.0	3 x 3	1/4	177.0		
	1	100.0	3 x 3	1/4	100.0		
	1	186.0	3 x 3	1/4	186.0		
	...	227	3 x 3	1/4	227.0		
Total angle Iron...					1753. 1 1/2	6	10,518 1/2
Sheet Iron for ribs					326"	5"	135.10
Do. do.					177	5"	73.9
					209.7	10	2,095 1/2
Keel plate					252.6	20	5,050
Bilge plate					500		
Hull					708		
Do.					44		
Cover plate					136		
					1,388	15	20,820

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Probable Estimate, etc.—(Concluded.)

Particulars.	No.	MEASUREMENT.			Running or square feet.	lbs. per foot.	Total lbs.
		Length.	Breadth.	Thick.			
Side plate	...	200	2.3	$\frac{1}{4}$	450		
Gunnel plates	2	100	0.6	$\frac{1}{4}$	50		
Gusset pieces	...	195	0.2	$\frac{1}{4}$	32.6		
					532.6	10	5,325
Total Sheet Iron...	...	.....	.....	...	.....	...	33,290 $\frac{1}{2}$
$\frac{1}{2}$ " round iron for revets 18,725.	...	.....	.....	...	4,860	1 $\frac{1}{8}$	5,131
Grand Total Wrought Iron, lbs.	...	.....	.....	...	.....	.....	48,978 $\frac{1}{2}$

ABSTRACT.

Quantity.	Description of work.	Rate.			Amount.			Total.
		RS.	A.	P.	RS.	A.	P.	RS. A. P.
48,978 $\frac{1}{2}$ lbs. ...	Wrought Iron	0	2	2	6,631	13	3	6,631 13 3
	Centage @ 1 @	25	0	0	.....			1,658 2 9
	Total...	.....			.....			8,290 0 0

DOWLAISHWERAM,
30th June 1873.

(Signed) J. F. FISCHER, Lieut.-Colonel, R.E.,
District Engineer, Godavery.

Probable Estimate of Iron work for building Hull of Canal Steamer 70' x 10' x 3'

Particulars.	No.	MEASUREMENT.			Square or running feet.	lbs. per foot.	Total lbs.
		Length.	Breadth.	Thick.			
Angle iron, Keelson ...	1	72.3	3" x 3"	$\frac{1}{4}$	72 $\frac{1}{2}$	6	433 $\frac{1}{2}$
" " Sester keelson ...	2	66.6	3 x 3	$\frac{1}{4}$	133	6	798
" " ribs, rear ...	21	13	3 x 3	$\frac{1}{4}$	273	6	828
" " " front ...	14	10.9	3 x 3	$\frac{1}{4}$	150 $\frac{1}{2}$	6	903
" " " " ...	1	272	3 x 3	$\frac{1}{4}$	272	6	1,632
" " Keelson pins ...	2	70	3 x 3	$\frac{1}{4}$	140	6	840
" " Sester do. ...	2	67	3 x 3	$\frac{1}{4}$	134	6	804
Sheet Iron for ribs ...	1	28.0	0.5	$\frac{1}{4}$	116 $\frac{3}{4}$	10	1,166 $\frac{1}{2}$
" " keel plate ...	1	66	2	$\frac{1}{2}$	132	20	2,640
" " bilge plate ...	2	71.6	2.6	$\frac{3}{8}$	357 $\frac{1}{2}$	15	5,362 $\frac{1}{2}$
" " hull ...	2	71.6	2.6	$\frac{3}{8}$	357 $\frac{1}{2}$	15	5,362 $\frac{1}{2}$
" " side plate ...	2	71.6	1.9	$\frac{1}{4}$	250 $\frac{1}{2}$	10	2,502 $\frac{1}{2}$
" " ground plates ...	2	71.6	0.6	$\frac{1}{4}$	71 $\frac{1}{2}$	10	715
" " cover ...	1	144	0.4	$\frac{3}{8}$	48	15	720
$\frac{1}{2}$ " round Iron for 11,000	...			...	2,750	1 $\frac{1}{8}$	2,921
Total...	...			...			27,628 $\frac{1}{2}$

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18th August 1873.*

ABSTRACT.

Quantity.	Description of works.	Rate.			Amount.			Total.
		RS.	A.	P.	RS.	A.	P.	RS.
27,628 $\frac{1}{2}$	lbs. Wrought Iron	0	2	2	3,741	5	2	3,741 5 2
	Centage	25	0	0	935	10	10	4,677
	Total...	.....			.....			4,677

DOWLAISHWERAM, 30th June 1873. (Signed) J. F. FISCHER, Lieutenant-Colonel, R.E.,
District Engineer Godavery.

SUBMITTED to Government with reference to paragraph 5 of G. O., No. 673, dated 3rd March 1873.

2. These papers will afford to the Ship-builders in England sufficient information to enable suitable designs to be prepared for the steamers of the two classes required, and it is recommended that, in the first instance, two of the smaller and one of the larger vessels be ordered.

* Dated 18th March 1873.

The general specification* may be taken as a guide to the dimensions, and the tracings will show the general arrangement of the cabin fittings, which it is intended to construct, together with the decks and all wood-work, at Dowlaishweram; the hull, boilers, engines, etc., being alone required from England. Spare screws for each steamer should be provided.

3. The hulls of the steamers can be put together at Dowlaishweram, and these together with the engines, boilers, etc., should be shipped direct to Cocanada to the address of the District Engineer, Godavery.

(Signed) J. MULLINS, Lieut.-Colonel, R.E.,
Chief Engineer for Irrigation.

No. 275. ORDER THEREON, 18th August 1873, No. 2,050.

ACCOUNT, No. 22.

THE Government approve of the proposal of the Chief Engineer for Irrigation to obtain from England two small and one larger steamer, for use on the canals of the Godavery and Kistna Deltas, and for river work, and an indent will accordingly be forwarded to the Secretary of State, together with a copy of these Proceedings, which contain, it is hoped, sufficient information to enable vessels of the description required to be designed.

2. The cost of the larger steamer, including the wood-work and fittings, to be executed in this country, is estimated by Lieutenant-Colonel Mullins at £2,000, and that of the smaller steamers at £1,000 each.

(True Extract.)

Lieut.-Colonel, R.E.,
Joint Secretary to Government.

To the District Engineer, Godavery.
" do. Kistna.
" do. Presidency.
" Officiating Controller of Public Works Accounts.
" Chief Engineer for Irrigation.
Etd. T. O'Connor.
Spare Copies.

Read the following :—

No. 78.

No. 310. *Note by the Chief Engineer for Irrigation.*

PARTICULARS of the number and condition of the river steamers attached to the Godavery Delta have recently been laid before Government, and arrangements for ensuring their being maintained in a more efficient state have been sanctioned.* These steamers are all propelled by side paddles, and it was noticed that this mode of propulsion is not well adapted to canal navigation, and I stated that I hoped that before long the Government would obtain a much more serviceable and efficient steamer propelled probably by twin screws.

2. Captain A. T. Fraser's letter, with its enclosures, has arrived opportunely, and, as I am about to proceed to England on furlough, I should like to take up the subject where he has left it, and to endeavour to get a river steamer designed and built to answer the purposes for which such vessels are required in the Godavery, namely, to tow in the river, sometimes against and across a considerable current, and to be handy canal boats. The principal conditions to be satisfied are—

(1.) Dimensions— $\left\{ \begin{array}{l} \text{Length not exceeding 101 feet.} \\ \text{Breadth } 13\frac{1}{2} \text{ to 14 feet, the lesser breadth being preferable.} \end{array} \right.$

(2.) Draught not exceeding 3 feet.

(3.) Speed should be 9 statute miles, at least, an hour in still-water, with wood fuel.

(4.) Power of towing should be considerable, as the steamer would be required to take two if not three barges, of about 50 tons capacity each, across the river in moderate freshes, and should at all times be capable of towing one such barge. The maximum current in the river may be taken as 5 miles an hour.

(5.) The boiler should be of very ample capacity for generating steam, and with the engines, which should be as simple as possible, should be of the very best manufacture, and fitted with such fuel-saving appliances as have been found to answer most effectually. The first cost of the engines and boiler is a matter of less importance than economy in working, and a minimum of wear and tear; and if high piston speed be provided for, good workmanship and well balanced moving parts are essential in the engines, as well as strength and rigidity in the framing.

(6.) Great steering power will be essential, for, with a barge or barges in tow and a cross current, any defect in this respect might result in the steamer being carried over the anicut.

3. It is not perhaps necessary to extend the specification here. I hope £2,000 would be sufficient for a steamer of the kind required; but if the Government are pleased to entrust to me the obtaining of a steamer, I think I may safely promise to look carefully into all the details, and that no arrangements involving additional cost will be adopted, without clear evidence of their advantage in securing proportionately increased efficiency. I would therefore name £3,000 as the

*Proceedings of the Madras Government, Public Works Department,
21st April 1871.*

maximum cost to be allowed; this sum to be inclusive of all expenses and to provide for freight to Cocanada, insurance, etc. I should propose to take several months for ascertaining what has already been done in England, and perhaps elsewhere, of late years, in improving the construction of river steamers, and then to obtain, either from Messrs. T. B. Seath & Co. of Glasgow, or from some other firm, detailed plans and estimates, which would be submitted to the Secretary of State with a report. After this sufficient time would remain for building the vessel and having it fully tried, so as to ascertain that all conditions of efficiency had been secured.

FORT SAINT GEORGE, (Signed) J. MULLINS, Major, R.E.,
13th March 1871. Chief Engineer for Irrigation.

From Captain A. T. FRASER, R.E., to the Chief Engineer for Irrigation, Madras, dated 16, Dalhousie Street, Glasgow, 17th January 1871.

I HAVE the honour to send, as an accompaniment to this, a sketch drawn up by a builder here, at my suggestion, of a steam-boat suitable to the Madras canals. Having, with a view to seeing if they would answer, examined the small ferry-boats in use on the Clyde, and finding there were objections to their pattern, I applied for further information to the Engineer of the trust, who very kindly put me in communication with a practical man, a member of the small firm of Seath & Co., who appear to confine themselves almost exclusively to the building of iron boats and barges of light draught. My own experience of canals in the Madras Presidency has been chiefly in the Kistna District, and I told the builder that the conditions to be fulfilled were a draught not much exceeding 2½ feet; a breadth of beam not over 15 feet, to go through the locks; a speed of about 7 miles an hour in still or nearly still-water; and certain particulars in arrangement of the storage and passengers' accommodation which are more or less indicated on the plan. It was at once agreed that the best means of propulsion would be by "twin screws," as the limited breadth did not afford scope for side-paddle wheels. I remember that the small steamers at Bezwarah, constructed by Forrester & Co., failed in speed, especially against current, on account of the narrowness of the paddle floats, which were also much in the way in parts of the canal, which had partially silted up, continually striking the mud. The design has, therefore, a pair of screws, one on each side of the stern post, worked by direct acting engines of about 15-horse power. The builder said it would be necessary, on account of the light immersion, that the screws have a diameter of 4 feet to ensure the necessary bite in the water. Steering is performed either by the rudder, or an attachment which acts on the throttle valves connected with each of the screws. The engines would be fitted with expansion gear, so as to economize steam when going with a current and yield full power in the opposite case. Messrs. Seath state, in forwarding the tracing, that the boat "fitted up in frames, plates, etc., painted, marked, lettered, etc., taken down and delivered alongside a ship on the Clyde will cost £1,400." This, I presume, is a rough estimate, and that it would be subject to some variation according to the more detailed specification which would be sent from India, as I only gave leading points and dimensions. What very much induced me while here to take the matter of the best form of canal boat up was a discussion which took place in the Kistna District in 1860, when the Native Company began to engage in the navigation of the Masulipatam canal. This company had been in correspondence with English firms as to suitable steamers, and were recommended those with stern wheels, as on the whole the most likely model. However the great weight of the paddle wheel aft, the first cost of the steamers and expense of fuel, led them eventually to discard the idea of steamers and employ track boats that they built themselves. The Department Public Works, as you are aware, continued to use both at Bezwarah and Dowlaisweram the narrow paddle-wheel steamers of Messrs. Forrester. It seems to me that there is a field for properly adapted light draught steamers on the Godavery and

*Proceedings of the Madras Government, Public Works Department,
21st April 1871.*

Kistna canals, when the Native Company were not at all unwilling to take up steam power as well as on other navigated canals in the Presidency, and that my having found a firm able to build, to whom I have described the requisite conditions, or at all events my ventilating the subject, may possibly be of service. Whilst writing this letter to-day, a Mr. Moodie of Glasgow, the Patentee of a very ingenious, feathering propeller, called upon me at the instance of Messrs. Seath & Co. to explain his invention, which he thought would be superior for my style of vessel to the twin screws. He also gave me his circular, which I send along with the tracing. The idea may be described as that of a feathering paddle laid on its side and fixed in the dead part of the stern, where a screw generally is but upon a verticle, axis. The novelty rests in the mechanism for feathering the floats which gives, it would appear, propulsion on one side and absolutely no resistance on the other. The inventor said he had submitted the principle to Professor Rankine who had pronounced the feathering mathematically perfect, and so it would appear from such rough test as I was able to apply to the model. The advantage claimed for this propeller over twin screws is entire immersion, and consequently maximum of power in cases of light draught, whilst, as its diameter is much the same as that of a screw, there is not the weight of a stern wheel of the ordinary kind. The patentee has had the difficulty experienced by all inventors of getting a capitalist ship-builder to give the horizontal propeller a fair trial, but it appears to me that it promises well, and is likely to overcome some of the impediments to free steam navigation of Madras canals or rivers, and I have no doubt that were builders here encouraged to think there would be a sale for canal boats, either to Government or private Companies, they would devote the requisite attention to their peculiar construction, taking more interest and trouble in the matter than as a mere chance speculation. Perhaps you would let Superintending Engineers and Secretaries of the Kistna and Godavery Navigation Companies see these papers, in case either the sort of steamer or mode of propulsion might be usefully introduced on the canals.

No. 311.

ORDER THEREON, 21st April 1871, No. 1,125.

CIVIL WORKS, No. 20.

THE Government have no doubt that Major Mullins' leisure while on furlough might profitably be utilized in investigating the question of the description of river steamers best adapted to overcome the impediments to free steam navigation on the canals and rivers in this Presidency, but as the Secretary of State has distinctly prohibited local Governments from procuring stores or plant from England except through the intervention of the Home Government, His Excellency the Governor in Council regrets that he is precluded from empowering Major Mullins to procure a steamer of the kind required.

(True Extract.)

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

To Major J. Mullins, R. E.
,, the Acting Chief Engineer for Irrigation.

Exd. S. T. Augustin.

Probable Estimate of Iron work for building hull
of Canal Steamer. 70' x 10' x 3' 13

Particulars	Number	Measurement			Square or Round ft.	lbs per ft	Total lbs
		L	B	Thick			
Angle iron Keelson	1	72.3	3 x 3	$\frac{1}{4}$	72 $\frac{1}{4}$	6	433 $\frac{1}{2}$
" " Sexter Keelson	2	66.6	3 x 3	$\frac{1}{4}$	133	6	798
" " Ribs rear	21	13	3 x 3	$\frac{1}{4}$	273	6	828
" " " front	14	10.9	3 x 3	$\frac{1}{4}$	150 $\frac{1}{2}$	6	903
" " " "	1	272	3 x 3	$\frac{1}{4}$	272	6	1632
" " Keelson pins	2	70	3 x 3	$\frac{1}{4}$	140	6	840
" " Sexter do do	2	67	3 x 3	$\frac{1}{4}$	134	6	804
Sheet Iron for ribs	1	280	0.5	$\frac{1}{4}$	116 $\frac{2}{3}$	10	1166 $\frac{1}{2}$
" " Keel plate	1	66	2	$\frac{1}{2}$	132	20	2640
" " Buldge plate	2	71.6	2.6	$\frac{3}{8}$	357 $\frac{1}{2}$	15	5362 $\frac{1}{2}$
" " Hull	2	71.6	2.6	$\frac{3}{8}$	357 $\frac{1}{2}$	15	5362 $\frac{1}{2}$
" " Side plate	2	71.6	1.9	$\frac{1}{4}$	250 $\frac{1}{4}$	10	2502 $\frac{1}{2}$
" " Ground plates	2	71.6	0.6	$\frac{1}{4}$	71 $\frac{1}{2}$	10	715
" " Cover plates	1	144	0.4	$\frac{3}{8}$	48	15	720
$\frac{5}{8}$ Round Iron for 11000	.	.	.	.	2750	1 $\frac{1}{16}$	2921
Total lbs							27628 $\frac{1}{2}$

Abstract.



Quantity	Description of Works.	Rate	Amount	Total
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27,628 1/2 lbs	Wrought Iron	22	3,741 52	
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	Centage	25	935 10 10	
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4,677

Total Rupees 4,677

District Engineer's office,
Godavari
Dowlaiswarum.
30th June 1873—

W. T. Tucker Lieut Col. R.E.

District Engineer Godavari

Probable Estimate for Constructing hull for Godavery Steamer (ribs) 17

Particulars

Measurement
No Length Breadth Thick Running or Square Feet lbs per foot Total lbs

5	20.9	3x3	1/4	103.9
1	20.7 1/2	3x3	1/4	20.7 1/2
1	20.7	3x3	1/4	20.7
1	20.6	3x3	1/4	20.6
1	20.3	3x3	1/4	20.3
1	20.1	3x3	1/4	20.1
1	20.0	3x3	1/4	20.0
1	19.10	3x3	1/4	19.10
1	19.8	3x3	1/4	19.8
1	19.7	3x3	1/4	19.7
1	19.3	3x3	1/4	19.3
1	19.1	3x3	1/4	19.1
1	18.9	3x3	1/4	18.9
1	18.6	3x3	1/4	18.6
1	18.2	3x3	1/4	18.2
1	17.10	3x3	1/4	17.10
1	17.5	3x3	1/4	17.5
1	17.0	3x3	1/4	17.0
1	16.6	3x3	1/4	16.6
1	16.0	3x3	1/4	16.0
1	9.10	3x3	1/4	9.10
1	11.3	3x3	1/4	11.3
1	12.8	3x3	1/4	12.8
1	13.10	3x3	1/4	13.10
1	15.3	3x3	1/4	15.3
1	16.3	3x3	1/4	16.3
1	17.2	3x3	1/4	17.2
1	18.0	3x3	1/4	18.0
1	18.8	3x3	1/4	18.8
1	19.2	3x3	1/4	19.2
1	19.7	3x3	1/4	19.7
1	20.0	3x3	1/4	20.0
1	20.3	3x3	1/4	20.3
1	20.6	3x3	1/4	20.6
1	20.7	3x3	1/4	20.7
1	20.9	3x3	1/4	20.9

Carried Over 727

Less Iron for ribs

26 9/10 45 3/4
S.M. 434 3/4

737

5" Round iron for perote 18,725	4860	$\frac{1}{16}$	5164
Grand Total Wrought iron lbs			48,973 $\frac{1}{2}$

100

District Engineer's Office Godavari
Dowlaisheram 30 Jano 1873.

Westchester Locust Hill RR
District Engineer Goddard

No 1045/73
 P. W. 4343/73.
 Enclosures in a letter
 No 1014, dated 30th June
 from the District
 Engineer for Irrigation
 to the Chief Engineer
 for Irrigation

1014 District Engineer's Office, Government
 Irrigation 30th June 1873
 Defd 12, July 73
 Sir,
 Lieut. Col. J. P. F. Freshfield M.A.
 District Engineer, Government
 Lieut. Col. J. Mullins M.A.
 Chief Engineer for Irrigation and
 Joint Secy to Government M.A.
 Messrs

In reply to your letter of the 18th
 March last No 175. I have the honor to return
 all its accompaniments together in the
 original letter and design for a steamer
 prepared by Major Hawks M.A. and 2 designs
 for steamers, one for river and one for Canal
 navigation prepared by myself.
 I have sent in estimates for these of
 the quantity of iron likely to be required,
 but have not attempted to propose any
 specification which I fear must be left
 to more competent hands in dealing with
 English builders as we have no experience
 here in such matters; the lines I have adopted
 are those approved of by Colonel Pinnock,
 and have been found to answer very well
 in sailing vessels. I do not consider sky-
 lights should be provided in these vessels
 as they spoil the deck, admit the sun in,
 and can seldom be kept water-tight.

is very easy to thoroughly ventilate the whole vessel by tube ventilators fixed to the sides; the screw I consider should be protected from weeds by having a ring of iron fixed round the ~~tube~~, carrying sharp sword-blades which would cut the weeds without interfering much with the speed of the vessel.

3. In a private letter to me just received, Sir A. Cotton says he has sent out Steamers for the Orissa works costing only £200 a piece, their dimensions are small apparently 30 ft in length and 6 ft beam, but as he takes the greatest interest in all matters connected with inland steam navigation and is well acquainted with several of the best Engineers and Builders in the trade, I beg respectfully to suggest for the consideration of Government that these designs be submitted for his opinion in the event of the Government approving of such vessels being obtained for these works.

Have the honor to be

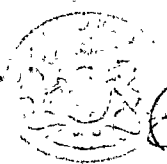
Sir

Your most Obedt Servant

W. T. Tucker
Lieut. Col. R.E.
(District Engineer Godavari)

No. 49.

District Engineer's Office
Camp Massanutten
5 June 1873.



From
The District Engineer
Kistna
To
The District Engineer
Godavery.

Enclosures
Papers retained 8.
Sketches 1/9 Sir,

I have the honor to return
herewith the papers forwarded with
your letter of 410 dated 5th May
together with a tracing showing what
I consider would be the best arrange-
ments of the interior of a steamer to
be used on the River and Canals. The
sketch refers to the larger steamer, the
arrangements in the smaller one
would be much the same, the size
of the compartments being some what
smaller, and the bed room being done
away with. In both cases I would
have a skylight over the centre of the
front cabin with windows to open
inside, it adds to the coolness of
the cabin and affords light when

- 1 Original Letter from Chief Eng^r for Godavery dated 10th May 1873
- 1 Specification of 21st April 1871
- 1 Copy of G.O. No. 1135 of 21st April 1871
- 1 Tracing of steamer
- 1 Plan of river steamer
- 1 Estimate of cost
- 1 Plan of Canal steamer
- 1 Estimate for cost

C.S. No. 1045
By

From
The District Engineer
Godavery.
To
The District Engineer
for Navigation
Kistna.

Dated 30th June 1873
Received 8th July -
10/10/14
Encls: 8

Forward a design
for a steamer prepared
by the District Engineer
Kistna and those prepared by
himself for River and
Canal steamers.

P.M. 4343/73

the side ventricles have to be closed in bad weather.

2. I have adopted the outline shown in the plan by Messrs. Leath and Co. but I do not wish to give any opinion as to the lines of the boat. The specification states the speed required, and so long as this speed is secured, I would leave the lines to be decided by the builders who are much better acquainted with the subject than we are. We require as much space as can be provided, with a given length, maximum width and speed, and one objection to the outline you have given, is that the space is considerably reduced, in consequence of the sharpness of the bows.

3. I have little to suggest as to the specification. If space allows the engines should be compound Condensing. This probably may be

arranged for the larger steamer, the smaller one having non condensing engines. otherwise the engines should be as simple as possible and capable of easy adjustment, as they are often worked by unskilful hands. The engine framing of our small steamers is generally too weak, it should be very strong to ensure perfect rigidity. There should be a feed pump capable of being worked by hand and effective bilge pumps should be attached to the engines, these points perhaps should be mentioned in the specification. 4. The means of propulsion. I think should be twin screws in a vessel with so small a draught of water, though I am afraid they would be difficult to keep clear when there are weirs in the Canals. In this district however the weirs are not very troublesome and the larger steamer at all events would seldom be

need on the Canals - I notice that
in your sketch the position of the
screws is not shown, though I con-
clude you propose to use screws.
I am not myself aware of any
better means of propulsion than turn
screws, but if any can be devised
that would abate the risk of
damage by fouling the screws, it
would be a desideratum.

5. I think spare screws should
be sent out with each steamer,
without them any accident to the
screw would lead to the steamer
being laid up for some months.
6. The back of the boiler should
be placed 3 feet from the Iron
bulk-head which shuts off the
fore cabins so that it can be
examined and painted when necessary.
7. I have the honor to request
that copy of this letter and sketch

78
enclosed may be forwarded to the
Chief Engineer for Irrigation. I am
sorry my reply has been so long
delayed, it is owing to the paper
having been mislaid when I
was out in the district.

I have the honor to be
Sir,
Your most obedient servant
J. H. Steel Major R.E.
District Engineer R.E.

to be very carefully packed to prevent radiation. The engine framing to be strong and perfectly rigid. Taking the gross tonnage at 70 tons the Engines should be about 15 HP nominal working up to 70 HP indicated.

6 - The boiler should be tubular of very ample capacity for generating steam, the fire grates of much larger area for the wood fuel which will be principally used, than would be necessary for coal. Four cwt of wood may be taken as equivalent to 1 cwt of steam coal. The boiler to be completely fitted with steam gauge, double safety valves, water gauge, water and steam cocks &c, and to be proved to 3 times the intended working pressure. Spare tubes for the boiler to be supplied with it.

7 - Great steering power will be essential for, with a barge or barges in tow and across current, any defect in this respect might result in the Steamer being carried over the weirs and destroyed.

8 - Mode of propulsion single or twin screws - probably the latter will be necessary to secure the requisite power with so small a draught.

9 - Engines and boilers to be placed as far aft as possible consistently with a proper distribution of weights.

10 - Hull to be of the very best tough iron plate. It is intended to fit up the vessel with cabin, decks &c in India, but in order that the most convenient position for bulkheads and deck beams may be understood, a section showing the general arrangements proposed accompanies this specification. The weight of the decks, cabins and fittings may be taken at 8 tons.

No. 2 Steamer

Dimensions. { Length 60 feet
Breadth 9

Draught - 2' - 9"

Speed - 9 miles in still water

Tonnage - 30 to 35

Engine power - 10 nominal working up to 40 indicated.

Engines - Compound, direct acting
non condensing.

Propeller - Single or twin screw.

Boilers - tubular with ample
fire grate for burning wood.
all fittings complete and
spare tubes.

Wm. L. Williams Lieut. Col. R.D.
Chief Engineer for Disposition.

18 March 1873

Recd. Williams
with friends
1873

CSO 1/104573.
P. M. 4343/73.

1/104573

Fort L. G. 1
18 March 1873.

From
The Chief Eng^r for Disposition
To The District Engineer, Goddard

With reference to para 5 of
Instructions L.O. 1125 of the 3rd instant, I
have the honor to forward stated
copy of 7th 1125 specifications for 2 classes of steamers,
the one of about 70, and the
other of between 30 & 35 tons, &
to request that you will be good
enough, at your convenience, to
complete the specifications making
whatever alterations may be con-
sidered advisable, and to prepare
a section of each vessel showing
the cabin & other arrangements.
2. I enclose a copy of L.O. 1125
of the 21st April 1871, and the tracing
of the steamer obtained by Captain
Fraser.
3. The larger steamer is intended for

for general purposes in the rivers
& canals. It should be powerful
enough to be used in crossing
the rivers at all times, and be
capable of towing barges across
also, except perhaps during very
high freshes in the Hudson. The
smaller steamer would be used
for towing when the current is
moderate, for keeping up com-
munication across the river, & it
should be a handy, comfortable
& economical boat for inspection
purposes, especially for running
up the Goddard when the upper
Goddard works may have to be
inspected.

4. You may, if you wish, de-
sign the two steamers in a gene-
ral way. Their lines would pro-
bably be modified by the Builder,
as very great improvements have
in recent years been effected in

respects

respects of this class and tonnage.
5. I attach much importance
to the use of compound engines.
They have effected a complete re-
volution with regard to consump-
tion of fuel, and I anticipate
that the working expenses of
these steamers, if successful, will
be so moderate as to admit
of their constant use.

6. When in England I had
many opportunities of seeing small
steamers at work. Some boats
are of as small a burden as
7 or 8 tons. The engines are placed
about 8 feet from the screw im-
mediately over the screw shaft,
and are direct acting. The steam
pressure is 40 to 60 lbs and the
engines make 120 to 190 revolu-
tions per minute. A steam ferry
boat, which I saw & made use

of

of at Portsea was 50 feet long,
9 feet beam, had engines of
the above description, of 10 HP
nominal, boiler tubular & 8 feet
long steam pressure 50 lbs, cy-
linder 10 inches diameter & 12
inches stroke, and burnt 6 cwt
of coal (Welsh) in 14 hours. The
cost of the steamer complete
was £750. This vessel had
not compound engines. With
them the consumption of fuel
would probably not have been
more than between 3 & 4 cwt.
The Navy has steam boats of
two descriptions, the smaller
called Miners which have
one screw, the larger Launches
with twin screws. Those being
for use at sea have a great
beam, but ^{some} of them are never
the less very fast.

7.

7. I am anxious that the
new steamers, which are now to
be obtained from England, should
be in all respects thoroughly
efficient. A few years ago
Builders had not had much
experience in the construction of
such boats, but now there
are hundreds of these vessels
performing all sorts of work,
and I think that, if the
requirements of the steamers
we want be clearly explained
& specified, the results will
be satisfactory. I should es-
timate the cost of the larger
vessel at £2,000 and that
of the smaller at £1,000.

8. I have suggested that
the engines of the larger steamers
should

should be condensing, & as their weight will therefore be considerable, it will be well to place them not too far aft and, as moreover the part of the vessel aft of the engine room can be conveniently utilized, there is not much object, beyond the shortening of the screw shafts, in putting them far from the centre of the vessel. Taking the length over all at 101 feet, the following distribution would seem to be convenient

13 feet, bow, for captain, chain locker & bulwark	
15-0- forecabin	
7 1/2-0- bed-0-	— do —
6-0- bathroom	
24-0- engines & boiler	— do —
26-0- aftercabin	— do —
	— do —

9. The depth of the vessel or in other words the freeboard should be kept as low as may be convenient, for it is advisable that the sill of the cabin windows should not

not be more than 1 foot or 15 inches above the level of the fixed seats, and the cabin floor with a high freeboard would have to be raised considerably, while no use of the space beneath could be made.

10. All the interior of the vessel should be readily accessible for renewal of the inside paint.

11. When you have matured the specifications, I shall feel obliged by your affording the District Engineer Kistna an opportunity of recording any observations he may wish to make, & then the whole of the papers can be sent to me.

I have the honor to be
Sir
Your most obedient Servant

Respectfully John Mullins Esq.
Chief Eng^r for Irrigation
[True copy]

Wm. L. L. Esq.
Chief Eng^r for Irrigation

No 429A.

P 10

Letter No 175. 18th March 1873 to Dis-
tinct Engineer Goddard.
General specification of 2 classes of
steamers.

From Dist^{ct} Engineer, India No 429
5th June 1873

— do — Goddard No 1014-

30th June 1873.

2 estimates

14 tracings of designs of steamers.

Submitted to Government,
with reference to para 5 of
L.O., No 673 dated 3rd March
1873.

2 These papers will afford
to the ship-builders in England
sufficient information to enable
suitable designs ^{to be prepared} for the steamers
of the two classes required, &
it is recommended that, in
the first instance, two of the
smaller and one of the larger
vessels

Letter No 175. 18th
March 1873 to the
Dist^{ct} Eng^r Goddard.

No 429A/175.

No 1014-

specifications be ordered. The general
specification may be taken as + dated 18th
a guide to the dimensions, & March 1873.
the tracings will show the
general arrangement of the
cabin fittings, which it is
intended to construct, together
with the decks & all wood
work, at Dowlaisheeram, the
hull, boilers, engines &c. being
alone required from England.
Spare screws for each steamer
should be provided.

3 The hulls of the steamers
can be put together at Dowlaisheeram, and these together with
the engines, boilers &c. should be
shipped direct to Cochin & to the
address of the District Engineer
Kodaverry.

Estacannur John Mullins Lt Col R.E.
16th July 1873. Chief Engineer for Irrigation
To The Secretary to Govt. P.W.D.

12
A^o 2050 P.M. d.

Pro. of the Madras Govt
and the following

From the Secy for P.R. No 429 of 1873
Mist.

The Government
approve of the proposal
of the Chief Engineer for
irrigation to obtain from
England 2 small and
1 larger steamer, for
use on the Canals
of the Godavery and
Kistna Deltas, and for
river work, and an
indent will according
ly be forwarded to
the Secretary of State,
together with a copy
of these Proceedings, which
contain

J. D. S.

1873
14.03.73

Chief Engineer for
irrigation

to the Secretary
Government

P. D. S.

Dated 18th July 1873.

No. 429 d.

1873

to the Secretary
Government

Estimates with a specific
reference for use on the
Canals of the Godavery
and Kistna Deltas

No 274

No 2050-18 July 73

Re. 4. Aug 73

contain, it is hoped,
sufficient information
to enable vessels of the
description required to
be designed.

2. The cost of the
larger steamer inclu-
ding the wood work
& fittings to be execu-
ted in this country,
is estimated by Lieut
Colonel Mullins at
£2,000 & that of
the smaller steamers
at £1,000 each.

W. 23/7/73

W. M. C.

To The Dir. Imp. Govt. Secy. S

— — — — — Victoria S

— — — — — Presiding S

— — — — — Controlling M^r acct. S

— — — — — Chief Agents for Immigration S

Disb. in the S.C. 2/9/73

N^o 274-75

D. 4. Aug 73

Ch 4913

Govt. of 1873 Madras.

PUBLIC WORKS.

To

The Dist Engr Godavary

Wingate J.

Dated Aug 18.

Issued

Recd

Encl.

G. O. 18th Aug 1873 No. 2050

Nos. 274-275

Steamers. — Proposal of
the Chief Engineer for Irriga-
tion to obtain from England
three steamers for use on the
Canals of the Godavary and
Kistna Deltas, approved with
remarks.