

Recd 387/✓

No. 1297 Wd/ 25 May 1886

Gobt. of {1886} Madras.

MARINE.

Communicated to
the Ch. Eng^r for Irrigation,
to Superintending Engineers
for information.

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Issued

Recd. 21/5/86

Encl.

G.O., 22nd April 1886, No. 206.

No. 1297 Wd/ 25 May 1886

APRIL.

Ch. E. for I ✓

Ch. E. for I ✓
Supt. Eng^r ✓

Decd
25/5/86

Ref. 80/5.

26/5/86

Dredgers.

Directing that certain papers relative to the kind of dredger to be sent out for work in the Pamban Pass be forwarded to the Secretary of State.



Encl. in R.

22ND APRIL 1886, No. 206, MARINE.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

READ—the following papers :—

From Captain J. E. BROADBENT, R.E., Assistant Secretary to the Government of India, Military (Marine) Department, to the Secretary to the Government of Bengal, dated Simla, 16th June 1885, No. 816.

I am directed to forward the accompanying copy of a telegram* received from the Government of Madras, and to ask

* Dated 13th June 1885.
“ Early information requested as to working of Bengal hydraulic dredger.”

that, under the orders of the Honorable the Lieutenant-Governor, the information desired regarding the working of the Bengal hydraulic dredger may be furnished direct to the Government of Madras.

Forwarded to the Secretary to the Government of Madras, Marine Department.

(By Order.)

(Signed) J. E. BROADBENT, Captain, R.E.,
Asst. Secy. to the Govt. of India.

From J. W. EDGAR, Esq., Officiating Secretary to the Government of Bengal, Municipal Department (Marine), to the Acting Chief Secretary to the Government of Madras, dated Calcutta, 29th December 1885, No. 3021.

With reference to your telegram, dated the 13th June last, to the address of the Government of India, Military (Marine)

Memorandum from the Government of Bengal, Public Works Department, No. 1398-I, dated 14th December 1885, and enclosure.

Extract paragraph 8 from the Revenue report of the Superintending Engineer, South-Western Circle, for the year 1883-84.

Department, I am directed to forward, for the information of the Government of Madras, the papers noted in the margin, which contain all the particulars available regarding the working of the Bengal hydraulic dredgers.

ENCLOSURES.

Memorandum from Major A. D. McARTHUR, R.E., Under Secretary, Public Works Department (Irrigation), to the Secretary to the Government of Bengal, Municipal Department, dated Calcutta, 14th December 1885, No. 1398-I.

In continuation of this office memorandum, No. 375-T.J., dated 14th October last, the undersigned has the honor to forward herewith a copy of letter, No. 778, of the 18th ultimo, from the Executive Engineer, Cossye division, giving a description of the hydraulic dredgers *Atlas* and *Ajax* which have been in use for some time on the Midnapore canal, and stating what defects have been noticed in the different working parts.

2. For a statement of the work performed by these dredgers reference is requested to the table given in page 4 of the Superintending Engineer, South Western Circle's Revenue report for 1883-84. The full working power of the dredgers is not represented by the statement as they have never been supplied with the full complement of hopper barges or served with suitable tugs when there has been a long lead for the silt. The greatest quantity of work obtained from one of these dredgers in one working day in the canal was 16,000 cubic feet of silt dredged when there was a short lead and the allowance of hopper barges ample.

From C. E. LIVESAY, Esq., Executive Engineer, Cossye Division, to the Superintending Engineer, South Western Circle, dated Midnapore, 18th November 1885, No. 778.

As requested in your No. 4255, of the 23rd September 1885, and subsequent reminder, I have the honor to submit herein a report on the working of Bruce's hydraulic dredgers *Atlas* and *Ajax*, including all particulars of original cost and details of machinery which have caused inconvenience, and improvements which might be introduced into future dredgers of the patentees. A previous report was conveyed in this office No. 228 of the 2nd April 1885.

2. *Hydraulic Dredger "Atlas."*—Patentees Bruce and Batho; original cost unknown, dredger having been transferred to this division on loan.

The dredger consists of a wrought-iron built beam supported by, and pivotted at its centre on, iron trusses resting on girders rivetted to the bottom of the boat which contains the dredger and engines; at one end of the beam is fixed the bucket, which consists of three conical scoops working on a central shaft by thrust and tie-rods which alternately close and open them when dredging silt and discharging the same into a shoot. The bucket contains 50 cubic feet, and in the act of being lifted, raises the shoot into which it discharges its contents, the silt sliding off into the hopper barge alongside.

3. The beam is actuated by two plungers working in cast-iron sockets hinged at foot between the trussed standards which carry the beam, one being placed about midway between the centre and bucket, and the other between centre and opposite end from which is suspended a weight to balance the bucket when empty and not working.

4. The power is obtained by a double cylinder steam engine of 12 diameter and 17 $\frac{3}{4}$ " stroke, making, at its most effective speed, 60 revolutions per minute with 95 lb. pressure of steam. The engine works hydraulic rams which pump water from a supply tank into a pipe so as to lift an accumulator of a fixed weight, according to which the power is maintained. The accumulator is composed of leaden weights held in a large iron cylinder resting on a hydraulic ram which lifts it as the pumping is continued but only up to a certain height considered the limit of safety; when this is reached a relief valve is opened, and the water escapes from the main pipe back to the supply tank, thereby obviating all danger to pipes and machinery; smaller pipes convey the compressed water to the plungers under the beam alternately, so that the bucket is driven down by one and raised by the other. Similar pipes are connected with the plungers on the bucket which close the scoops for a bite when the bucket descends and opens them to discharge when it is lifted.

5. The dredger has a draught of 5 feet and can only work in a total of 10 $\frac{1}{2}$ feet depth of water including the silt to be excavated, so that from 6 to 10 $\frac{1}{2}$ feet is the usual range of depth in which she can work. The water level of canal or channel must be under effective control for the dredger to work continuously. The defects observable in her working are as follow:—

- The boiler is said to be too small for the size of engine, and sufficient steam cannot be kept up. In consequence of this circumstance the dredger takes twice the time she would otherwise require to fill a barge. At most, she can only fill two barges and then has to stop to get up steam again.
- The donkey engine is connected with the steam pipe instead of with the boiler direct, and its working is therefore as intermittent as the engine. The donkey would be better if double acting, and requires a bilge pipe to pump out the boat. The donkey should also be connected with the supply tank which is situated on the deck, as water has to be baled into this tank by hand to keep down the temperature caused by the escape water from the supply pipes which is sometimes high enough to soften the guttapercha packing of pumps.
- The accumulator relief valve is fixed nearly at level of bottom of boiler between the latter and the coal bunkers or in a space 15" across. This position makes it most difficult for the valve to be adjusted when the dredger is under steam. The valve should be shifted on deck, and the connection made between the feed and relief pipes.
- The two regulating covers and screws of suction and four of delivery valves wear out, and should be converted so as to carry a bar and regulating screw above cover as in the steel valve for admitting steam to cylinder.
- Patent cylinder lubricator does not work satisfactorily; independent lubricator to be fixed instead of it to each cylinder.
- Eye of cross head for pin of connecting rod requires to be bushed and pinned turned to enable latter to be adjusted when worn on bearing of the connecting rod.
- Blowoff cock of boiler is placed below it near furnace door instead of at end of a pipe at bottom of one side where it can be worked freely at all times; at present it can be manipulated with difficulty and the joint cannot be opened at all.
- Slide valve seating of starting gear had too small a bearing surface and used to wear very quickly and had to be faced daily. The size of posts in new seating has been reduced and metal thickened and answers better. The seating was last renewed four months ago and has to be faced only once a month. The cover plate of the

starting gear was too thin previously, and although ribbed, it buckled under the pressure. It has since been cast solid of double the thickness, and has stood well; a lead joint has been found more convenient than guttapercha and more lasting.

- The shoot which receives the silt from the bucket is too weak and requires the angle iron ribs to be placed closer, they have twice been broken. The brackets carrying the shoot are not connected at the top, and have bent outwards so much that the axle on which the shoot works has nearly come out of its bearings. The brackets will be connected by a screwed tie-rod and nut to prevent the lateral movement.

6. *Hydraulic Dredger "Ajax."*—Patentees Bruce and Batho; original cost Rs. 38,271. The description of the main working parts of the *Atlas* applies to the *Ajax*. The beam of the latter is a little smaller, and the greatest depth in which she can work is 10 feet instead of 10 $\frac{1}{2}$ feet. Her engines consist of a single cylinder of 14 $\frac{1}{4}$ " diameter and 2 feet length of stroke, and the working parts are better arranged than in the *Atlas*. She has a double acting donkey, but no injector as in the *Atlas*.

Blowoff-cock at side of boat and not next boiler connecting pipe can be renewed.

Cross head of connecting rod open suction and delivery valves have fixed covers, valves being adjusted once for all with sufficient play regulated by rubber rings.

Supply tanks on bottom of boat and therefore below water-level in canal and can be renewed at pleasure.

Starting gear lever boxes are smaller than in the *Atlas*, and the valve seatings are in good order, and have given no trouble to renew and face.

7. The power is maintained by 16 valute steel springs instead of the weight accumulator in the *Atlas*, the pressure being communicated by a ram worked in the usual way from the feed pipe. Before the ram is a spring relief valve, which is screwed down by experiment to the power necessary to work the beam, &c. There is a similar relief valve on the main feed pipe behind the spring accumulator, and four lever weighted relief valves connected with the supply pipes. All these are connected with the supply tank into which they discharge surplus water.

8. The apparent defects of this dredger are as follow:—

- There is no hydraulic gauge fitted to the feed pipe by which the pressure of the water may be indicated, and according to which the spring relief valves can be readily adjusted previous to working.
- Although there are six relief valves to pass surplus water when the pressure is too great, there is no arrangement by which the pressure on the accumulator springs can be removed in the case the engine has to stop working suddenly. Such stoppage has a tendency to fracture the springs of accumulator.
- All the feed and supply pipes of both dredges appear to wear very soon, and many have leaked and should be renewed.
- A bar is required to be placed above the shoot to carry a leading block and chain by which the shoot can be raised out of the way when not required for work.

EXTRACT from the Revenue Report of the Public Works Department, Bengal Irrigation Branch, for the year 1883-84.

Para. 8.—The following table shows the working of the dredgers:—

Names of dredgers.	Number of days at work.		Quantity of work done				Cost of working dredger during the year.		Rate per 1,000 cubic feet.	
	1882-83.	1883-84.	Per day.		During the year.		1882-83.	1883-84.	1882-83.	1883-84.
			1882-83.	1883-84.	1882-83.	1883-84.				
"Hector," Bucket	240	216	C. FT. 2,950	C. FT. 3,136	C. FT. 715,430	C. FT. 677,450	RS. 6,883	RS. 6,755	RS. 9.6	RS. 9.97
"Ajax," Hydraulic	213	224	3,896	6,753	829,880	1,512,700	13,469	9,846	9.0	6.51
"Atlas," do.	151	219	4,986	7,695	653,230	1,683,300				
"Combination," Fouracers	245	293	1,486	1,577	364,000	461,950	4,696	3,900	12.8	8.46
Scraper dredger, No. I	291	60	226	242	45,595	14,516	6,376	6,787	52.9	48.4
Do. " II	293	129	194	292	39,500	37,700				
Do. " III	..	188	..	221	..	41,625				
Do. " IV	172	264	204	174	35,250	46,000				
Ordinary and steam hopper and mud barges	..	..	..	..	..	..	5,386	7,973	..	..
Steam launch "Kobaduck"	..	..	..	..	..	..	..	2,850	..	..
Do. "Coot"	..	..	..	..	..	..	..	8	..	..
Do. "Sir Arthur Cotton"	..	..	..	..	..	..	..	215	..	..
Total	1,405	1,593	1,909	2,812	2,682,885	4,477,241	36,810	47,351	13.7	10.57

N.B.—Dredger *Hector* was under repairs from 26th January to 31st March 1884.

The fleet remained as described last year.

The *Hector* was under repair from the 26th January to 31st March 1884.

The cost of dredging has been decreased in the hydraulic dredgers from Rs. 9 to Rs. 6 per thousand cubic feet. The outturn has been increased from 26 to 44 lakhs of cubic feet, and the number of days of working from 1,405 in the preceding years to 1,593 in the year under report.

The number of hopper barges was not, however, such as to obtain full work from the hydraulic dredgers, and, moreover, on account of the draught of the steam hopper barges which were used for towing as well as loading silt, they could not go out into the river at low tides to discharge, and the working was considerably impeded.

The *Hector*, bucket dredger, remained almost entirely at the river entrances at Kantapookur, and could only work at half tides, her outturn being not more than one-third of what she could do in the canal. The daily outturn shows better results than last year, but the outturn for the year is less than last year owing to her being laid up for repairs.

The working of the hydraulic dredgers shows a considerable improvement both in progress and rate. The following statement shows in detail the cost of working the dredger and towing and removing the silt in barges :—

STATEMENT showing Quantity and Cost of working Dredgers, &c., during 1883-84.

Name of dredgers.	Quantity of earth dredged.	Actual cost.	Cost of working dredger.			Rate per 1,000 cubic feet.	Remarks.
			The cost of working steam and ordinary hopper barges and mud barges distributed proportionately to all the dredgers according to the quantity of works executed by them.	The cost of working steam launches charged to dredging, distributed proportionately to all the dredgers according to their actual costs.	Total.		
"Hector" ..	C. FT. 677,450	RS. 6,755	RS. 1,245	RS. 703	RS. 8,703	12.8	Under repairs from 26th Jan. to 31st March 1884.
"Ajax" ..	1,512,700	9,546	2,781	1,024	13,651	9.0	
"Atlas" ..	1,585,300	9,019	3,098	938	13,055	7.7	
"Combination" ..	461,950	3,900	849	406	5,155	11.1	
Scraper dredger No. 1 ..	14,516	1,881	..	..	..	..	
Do. " 2 ..	37,700	1,471	..	..	..	..	
Do. " 3 ..	41,625	1,853	..	..	..	..	
Do. " 4 ..	46,000	1,582	..	..	..	..	
Total ..	4,477,241	36,307	7,973	3,071	47,351	..	

The *Atlas* has the advantage in number of hopper barges and for disposing of silt, being kept nearer the river. Twenty new hopper barges have been received, and an improved outturn is expected during the current year.

The state of all the river entrances was satisfactory; the scraper dredgers worked in them; and advantage was taken of very low tides to scour the entrances by discharging through the lock valves with loaded mud barges moored across the channel. The entrances at Kooltaparah, Bausberiah and Oolooberiah after the flood season were cleaned out by the hydraulic dredgers. The tidal reaches were kept open for navigation, obstruction occurring only in the month of January, due to very low tides and considerable leakage from the valves of locks, which is now being remedied.

The silt in the reach below Panchkoorah has been kept down by the Fouracre's combination dredger. The head sluice channel only was closed at the end of the year for silt clearance. The excavators at the locks have been found sufficient to keep the chambers clear.

The Executive Engineer computes that 3.5 cubic feet of silt are deposited in the first reach of the canal for every 10,000 cubic feet of water admitted, and that for the irrigation season one cubic foot per second of discharge brings in nearly 4,800 cubic feet of silt.

From J. H. TAYLOR, Esq., Lieut., R.N.R., Master Attendant, Madras, to the Acting Chief Secretary to Government, dated Madras, 22nd January 1886, No. 470.

Administrative department.

In attention to endorsement, No. 30, of 8th instant, I have the honor to remark that the information conveyed in the papers forwarded therewith is such as can only

be dealt with by an expert. So far as I am able to judge, it appears to me that the Bengal hydraulic dredger is too complicated, unless manipulated by specially-trained men.

2. What is required for this department is the simplest form of machinery, which can be worked by any ordinary driver or winchman, and, moreover, there should be no restriction of breadth in the hull of the barge, as the operations of this department pertain to bars or river entrances, but do not extend to canals of limited width. For Paumben I would therefore respectfully recommend that Priestman's dredger, similar size to Cocanada one, with three different grabs for sand, mud and coral, be sent out as soon as possible, as delay is causing great inconvenience. The barge should be of extra strength, as occasionally bad weather may be encountered.

No. 221-C.

G.O., No. 94, 7th March 1885.

" Nos. 115-116, 17th March 1885.

" No. 179, 5th May 1885.

" " 315, 27th July "

" " 241, 13th June 1885, Mis.

Referred to the Public Works department for favor of opinion, with connected papers noted on the margin.

FORT ST. GEORGE,
6th February 1886.

(Signed) W. WILSON,
Acting Chief Secretary.

No. 30-I.

Note by the Chief Engineer for Irrigation.

The Priestman's dredger in use on the Godáviri canals has worked very satisfactorily, and I lately noticed a similar dredger working on the bar at Cocanada doing very good work, but the sea was almost smooth at the time. I can give no opinion as to the relative merits of the Priestman's and Bruce's dredgers, and the report from Bengal would seem to show that those employed there are working in smooth water, but General Hyde expressly states that the Priestman's dredger is only suited for work in canals or still water (as its construction, I think, would lead one to suppose, though I have never seen one working in rough water), and considers that the hydraulic dredgers are the best brought to notice and most suitable for the work. Under these circumstances, I should hesitate to press for a Priestman's dredger for the Paumben Pass.

2. With reference to the suitability of the Priestman's dredger in rough water, I may quote a remark of the Superintending Engineer of the I Circle, who says that on a narrow barge, the rolling "not only delays the work, but is liable to damage the machinery."

3. I doubt if the hydraulic dredger will be found much more complicated than the other, or more difficult to work; and if it has been proved in rough water, I should be disposed to accept General Hyde's opinion and order the dredger which he considers the best suited for the work. The reports show the outturn of work to be very good, but it will not do to order a dredger similar to those in use in Bengal, as they apparently only dredge 10 or 10½ feet maximum depth, while at Paumben a depth of from seven to fifteen feet is required, and it would be well that extracts from the reports showing the defects in the machinery which have become apparent in the working should be furnished to General Hyde, in order that improved machinery mode be sent.

CHEPÁK,
18th February 1886.

(Signed) J. O. HASTED, Col., R.E.,
Chief Engineer for Irrigation.

To the Joint Secretary to Government, P.W.D., Irrigation Branch.

No. 764-C.

MEMORANDUM.

Forwarded to the Marine Department, with reference to endorsement in that department, No. 221-C., dated 6th February 1886, the enclosures of which are here-with returned.

(By order.)

CHEPÁK,
24th February 1886.

(Signed) A. W. SMART, Captain, R.E.,
Under Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Marine Department.

From J. H. TAYLOR, Esq., Lieut., R.N.R., Master Attendant, to the Chief Secretary to Government, dated Madras, 7th April 1886, No. 3166.

Administrative Department.

Having just returned from Pámban, I am better able to remark upon the question of the dredge best suited to the locality, and looking to the fact that in cyclonic weather, such as has occurred in the two last years, both sides of the pass are visited by stormy wind and rough water, and barges like the Priestman's at Cocanada and Godáviri are utterly unsuited, and would succumb to the first bad weather. The dredge that was wrecked last cyclone was a double boat well decked over, and yet she soon gave way. The description of the hydraulic dredge does not recommend itself; we want a vessel easily managed, with some sea-going qualities, and much simplicity of gear, able to dredge to 17 feet, and I think a vessel about half the size of the *Albuquerque*, constructed to carry and discharge her own spoil ("without any of the expensive fittings and superfluous engines supplied to that vessel; she was in fact a box of engines") would suit. The cabins for the crew would not be wanted on arrival, as they would live on deck. Accommodation for the Master and Engineer need only be permanent. But a serious consideration should be disposed of before the great expense of a new dredge is entailed on the Port fund, namely, the proposed construction of the Rámesyaram canal. This scheme raises its head from time to time, and gives out most confident notes. For instance, I read in a well-informed paper lately in an article on Pondicherry and its Governor that, "some progress in the shape of international negotiations has been made in respect of the Pámban channel project, but neither the French nor English Government have been able to allot funds for the work out of the current year's budget." Messrs. Grindrod and Jenkins, the promoters, seem all alive, and assert that the canal will soon become an accomplished fact. If so, it will be better for small vessels, and ready in less time than any efforts of ours in the dredging line can advance the present pass to.

2. The pass itself does not seem to have deteriorated, but the sand banks at the western entrance change, and require attention.

ORDER—dated 22nd April 1886, No. 206, Marine.

Ordered that the Secretary of State for India be addressed.

(True Extract.)

E. F. WEBSTER,
Chief Secretary.

To the Master Attendant, Madras.

LETTER—to the Right Honorable the Secretary of State for India, dated Ootacamund, 30th April 1886, No. 2, Marine.

With reference to your Lordship's Despatch, No. 39, dated 23rd June 1885, we have the honor to forward copy of our No. 206, dated 22nd April 1886.

Proceedings marginally noted, from which it will be seen that the chief objections urged against the type of hydraulic dredger now in use in the Bengal Presidency are that it does not dredge to a sufficient depth, and that it is too complicated for use unless handled by specially-trained men. There are also certain defects in the machinery of this dredger which experience of its working has served to bring to light. We have the honor, therefore, to request that the papers now forwarded may be communicated to General Hyde, and that your Lordship will be pleased to take early steps to supply this Government with a dredger of whatever type General Hyde may consider best suited for the work. It will, of course, be remembered that what is required is not a *canal* dredger, but one adapted for work, if necessary, in troubled waters.

Exd. A. Raitt.

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