Public Works (1897) Department.

G.O., No. 1378 W.

& Dated 25 Mar 1897

[Despatch Abstract.]

Madras Harbour; Prop: marine Dept & Contg: to the Chairman, H.T. Board with remarks to Despatch from the Secretary of State forwarding particulars, with plan and tender of the Sand pump dredger recommended by Sir A. Rendel for use in the — and desiring that a thorough marine Survey of the Harbour should be made as early as possible, if needed.

[P.W. 25. 5,000—80-11-96.]

fc 28/5/97

Indexed. 16/5

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
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FURTHER PAPERS.

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Public works (1897) Department

Cypher No: 4886

Government {1897} of Madras.

MARINE.

Recd. 17.5. } 1897. *Enclosures*

Regd. 17.5. } *Spare copies*

G.O., No. 374, 26th April 1897.

No. 1378 W d/25 May 1897

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Recorded

APRIL.

Ch 3/5/97

Madras Harbour

Despatch from the Secretary of State forwarding particulars, with plan and tender of the sand pump dredger recommended by Sir A. Rendel for use in the —, and desiring that a thorough Marine Survey of the harbour should be made as early as possible, communicated to Chairman, Harbour Trust Board, with remarks.

O.L.S. 126

R 22/8

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

Read—the following papers:—

Despatch from the Right Honourable the Secretary of State for India, to His Excellency the Governor in Council, Fort St. George, dated London, 18th March 1897, No. 1, Public Works.

I have received your Excellency's Marine letter, No. 1, dated 5th January 1897, stating that the Trust Board of the Madras Harbour are not, at present, inclined to incur the large outlay requisite for obtaining the dredging plant recommended by Sir A. Rendel, but they would be glad to be furnished with full particulars and specifications of the proposed dredger for use hereafter in case it should be necessary to purchase it.

2. I now enclose particulars, with plan and tender of the sand pump dredger recommended by Sir A. Rendel for use in the Madras Harbour.

3. It is desirable that a thorough Marine Survey of the harbour, its approaches and surroundings, including rates and directions of currents, should be made as early as possible. I notice that your Government is in communication with the Government of India in view to the engagement of a trained officer for the survey of the roadstead.

Enclosures.

From Messrs. W. SIMONS and Co., Limited, Engineers and Shipbuilders, Glasgow, to Sir A. M. RENDEL, K.C.I.E., 8, Great George Street, Westminster, London, dated Renfrew, 25th February 1897.

Referring to your esteemed communication of 15th instant as requested, we now send you specification and plans showing longitudinal section, deck plan and cross section of a steel hopper steamer of 500 tons hopper capacity.

Dimensions.—Length 149′ 0″ on deck, breadth 28′ 0″ moulded. Depth 12′ 3″ moulded. *Engines* one set compound two cylinder surface condensing engines, capable of propelling the vessel about 7 knots per hour when fully loaded, and also driving the sand pump. Owing to the increased cost of materials and wages of workmen, and which are still having an upward tendency, the price we formerly stated, viz., £11,000 delivered on Clyde, would not pay us, but we shall be pleased to look closely into the matter and make the price as low as possible consistent with best materials and workmanship.

Any further particulars required shall be promptly attended to and your valued commands at all times shall receive our very best consideration.

From Messrs. W. SIMONS and Co., Limited, Engineers and Shipbuilders, Glasgow, to Sir A. M. RENDEL, K.C.I.E., 8, Great George Street, London, dated Renfrew, 3rd March 1897.

Referring to your esteemed enquiry of 2nd instant, our price for a new steel hopper steamer of 500 tons hopper capacity constructed in accordance with the plans and specification lately sent for, delivered on Clyde is £12,000, payable by the usual cash instalments during construction, this price, we, may state, does not fully cover the recent advance in materials and wages, but we are very desirous to secure this order, to which we should give our very best attention.

If required we would deliver this vessel in India, complete, for the additional sum of about £2,000 including the cost of insurance.

We shall be very pleased to have instructions to put the work in hand.

Specification of a 500 ton sand pump screw hopper dredger.

Dimensions.

Length on deck	149 feet.
Breadth, moulded	28 „
Depth, do.	12 „ 3 inches.
Hopper capacity	500 tons.
Speed per hour, loaded and light	7 knots.
Mean draft, when loaded, about	10 feet.

Generally.

The vessel to be so designed so as to be capable of safely encountering rough weather, and the hull to be constructed of steel of best ship quality (manufactured by the Siemens-Martin process).

Mill scale or black oxide to be removed from all surfaces before being painted.

The vessel to be sub-divided into six watertight compartments by means of bulkheads, which are all to be carried up to main deck.

The hull, engines, boiler, and machinery to be well and strongly constructed, in accordance with the detailed specification annexed hereto, and with the accompanying drawing.

The hoppers are to be strongly constructed with such longitudinal and cross girders as shall duly maintain the strength of the hull, and to have strong hopper doors, working on wrought iron hinges, extending across the same, and fitted with a sufficiency of strong lifting eyes well secured. The doors to be raised by steam and hand gear and of ample capacity and strength for the work required.

To be propelled by one pair of compound surface condensing engines of about 400 I.H.P. To have sufficient power to give the ship a speed (loaded and light) of 7 knots per hour. The boiler to be of marine multitubular type, and constructed of mild steel to Lloyd's requirements for a working pressure of 100 lb. per square inch, and tested to 200 lb. and to be of sufficient capacity for the work required.

Suitable cabins to be provided for officers also accommodation for the crew, with the usual conveniences; cabins to be sufficiently well lighted and ventilated. All the necessary cooking convenience and apparatus to be provided where most suitable, as well as accommodation for stores, provisions and fresh water.

Steering gear, wheel and pinion type to be provided with all necessary chains, pulleys, &c.

Telegraphs to be arranged to lead from bridge to engine room.

The usual outfit and furnishings for hull and machinery, including anchors, chains, ropes, and boats, all as hereafter specified.

Coal bunkers to be situated on each side of the boilers, and to have capacity for a weekly supply of fuel.

Triple barrelled steam mooring winches to be provided at bow and stern of the most improved type for the work required.

A suction pump to be provided for dredging sand from a depth of 32 feet below water level, and have a capacity to raise 500 tons per hour, depending on the quality of the sand; with steam appliances to lift suction pipe.

The hull, machinery, boiler, dredging and other apparatus, equipments, &c., are to be of the best material and workmanship, perfectly new, and finished in a thoroughly workmanlike and satisfactory manner.

Hull.

The hull to be constructed of steel of the best ship quality, subdivided into watertight compartments by 4 bulkheads, extending up to main deck.

Stem.—To be 6″ × 1½″ forged of best scrap iron, and well scarphed and secured at foot to keel.

Sternpost.—Of 6″ × 3″, bands for pintles and other connections to be of adequate strength and well secured.

Frames.—To be of angle steel, 3½″ × 3″ × 6/20″ amidships, and 5/20″ at ends, spaced 24″ apart, centres throughout, to be in two lengths, connected with doublings across keel. Frames at hopper bulkheads to be double and of same scantlings and those at side of hopper to be well stayed to each other by angle steel stays 3″ × 3″ × 5/20″ having bracket plates on their ends, and spaced on alternate frames. Stern cant frames to be of same scantlings as main frames and to be returned, and riveted on to the nearest floor plate as a transom.

Floors.—At engines and boiler to be 7/20″ plate steel, and of suitable depth, elsewhere to be 12″ × 6/20″ and to be well riveted to their respective frames and water courses cut through them.

Each floor to have an angle steel reverse bar, $2\frac{1}{2}'' \times 2\frac{1}{2}'' \times 5/20''$, running across top of floor, and carried up to turn of bilge. Reverse bars in way of hopper on top of floor only. Double reverse bars to be fitted under engines. Limber holes and chains to be provided.

Centre Keelson.—Centre keelson to consist of intercostal plate 6/20″ thick and two angle steels 4″ × 3″ × 6/20″, riveted back to back, and well connected to bulkheads, extending as far fore and aft as practicable.

Sister Keelsons.—Consisting of double angle steel bars, 4″ × 3″ × 6/20″, to be run as far fore and aft as practicable.

Intercostal Plates.—To be provided between deep floors under engines, also at sand pump.

Limber Holes.—The frames and floors to have limber holes of ample size to allow of bilge water passing freely to pumps.

Cementing.—The bottom of the vessel to be carefully cemented with mortar, consisting of one part of Portland cement, and two parts of clean sand or other approved composition.

Deck Beams.—To be spaced on every frame, and well connected to same by bracket knees on their ends, forward and aft of hopper to be 5″ × 3″ × 6/20″ angle steel, and made heavier where required. Hold stanchions to be supplied where necessary.

Plating.—Garboard and sheer strake 8/20″ and 7/20″ at ends, bottom bilge and side plating 7/20″ and 6/20″ for one-half of vessel amidships, and 6/20″ and 5/20″ at ends plating of hopper to be 6/20 clinker built. The shell plating to be clinker built throughout, with liners between the outside strakes. All butt jounts to be double chain riveted. Fore and aft seams to be single riveted.

The strakes to be of the width generally adopted in shipbuilding. The whole of the seams and butts to be close fitted, the joints and outside edges of the shell and hopper plates to be planed. All rivet holes to be carefully punched opposite each other, and where untrue to be rimmeled till true, but where much out to be rejected. The rivets to fill the wholes properly, the plates to be countersunk to receive the heads, and the whole to be a first class job, and to the entire satisfaction of the Inspecting officer.

Bulkheads.—Four in number, of iron 6/20″ thick at ends of hopper, and stiffened with 5″ × 3″ × 7/20″ angles in way of hopper space, spaced 30″ apart, other bulkheads 5/20″ thick, stiffened with 3″ × 2½″ × 5/20″ angles spaced 30″ apart. All bulkheads to be fitted with sluice cocks and rods of galvanized wrought iron, carried to main deck having brass engraved covers.

Gunwale Angle.—Of steel, 3½″ × 3″ × 6/20″ well riveted to sheer strake, and deck plating all fore and aft.

Coamings.—Of hopper to be 6/20″ with suitable scuppers for escape of water.

Riveting and Caulking.—The whole of the reveting and caulking to be executed in a first-class manner and to the entire satisfaction of the Inspecting officer. All watertight joints to be caulked, metal to metal, and no filling pieces being allowed. The whole of the hull to be made thoroughly watertight. All landings of shell and hopper to be single riveted on the seams and double riveted on the joints. The size and spacing of rivets to be in accordance with Lloyd's rules. All butts to be absolutely knife tight before caulking and to the satisfaction of the Inspecting officer.

Rudder Frames.—Rudder to be made of best forged scrap iron and made to unship. Stock to be 4″ diameter and rudder to be of suitable strength and size for steering. Rudder to be plated with 3/16″ plates, and filled with white pine inside, and rudder chains for use in case of stock breaking.

Hopper.—To be arranged as shown on plan. The divisions between doors to be formed of 6/20″ steel plates, with double 3″ × 3″ × 6/20″ angles on bottom, and 2½″ × 1¼″ half round iron on top edge. A curved box girder to extend full length of hopper to approval, fitted complete with sheaves, brackets, &c.

Hopper Plating.—To be clinker built throughout, double chain riveted on the joints, and single riveted on the fore and aft seams.

Hopper Doors.—To be formed of steel plate with lining of rock elm, 3½″ thick, having angle iron around edges, 3½″ × 3″ × 6/20″. Each door to be secured to hull or keelson with strong hinges, having tails extending almost across doors, and to have steel pins of suitable diameter. These hinges are to be so arranged that they will be inside level of bottom, and underside of doors to be within line of bottom of vessel. The edges of the doors to be made so as to be thoroughly sand tight.

Coal Bunkers and Stokehold.—To have capacity for about 25 tons of coals, and to be formed of 3/16″ plates, well stiffened with 2½″ × 2½″ × 4/16″ angles. Bunkers to be close ceiled on bottom. Cast iron coaling scuttles to be fitted on deck for each bunker as required. A wrought iron ladder to be fitted from deck to stokehold, with gratings. Stokehold floors to be covered with wrought iron chequered plates.

Suitable ventilators to be provided for stokehold.

Engine and Boiler Casing.—As required to give suitable light and ventilation for engine room. Coamings of steel plates 5/20″ thick. Teak skylight to be placed over engine, having hinged windows and suitable quadrants

Engine Room.—Hand rails and stanchions where required. Vice behch to be fitted up in engine room and all necessary shelves, lockers and oil tanks to be provided.

Stanchions.—Of 2½″ round iron or tubes, to be fitted where reqnired.

Mooring Bitts.—To be well secured to deck, and as many as necessary.

Towing Gear.—To be fitted as per drawing.

Fairleads.—To be provided at each end of vessel with moveable sheaves for head and stern chains.

Ladders.—All wooden ladders throughout, unless where otherwise specified, to be of pitch pine with hardwood steps, having chequered galvanised iron tread plates. Ladders leading to engine room to be of iron, with suitable hand rails finished bright.

Grating.—A strong grating cover to be fitted over the tiller and made of pine.

Chain Lockers.—To be arranged convenient to winches, and divided into three compartments, capacity of each shall be amply sufficient to hold its share of the chains specified.

Anchors—

	cwt.
Two bower anchors	8
One stern anchor	6
Four side anchors	4
One kedge anchor	1

Chains—

100 fathoms stud link cable 14/16″
75 ,, 12/16″
200 feet best short link, 10/16″

All to be made by a good maker, and to be tested to admiralty requirements at public machine.

Ropes—

Two coils of 75 fathoms 4″ best Manilla.
Two heaving lines.

Steering Gear.—To be provided and fitted on bridge, having teak steering wheel, brass mounted, the usual pulleys and chains leading to tiller to be provided. Hand tiller to be supplied for use in case of accident to steering gear.

Bridge.—A bridge to be fitted in advance of funnel, and to have the necessary stanchions and rails and ladder leading to deck, also weather screens to be provided.

Ventilators.—To be fitted with an ash hoist for stokehold, also mushroom ventilators as required. Goose neck ventilators for coak bunkers and crew space.

Bell.—To be 10″ diameter, hung in suitable position, and name of boat engraved upon it.

Hold Pumps.—To be fitted where necessary throughout the vessel pump chambers to be of cast iron, 4″ in diameter, fitted with brass upper and lower boxes of best quality, mounted complete. To have the necessary levers and standards, mounted complete.

Boats.—One 17 feet service boat of larch or pine, and one 14 feet dingy, having the usual oars, rowlocks, boathooks and bailers.

Decks.—To be all of iron or timber at fore and after end of hopper as desired, 5/16″ and 4/16″ thick, made thoroughly watertight. Cabin floor to be of pine, and well secured to bearers, caulked and payed.

Ceiling under deck in way of cabins.

Anchor and Boat Davits.—To be provided forward and aft for lifting anchors and also davits for boats.

Cooking Stove.—To be fitted up in a suitable galley of approved size, having complete set of cooking utensils, with bunker, seat, locker, &c.

W.C.—Having pan, soil pipe and connections complete, is to be fitted in the most suitable position on deck, as may be arranged, also to be well ventilated.

Painting.—Unless where otherwise specified, the entire work of hull to be thoroughly cleaned and painted three coats. Officers' cabin to be teak grained, and to receive two coats of best varnish. Sailors' quarters to be done in approved colours. The vessel's name to be on both bows, also name and port of registry on stern, to be put in large block letters. The hull to the load line to be coated with anti-fouling composition. Hopper to be tarred. The painting of plates to be delayed as long as practicable, in order that they may have every chance of being free from black oxide.

Cabins.—For Masters and Engineers to be neatly but plainly fitted up at bow in pine, and to have berths, tables, looking glasses, lockers, bottle racks, wash hand basins, &c.

Mess room to be provided.

Crew accommodation to be provided forward, with berths, lockers, dining table, seats, &c., as customary.

Mattresses and pillows to be provided for Captain and Engineer.

Companions.—Of teak, to be of ample size. portion of companion to be made to slide back, and fitted with hinges, locks, and back bolts of brass.

Skylight.—Of teak, having glass windows protected by brass gratings and yellow pine weather boards.

Sidelights.—An ample number of circular openings in way of cabin to be provided. Sidelights to have cast iron shutters.

Rail—of elm, $6\frac{1}{2}'' \times 2\frac{1}{4}''$.

Bulwark Stanchions—of iron, securely connected to deck. A portion of the bulwarks forward to be closed with iron plates portable stanchions, with chains, provided in way of hopper.

Fenders.—Of rock elm, to extend all round vessel $9'' \times 5''$ and to be securely bolted inside the vessel by 5/8″ bolts on every frame space, and to have a $3'' \times 3'' \times 6/20''$ angle iron underneath.

Scuppers.—To be provided where required.

Lamps.—One set of copper signal lamps, also lamps for cabin, forecastle, engine room, and all other lamps, required, including anchor lamp and two hand lamps, two hold lamps, and one Davie lamp.

Lamp room.—A small lamp room to be provided, having necessary shelves for lamps and oil cans.

Compass.—One 7″ card compass in binnacle; one copper thermometer.

Water tank.—One 300 gallon water tank, fitted on deck, with manhole, sludge, and drain off cock.

Water cask.—One 50-gallon water cask on gantry, one zinc dipper.

Flags.—One ensign, one jack, one burgee.

Steam winches.—To be fitted up forward and aft for raising anchor and working mooring chains, having chain conductors leading to lockers.

Mast and sail.—To be provided to approval, and fitted with best galvanized wire rigging. Running rigging of best Manilla.

Store room.—Small store room to be provided.

Furnishings.

6 timber buoys to be provided.
2 deck buckets.
2 paint pots.
2 paint brushes.
1 hand lead and line.
1 log reel and line, with sand glass.
1 deep sea lead and line.
2 hand hammer.
2 life buoys, and cork packets for all the crew.
2 cork fenders.
1 cooking range of suitable size.
1 goblet.
1 large oval pot.
1 frying pan.
2 naptha lamps.
1 3-gallon paraffin oil can.
1 boiler galvanized.
1 coffee kettle.
1 soup tureen.
1 soup ladle.
1 salt box.
1 stew pan.
1 pepper box.
6 tin pannikins.
6 tin basins.
½ dozen soup plates.
½ dozen bread plates.
½ dozen cups and saucers.
1 dozen table spoons.
1 dozen teaspoons.
1 dozen knives and forks.
1 tea kettle.
1 cook's knife.
1 mincing board.
1 sounding rods.
2 hopper slices.
6 ship scrapers.
2 boat hooks.
2 mops.
2 holy stones.
2 scrubbers.
2 tar brushes.
2 funnels.
2 sledge hammers, for undoing triggers on winches on hopper doors.
1 saw.
1 axe.
2 sounding poles.
2 pin hammers.

Engines.

Generally.—Vessel to be fitted with one pair of high and low pressure compound expansive engines, having inverted cylinders and surface condenser. The engines to indicate, when propelling, about 400 I.H.P.

All working surfaces, including bearings to be extra large size.

A starting valve, of approved design, to be fitted on low pressure cylinder to give steam direct to both ends of cylinders and to be quick in action.

All hand gear, including stop valve, starting valve and drain cocks to be worked from starting platform.

To have steam vacuum and compound gauges, having solid drawn pipes, and three way cocks with flanges for fastening controlling gauge.

Engines to be fitted with bilge injection attached to circulating pump.

All stuffing glands to be bushed with brass.

Main and donkey feeds to have separate pipes and separate check valves on boiler.

All valves in connection with engines and boiler to be closed with right hand motion.

All cocks through ship's skin and boiler shell to have extra large flanges and spigots.

The flanges of all inlets on ship's side to be secured by studs to a wrought iron ring riveted round inside of openings in shell plating, and to have perforated plates.

To have one marine return tubular boiler, placed forward of engines, and to be fired from forward end.

The necessary disengaging clutches to be fitted between propelling and sand pumping machinery.

Cylinders.—Engine to have one high pressure cylinder 19″ diameter and one low pressure cylinder 38″ diameter, each adapted for a stroke of two feet.

Cylinders to be cast together, of good hard close-grained metal, free from all defects, and smoothly bored out to the above diameters. To have a recess at each end to allow the pistons to work ½″ out of bore.

Escape valves to be fitted top and bottom of cylinders, and one to L.P. receivers, loaded to 15 lb. per square inch.

Drain cocks to have copper drain pipes. Cylinder valve casings and receivers to be carefully lagged with hair felt and polished teak, secured by brass screws to wood grounds. Lagging to be portable where required.

Cylinder covers to be dished and fitted in with chequered iron plates, and ¾″ tap holes in flanges for starting covers.

Governor.—One of Tangye's or other approved patent high speed regulating governors to be fitted to high pressure casing, having stop valve attached.

Indicator bosses, cocks and pipes, with all necessary gear for taking off diagrams, to be fitted to both cylinders, and one indicator with springs and scales to be provided.

Columns.—Of sound cast iron or box form, those at back to be cast with condensers. Front columns to be cast separate, and securely bolted to bed plates and cylinders by turned and fitted bolts. Flanges to be stiff and strongly bracketed. Separate guide faces of hard close-grained cast iron to be bolted to each column. All necessary pipes and drain cocks, neat flanges and patches to be cast on H.P. columns for the attachment of starting gear, &c.

Bed plate.—Of sound cast iron of box section, having very strong flanges for securing to condensers and engine seat. Turned bolts to be fitted, one in each corner of the flanges which join the condenser. Strong brackets to be cast on all flanges between alternate bolts. Main bearings, three in number, of gunmetal. The bushes to be square and held down by bright wrought iron covers and steel bolts, having their nuts fitted with guards. Brass oil cups on each bearing. Crank pits lined with sheet iron. Bed plates to be securely bolted to engine seat, bedded on teak, and fitted with cast iron keye.

Pistons.—The pistons to be of close-grained cast steel, conical in shape, and fitted with lockwood and Carlisle's patent packing.

Surface condensers.—To be sound castings with air and circulating pumps fitted on. Condenser plates to be of rolled brass 1″ thick, secured to body of condensers by Muntz metal pins.

Tubes to be of brass solid drawn, and ¾″ external diameter, and No. 18 B.W.G. To be packed by means of cord packing and screwed glands. The glands to be cupped to prevent the tubes working on ends. All bolts and studs exposed to the action of steam or water to be of Muntz metal.

Tube plates to be efficiently stayed. A tail valve at bottom and a 1″ supplementary feed cock having a copper pipe. A soda cock to be fitted to condenser. Care to be taken that the tubes are capable of renewal without disturbing any part of the machinery.

Air pumps.—The air pump to be $11\frac{1}{2}''$ diameter and to be fitted on condenser, single acting, having chambers lined with brass, buckets, valve seats, and guards of brass. Valves of India rubber. All bolts and nuts exposed to the action of steam or water to be of Muntz metal. To have a separate hot well with air vessel. Pump rods to be of solid Muntz metal. A large air valve to be also fitted.

Circulating pump.—A circulating pump 6½″ diameter, to be double acting, having chambers lined with brass, and to have buckets, valve seats, and guards of brass. Valves of India rubber. Pump rods of Muntz metal, buckets to be solid. Studs exposed to the action of water to be of Muntz metal. Pumps to draw from sea or engine room bilges, and to have the necessary pipes and cocks for that purpose.

Feed pump.—Feed pumps, 3″ diameter, having suitable air vessel to be single acting. The plunger to be of brass, the valves and valve seats to be of gunmetal. To be fitted with an escape valve, having a spiral spring adjusted from the outside. To be of ample capacity for feeding boilers when engines are working at their full power.

Bilge pumps.—Bilge pump 3″ diameter, having single acting plunger. Plungers of cast iron. Valves and seats of gunmetal. Bilge pumps to be connected to main compartments to have separate discharge valves on ship's side. Stroke of all pumps to be 12″.

A separate pipe to be carried from main compartments to cocks placed on mud boxes, one on port and one on starboard side, above the floor plates in engine room and stokehold.

The name of each suction to be distinctly marked on the cover of its respective cock.

The pump to be so arranged that it can pump from either set of pipes. Bilge pipes to be 2″ and 3″ diameter, of lead, equal to 20 and 30 lb. per yard, to be flanged and held together by 5/8″ bolts and to have iron back straps. None of the pipes to have sharp bends and they must not be syphoned.

Galvanized iron rose boxes to be fitted at each end of suction pipe. All rose boxes to be 6″ × 6″ with lid, having brass pins in hinges and keeper.

All bilge cocks to be placed above floors, and to be of brass.

Shafting.—The crank shaft to be built double throw with cranks at 90 degrees. Body of shafts to be not less than 7¼″ diameter. Stern shafts to be not less than 7¼″ diameter, covered with brass in way of stern tube bearings and at stuffing boxes.

All shafts to be of best forged ingot steel.

Stern tube.—To be of cast iron, extra strong, stern bearings to have ample surface, and to be fitted with separate brass bushes having lignumvitae stripes, brass bushes not less than 7/16″ thick and wood 9/16″ thick, inner bushes of brass having ample surface. Stuffing glands to be of brass. The outer ends of stern tubes to be strongly stayed to hull of vessel by wrought iron nuts.

Propeller.—The propeller to be of suitable form, pitch, and diameter for the vessel and engines. To be a strong mixture of steel, wrought and cast iron.

Piston and connecting rods.—Piston rods of ingot steel, connecting rods of ingot steel, and all to be sound, and free from flaws. All the bushes to be of gunmetal or of best bearing brass. The crosshead guide blocks to have ample bearing surface and properly fitted to the guides.

Valve gear.—All the valves to be single ported, each worked by means of double eccentric and link motion and the necessary reversing gear arranged in the most improved manner.

Slide valves to be worked by link motion. Eyes of eccentric rods to have brass bushes, having two bolts, double nutted for ready adjustment. Double drag links, having brass bushes, secured with bolts and nuts. Plate links, with pins forged on links, drag links to be fixed on same pins as go-ahead eccentric rods, which pins must be lengthened for that purpose. When links are in full gear the valve spindle and eccentric rods are to be in line. Guide brackets with adjustable bushes. Bottom end of valve spindles to be adjustable, having two bolts with the heads recessed, and wrought iron caps. Top ends of spindles to work into domes on top of casing. Slide blocks to have large surface and adjusting slips where valves rest on spindles, they are to have large wearing surfaces, and tapered washer fitted to spindles eccentric straps and pulleys to be of cast iron, having ample surface. Eccentric rods to have crosstails top and bottom and at top with adjustable brasses, having bolts double nutted. All valve gear to be finished bright.

Bushes.—All bearing bushes, neck bushes, small glands, and gland bushes, are to be of best bearing brass. All cast iron stuffing boxes to be fitted with brass neck rings. The main bearing bushes to be of best hard brass.

Turning gear.—To be fitted for turning engines by hand to be easily disengaged, and fitted with locking.

Injection valves.—To be large at the part which takes the ship's side to be diced and fitted with brass seat, valve and spindle.

Discharge valves.—The delivery valves on ship's side for air, circulating, bilge and donkey pumps to be of cast iron, with brass valve, seats, lids and spindles, and placed above the load water line.

Pipes.—All steam, feed, air and circulating pump, discharge, surface and bottom blow down and internal pipes to be of copper. All bilge pipes to be of lead. All copper pipes to have thick flanges, brazed on and faced and to be neatly chipped and filed after pikes are bolted up

in position. All steam pipes, including main steam and donkey steam pipes, whistle pipes, pipes to winches, hoisting gear, and governors, to be covered with hair felt, and canvas, and to receive two coats of best white lead paint.

Cocks.—All sea cocks to be of gunmetal, with Board of Trade guards, and have spigots projecting through plates, and fitted as required.

All suction cocks to have brass rose plates. The blow down cocks to have brass washer plates on the outside, over which the spigots are to be caulked.

All bilge cocks to be above engine room and stokehold platforms, and all clearly marked with names of compartments from which they draw.

Lubricators.—All necessary lubricators to be supplied and neatly fitted. A large supply impermeator to be fitted to each high pressure casing as directed. A double keyed tallow cock to be fitted to each low pressure casing cover.

Water to bearings.—Ample arrangement of water service to be fitted to all bearings on crank shafting and thrust blocks, having pipes with brass telescope directors, and with universal joints.

Lifting gear.—To be fitted and of sufficient strength for lifting cylinder covers and casing doors.

Telegraphs.—Reply telegraph to be fitted at steering wheel and engine room. Telegraph dials to be fitted with gongs, to be illuminated, and to have a complete set of lamps.

Steam whistle.—An organ pipe steam whistle to be placed at forward side of funnel, and connected with boiler by copper pipes.

Donkey and hand pumps.—Donkey pump to be supplied. Pump rod and valve spindle of Muntz metal, bucket valves, seats, and chamber of brass, bucket not less than 3″ diameter. Pump to draw from the sea, and hot wells; and to discharge into boiler, on deck, and through ship's side. An approved hand pump to be fitted adjoining donkey pump, and having all details and connections, as specified for donkey pump. This pump to be worked by hand levers on deck. To have all the necessary standards, double brakes, connecting rods, and proper means for fastening these when not in use. To have brass screwed covers on deck.

Gratings and platforms.—Starting platforms and all necessary gratings to be provided in way of starting gear, having the necessary hatches for cleaning bilges. All doors on condensers, pumps, &c., to be kept clear. Stokehold to be floored with close jointed cast iron plates. A wrought iron platform to be fitted from engine room to stokehold.

Store rooms.—To be fitted up where necessary, having cupboards, with drawers and hooks, as may be required, for storing tools and outfit. Locks to be fitted.

Spanners.—A set of standard spanners to be provided, fitted in rack in engine room. Also all special keys and spanners to be supplied.

Boiler.—To have one marine multitubular steel boiler, 11 feet diameter inside outer strake, and 10 feet long, and fitted with two furnaces. The furnaces to be 3 feet 3 inches diameter. The total heating surface to be not less than 840 square feet. The tubes to be of iron, lap welded, 3½″ diameter, 8 B.W.G. thick, arranged in two groups. Stay tubes to be 5/16″ thick, and secured both into front and back tube plates. The grate surface to be 40 square feet.

Ample steam room to be allowed, also the stays and tubes to be so arranged that a man can enter to clean and repair the boiler when necessary. End plates to be flanged to meet shell plates. No vertical seams in front or back of boiler. Circumferential seams to be lap jointed and double riveted. Longitudinal seams to be butt jointed with double butt straps, treble riveted, holes in shell to be drilled. The boiler to be machine riveted as far as possible, and no angles to be used in the boiler proper, except where necessary to strengthen flat surfaces. Boiler to be caulked outside and inside and sufficient manhole and mudhole doors in front to be provided, with strengthening rings outside for purposes of cleaning and inspection.

Fire box stays to have nuts where exposed to the flames, boiler to be fitted with a complete set of fire bars, bearers, bridges, &c. Smoke boxes, doors and uptake to have damper plates. Furnace fronts to be formed of wrought iron. A set of furnace dampers to be fitted furnaces to be welded 9″ at each end. The boiler to be kept up at least 12″ above floors, and to be supported by strong cast iron stocks properly tied together, and easily removable to facilitate repairs.

Boiler plates.—The thickness of the various plates to be equal to Lloyd's rules for a working pressure of 100 lb. and to be tested by water pressure to 200 lb. per square inch above the atmosphere. All boiler, shell and inside plates to be of steel. The plates to be obtained from the Steel Company of Scotland, Messrs. Colville, Dalzell, or Parkhead, and to Lloyd's requirements.

Boiler Mountings.—All the necessary mountings to be provided to include uptake, funnel, with necessary wire rope stays and fastenings, and fire bars and bearers. Steam stop valves to be fitted and two spring loaded safety valves having the valve spindles and valve seats of gunmetal.

Bottom blow off cocks on boiler and ship's side above floor plates. Feed valve chests with separate screw down valves for the main and donkey feed. Water gauge glass cock $\frac{3}{4}''$ diameter, also $2\frac{3}{4}''$ test cocks scalding down cock at after end of boiler, also stop valve for steam to whistle.

Safety valve drain pipes of copper led into bilges and water tank in stokehold. Two steam gauges to be fitted to boiler, one in stokehold and one in engine room. Boiler after receiving two coats of paint, to be covered with patent non-conducting composition.

Internal pipes and steam collecting pipe to be provided, all necessary air cases to be fitted.

Funnel.—To be of sufficient diameter and height to suit the vessel. The lower tier of plates to be $\frac{1}{4}''$ thick, others $\frac{3}{16}''$ thick, to be butt jointed and flush riveted with the necessary rings, dampers, studs, shackles, shrouds and blocks for funnel rings. All necessary air casings to be fitted.

Painting.—The engines and engine room to have three coats of paint and varnish and engines to be varnished.

The boiler machinery to have three coats of paint.

Sand Pump.

A powerful centrifugal pump to be fitted at forward end of engine, having clear passages all round, and satisfactory arrangements to be made for cleaning casings, should they get choked, and also for inspection and repair when necessary.

The foundation on which the pump sits to be very strong, and substantially constructed of steel plates and of the required form to suit the pump.

To be of suitable diameter, the casing on body being stiffened with strong cast iron brackets, made as required.

The fan to be forged or cast of best mild steel, and thoroughly solid. To have three arms fitted with mild steel blades, and to be a good fit, and of approved shape.

To be connected and driven direct from crank shaft of engine, clutches being provided and arranged for the easy connecting and disengaging of pump as required.

Where the fan is fitted on spindle, the latter to be tapered, and the fan to be secured with key and nut.

The bearings to be very large, and the spindles to be cased with gunmetal $\frac{1}{2}''$ thick, and carried 4″ through stuffing boxes, and working in gunmetal bearings.

The suction pipe to be 18″ diameter inside, and a $\frac{1}{4}''$ thick. To be constructed of mild steel plates, and to have all the necessary mountings and fixings as required, and satisfactory arrangements for lifting by steam winch, which is also to be provided for working a nozzle to a radii shown on plan.

Strong cast iron connections to be provided on deck, to which suction pipe is to be attached. Brown's patent swivel joints, to allow pipe to be brought in-board. All necessary lifting tackle, &c., to be provided for suction pipe.

Discharge pipe to be provided, and fitted over hopper well, to be nearly as long as the hopper, fitted with all necessary doors, &c., for distributing the load in the hopper.

These pipes to be formed of mild steel plates $\frac{5}{16}''$ thick.

Connections to be formed if required, on one side, for filling barges.

Crab Winches.—Steam winches for mooring or regulating the cut of the dredger to be placed at bow and stern of vessel.

Both winches are to be fitted with chain drums, designed so as to take firm hold of the chains, and to be so constructed that the stem and stern and thwartship chains can be taken in and slackened out separately or together.

A suitable warping end to be fitted to each winch. Suitable brakes, with tightening gear, to be fitted to each chain barrel.

The position of the chain lockers to be such that the chains will lead to or from the winches without manual assistance to their respective compartments.

All pinions and clutches to be made of steel or malleable cast.

All steam and discharge pipes to be of copper.

Pipes where passing through deck to be made water tight.

Steam crane to be fitted on deck for controlling suction pipe.

Engine Room and Stokehold Furnishings.

1 fore hammer.
1 chipping hammer.
1 plying hammer.
1 coal hammer.
1 copper hammer.
4 small scaling hammers.
1 copper drift.
1 ratchet brace.

Bottom blow off cocks on boiler and ship's side above floor plates. Feed valve chests with separate screw down valves for the main and donkey feed. Water gauge glass cock $\frac{3}{4}$" diameter, also $2\frac{3}{4}$" test cocks scalding down cock at after end of boiler, also stop valve for steam to whistle.

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1 fore hammer.
1 chipping hammer.
1 plying hammer.
1 coal hammer.
1 copper hammer.
4 small scaling hammers.
1 copper drift.
1 ratchet brace.

1 force brace.
6 drills assorted, to fit either brace.
6 chipping chisels.
6 files, assorted, with handles.
1 pair wire cutting plyers.
1 pair lamp scissors.
1 set screws keys, to suit all nuts about the engines and boiler, with rack for same.
1 hand vice.
4 plying screws.
1 screw driver.
Necessary blocks and tackle for tube doors.
All necessary engine room and stokehold lamps.
1 set Weston's differential pulleys and chains, to lift 40 cwt.
6 collier lamps.
Oil tanks, of galvanized iron, to hold—
Twenty gallons engine room oil.
Ten gallons cylinder oil; five gallons lamp oil.
Savealls and drainers to be fitted to all cans.
1 galvanized iron tallow tank to hold 2 cwt.
1 cast iron tallow kettle.
1 tin kettle.
6 oil cans.
1 emery box.
6 oil feeders, assorted.
1 half gallon tin oil measure.
1 quarter gallon tin oil measure.
2 filters.
1 brass syringe.
2 patent tube stoppers.
1 german silver and two glass salinometers.
2 firing shovels.
2 trimming shovels.
2 spring tube scrapers.
6 tube brushes, with handles.
6 scaling tools, assorted, for cleaning boiler.
2 ash buckets.
2 water buckets, galvanized iron.
2 long slicer bars.
2 long fire rakes.
2 pricker bars, with 12 spare blades.
1 set of caulking tools for boilers.
6 coir brooms and handles.
2 coal hammers with shafts.
1 complete set of eyebolts for engines and gearing, cord packing, with brace and tools for condenser tubes.
1 packing ring.
Sufficient length of canvas hose to reach any part of the vessel for fire purposes.

Order—No. 374, Marine, dated 26th April 1897.

Communicated to the Chairman, Harbour Trust Board, with reference to G.O., No. 15, Marine, dated 5th January 1897.

2. It is observed that the Government of India has since sanctioned the deputation of an officer for the proposed Marine Survey.

(True Extract.)

for Under Secretary to Government.

To the Chairman, Harbour Trust Board.
" Presidency Port Officer.
" Public Works Department.

Exd. Shaik Karim.

Marine G.O. No. 15 of 5-1-97.

Government {1897} of Madras.

MARINE.

Recd. } 1897. Enclosures

Regd. } Spare copies

G.O., No. 15, 5th January 1897.

JANUARY.

Madras Harbour Improvement

Ordered that the Government of India and the Home Government be addressed — the former in regard to a trained officer for the survey of the roadstead, and the latter in regard to the proposed dredging operations.

GOVERNMENT OF MADRAS.

MARINE DEPARTMENT.

Read—the following paper :—

From W. AUSTIN, Esq., I.C.S., Chairman, Harbour Trust Board, Madras, to the Secretary to Government, Marine Department, dated 15th December 1896, No. 3951.

I have the honour to acknowledge the receipt of (*a*) memo. No. 566 E., dated 12th November, enquiring whether the Harbour Board agrees to purchase plant for stopping the passage of sand through the south arm, at a cost of £1,048, which has been considered by the Trustees in connection with (*b*) report from Sir Alexander Rendel—communicated for remarks under G.O., Marine, No. 813, dated 23rd November—at their meetings held on 20th *idem*, 4th and 18th December

2. With regard to (*a*) it is observed that, in the estimate for additions to the south arm, to render it sand-tight, amounting to Rs. 54,369, provision is made for tools and plant to the extent of only Rs. 3,604, and the Board is not prepared to purchase plant to the extent of about Rs. 18,000, without a revised estimate and full information as to what it is proposed to do. If the boiler and pump are to cost five times as much as the provision made in the estimate for tools and plant, the other items may require revision also.

3. It is, no doubt, desirable that the south arm should, if possible, be made sand-tight; but as dredging plant appears to be a necessity in the near future, the question will have to be carefully considered whether the small quantity of sand, which filters through the south arm in the course of a year, cannot be more economically kept under control by dredging it away, than by attempting to prevent its finding an entrance through the wall. Should a powerful dredger, such as that referred to by Sir Alexander Rendel, become necessary, it would apparently be a small matter for such a vessel to remove the sand accumulation of twelve months in a few days. In the meantime the bank which has already accumulated should be removed, at any rate in part, and it is understood that the *Wenlock* is well adapted to undertake the operation. Careful observation would then show whether it is necessary to make the south arm sand-tight; but, in dredging the sand bank, it will have also to be considered how much should be removed, whether all, or if a portion should not be left.

4. The sand which, during the past fifteen years, has accumulated along the south arm, has not yet encroached upon Nos. 1 and 9 berths to any greatly inconvenient extent, and it was useful only last month, in keeping the S.S. *Secundra* off the masonry of the south arm, when she broke away from her moorings. Had there been deeper water alongside the arm, the ship might have collided with and have been injured against it.

5. The Board is not at present in a position to arrive at any definite conclusion upon Sir Alexander Rendel's report, as to what should or should not be done with regard to the entrance, and the reported shoaling of it and the roadstead. He does not appear to consider the evidence before him as conclusive that shoaling of the roadstead is taking place, nor do the Trustees; but in this connection the Board would again urge that a trained officer, whose report would be final and conclusive, should, at as early a date as possible, be deputed to make a survey, using the steam-launch *Lady Wenlock*, which, it is understood, would be perfectly suitable, and in every way well adapted for carrying out the work.

6. The Board is strongly of opinion that the harbour having been completed to the sanctioned design, no attempt should be made at present to do anything further in the way of construction, beyond the minor improvements, for the purposes of

trade, lately submitted to Government. The sand bank along the south arm can temporarily be dealt with by the dredger *Wenlock*; the question as to the necessity for the powerful vessel proposed by Sir Alexander Rendel, can lie over for consideration until it is proved that shoaling of the roadstead is likely to effect the entrance to an appreciable or dangerous extent; and it does not appear that there is the least probability, or even possibility, of any very sudden shoaling taking place, to an extent calculated to interfere with the free use of the entrance.

In the meantime the Board would be glad to receive full particulars from the builders, with specifications, of the dredger which may become necessary, should the dredging which Sir Alexander Rendel recommends in certain eventualities, ever have to be undertaken.

Enclosure.

Extracts of Proceedings of the Trustees of the Harbour of Madras, at a meeting held at the offices of the Board on Friday, the 4th day of December 1896.

* * * * *

3. Read G.O., No. 813, Marine, dated 23rd November 1896, forwarding, for remarks, report from Sir Alexander Rendel.

Read minutes by Trustees.

Resolved that the Chairman is requested to address Government.

* * * * *

4. Read again memo. No. 566 E., dated 12th November 1896, from the Secretary to Government, Marine Department, forwarding for report telegram from the Secretary of State, dated 10th idem, enquiring if the Harbour Trust Board agrees to purchase a steam boiler, and other plant, at an estimated cost of £1,048 (including £657 for the boiler) for stopping passage of sand through the south arm.

Read minutes by Trustees.

Resolved that the Board is not prepared, at present, to sanction the expenditure.

* * * * *

(True Extract.)

(Signed) C. PINSENT,
Secretary, Harbour Trust Board.

Order—No. 15, Marine, dated 5th January 1897.

Ordered that the Government of India and the Home Government be addressed — the former in regard to a trained officer for the survey of the roadstead, and the latter in regard to the proposed dredging operations.

2. The following telegram will be despatched to the Secretary of State for India :—

"Your telegram 10th November last. Madras Harbour Trust Board not inclined to purchase dredger. Letter follows."

[Here enter No. 16, Marine, dated 5th January 1897.]

(True Extract.)

(Signed) D. McNEIL CAMPBELL, Colonel, R.E.,
Secretary to Government.

To the Chairman, Harbour Trust Board.

Exd. T. K. Narayana Aiyangar.