

A. G. MUMFORD, LTD.

CONTRACTORS to the ADMIRALTY, WAR OFFICE, INDIA OFFICE, CROWN AGENTS for the
COLONIES, SPANISH and other FOREIGN GOVERNMENTS, &c.

Compound Surface Condensing Engines,

FOR STEAM LAUNCHES, YACHTS, &c.

AS SUPPLIED TO H.M. ADMIRALTY.

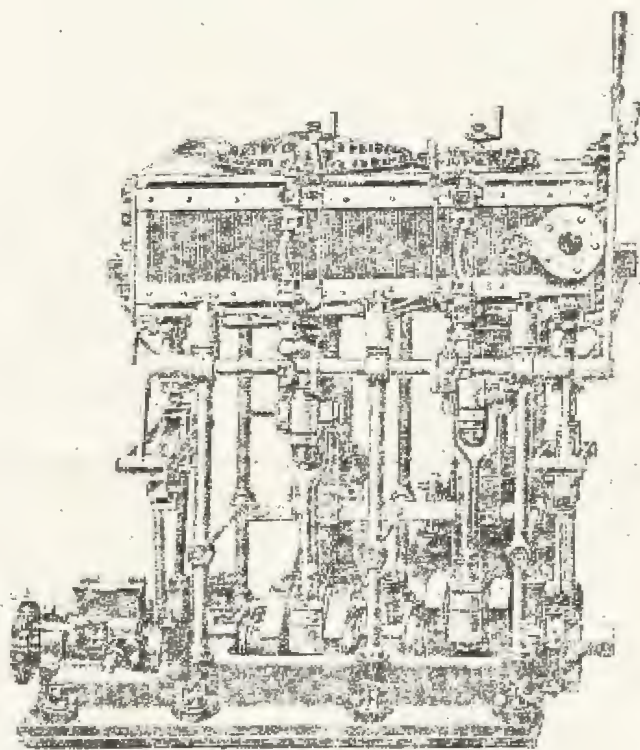


FIG. 1. B. PRODUCED FROM A PHOTOGRAPH.

These Engines are made in several sizes, from $2\frac{1}{2}$ ins. and 5 ins. \times 4 ins. stroke to 6 ins. and 12 ins. \times 7 ins. stroke, and are supplied complete with Boilers Stern Tubes, Shafts, Propellers, Copper Pipes, and all connections ready for fitting into vessels.

For Complete Machinery of various sizes, see page 11.

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Compound Surface Condensing Engines,

COMPLETE WITH BOILERS, SHAFTS, SCREWS & FITTINGS, READY FOR FITTING INTO STEAM LAUNCHES, YACHTS, &c.

Awarded SILVER MEDAL,
Liverpool International Exhibition, 1886.

Awarded GOLD MEDAL,
Cardiff International Exhibition, 1888.

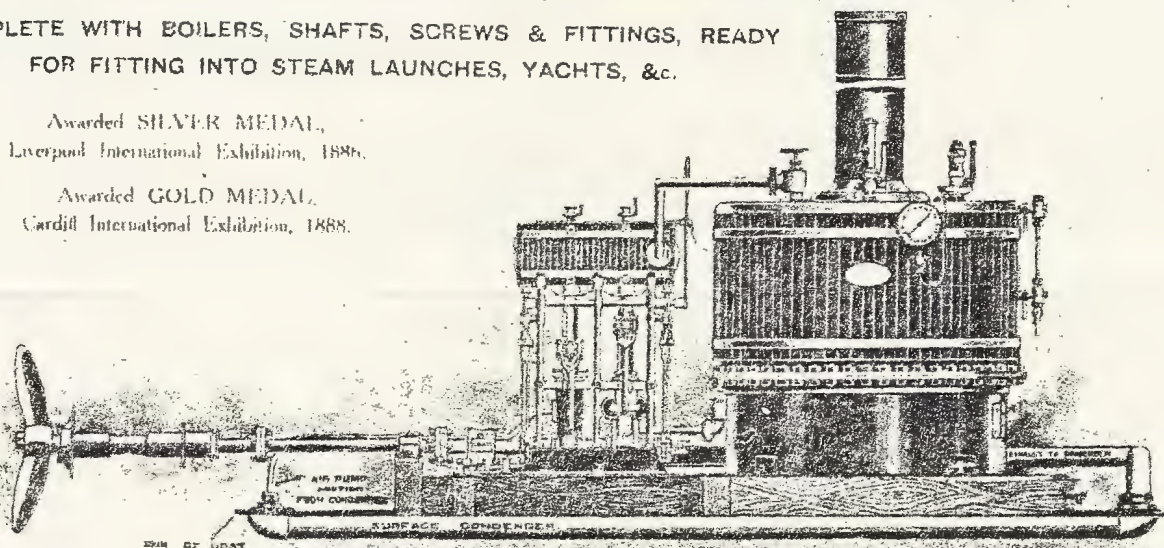


FIG. 2. COMPLETE SURFACE CONDENSING MACHINERY, AS FIXED IN BOATS.

Fig. 1 on page 10 and Fig. 2 above illustrate Mumford's well-known type of high-class Launch Machinery as fitted in a large number of Launches, Yachts and Pleasure Boats. All Machinery is erected and tested under steam before delivery.

DESCRIPTION.

Bed Plate.—Of Iron, on which are cast three Pedestals for Main Bearings, supporting Cylinders on six polished steel Columns, rigidly stayed.

Steam Cylinders.—Two in number, cast together with Steam Chests, lagged with polished Teak or Mahogany and polished Brass Bands, and fitted with Regulating and Pass Valves, Lubricators, Drain Cocks, &c.

Motion Work.—Steel Crank Shaft with Coupling and Thrust Collars and Eccentrics forged in one piece, Steel Piston Rods and Crossheads forged in one, Steel Connecting Rods, large Bearing Surfaces and efficient Lubricating arrangements, Slide Valves with Link Motion Reversing Gear.

Thrust Block.—Embodied in Engine Bed, where it is easily accessible.

Condensers.—Copper Surface Condensers of external type for placing in line with Keel. Large Cooling Surface. Fitted with Vacuum Gauge and all connections.

Air and Feed Pumps.—Fitted at back of Engine, driven direct from Crossheads, without Levers.

Workmanship and Finish.—First-class in every respect. Materials are of best quality and these Engines are most efficient in regard to speed, horse-power and proportionate economy of steam.

For Complete Specification, see page 12.

For Prices, see page 2 of separate List at end of book.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

Telegrams: "MUMFORD, COLCHESTER."

Compound Surface Condensing Launch Machinery, WITH IMPROVED VERTICAL WATER TUBE BOILER.

OUTLINE SPECIFICATION.

Cylinders.—Mounted upon turned and polished steel columns, bolted to base plate, and lagged with felt and polished teak, secured with polished brass straps.

Piston Rods.—Of steel, crossheads working in guides with large wearing surfaces and easy adjustments.

Crank Shaft.—Of steel, turned and polished all over, solid forged Coupling and Thrust Collars, gun-metal Thrust Block, fixed upon bed plate.

Reversing and Valve Gear.—Of steel, case-hardened at working joints.

Connecting Rods.—Of forged steel, turned all over, and fitted with brasses at top and bottom.

Condenser.—Of copper, with large cooling surface, Vacuum Gauge and connections for fixing outside Boat, as illustrated, and large Hot Well.

Air Pump.—Of gun-metal, attached to Engine, worked from crosshead of high pressure Piston.

Feed Pump for Boiler, of gun-metal, worked from high-pressure Piston crosshead, with connections for pumping from Hot Well or the Sea.

All necessary Lubricators, Drain Cocks, Oil Cups, and Copper Pipes complete.

Stern Gear.—Stern-tube of gun-metal, with gun-metal Gland, Studs and Nuts, fitted at both ends with lignum-vite Bushes (except No. 1, which is fitted with gun-metal Bushes).

Outer length of Shafting of gun metal, turned throughout, fitted with Nut and Key at outer end, tapered to fit Propeller.

Propeller.—Of gun-metal, of the most approved design, bored and fitted to Shaft.

Intermediate Shaft.—Of steel with solid forged Couplings, and cast iron Pillow Block, fitted with brasses.

Reserve Feed Tank.—A galvanised steel Reserve Feed Tank of suitable capacity, arranged to fix under Stern, fitted with Cock to Hot Well, Feed Pipe and Screw Cap.

Piping.—All copper pipes supplied in straight lengths with loose flanges, ready for brazing. All necessary Sea Cocks and connections for fitting to Boat's bottom.

Steel Vertical Water-Tube Boiler.—Of improved design, with extra large heating surface, grate bar surface, and steam space. The tubes are of brass.

These Boilers are so arranged that upon taking out the bolts from the angle rings and round the uptake, as well as removing the nuts from the top of Fire-box stays, the whole of the outer shell can be removed without disturbing the lagging, leaving the Fire-box and tubes perfectly free for sealing and cleaning; this admits also of the interior of the shell being thoroughly cleaned, and also enables any tube to be easily removed and renewed when necessary.

The operation of taking the Boiler to pieces, cleaning and putting together again can be carried out in a very short space of time; whilst the angle-iron rings, which are accurately turned, enable the joints to be easily and reliably remade.

This improved arrangement insures the safety and durability of the Boiler, a want long felt by users of Steam Launches.

The Boiler Fittings are of the best quality, gun-metal Main Steam Valve, one Water Gauge, two Test Cocks, Steam Pressure Gauge, two Safety Valves, large Steam Organ Whistle, Blast Cock, Blow-off and Scum Cocks, Feed Check Valves, and Furnace Fittings, Funnel and Ash Pan.

The Boiler is tested to 240 lbs. cold water pressure, for working at 120 lbs. steam pressure, and is lagged with mahogany or teak and polished brass bands. The top of the Boiler and Funnel are cased with sheet iron.

In Sizes 1 and 2 the Engine and Boiler are self-contained on a wrought iron bed plate, so that it requires but a few minutes to remove them from the Boat or to refix; and for the convenience of Yachts, a light Trolley can be supplied on which to place and fix the machinery when taken out of the Launch.

A gun-metal Hand Pump can also be fixed (and is strongly recommended), for feeding the Boiler in emergencies or for pumping Bilge; this is charged extra.

For Main Dimensions and Weights, see page 13.

For Prices, see page 2 of separate List at end of book.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

Telegrams: "MUMFORD, COLCHESTER."

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COLONIES, SPANISH and other FOREIGN GOVERNMENTS, &c.

Compound Surface Condensing Launch Machinery,

WITH IMPROVED VERTICAL WATER-TUBE BOILERS.

MAIN DIMENSIONS AND APPROXIMATE WEIGHTS AND SHIPPING DIMENSIONS OF SIX SIZES.

Engine No.	TELEGRAPHIC CODE WORD	Nab.	Naboh.	Nag.	Ndl.	Naked.	Nankeen.
H.P. Cylinder, dia. ins.		1	2	3	4	5	6
L.P. Cylinder, dia. ins.		2½	3	3½	4½	5½	6
Stroke ins.		5	6	7½	9	10	12
Weight (about) cwts.		4	5	5	5	6	7
Shipping Measurement (about) cub. ft.		1½	2½	3½	4½	8	11½
		7	14	15	20	40	47
Propeller and Shafting, &c.	TELEGRAPHIC CODE WORD	Nupe.	Naphn.	Napkin.	Narrow.	Wasnl.	Nasty.
Propeller, dia. ins.		16½	22	26	31	33½	36
Ditto, pitch ins.		30	30	32	33	42	45
Length of Shafting, from face of Engine Coupling to front of Propeller ... ft.		8	8	9	9½	10	11
Length of Stern Tube between Flanges ft. ins.		1' 10"	2' 3"	2' 3"	3' 0"	3' 2"	3' 9"
Weight (about) cwts.		½	1	1½	2	2½	3
Shipping Measurement (about) cub. ft.		4	5	6	7	15	18
Boiler and Fittings.	TELEGRAPHIC CODE WORD	Natal.	Natron.	Natus.	Nature.	Naval.	Nave.
Diameter ft. ins.		1' 10½"	2' 7½"	2' 10½"	3' 3"	3' 7"	4' 6"
Height ft. ins.		1' 11½"	2' 6"	2' 10½"	3' 4½"	3' 9½"	4' 3"
Heating Surface sq. ft.		20	43	57½	68	94	155
Grate ditto sq. ft.		1½	3	5	6	8	12
Weight (about) cwts.		6	15½	17	21½	29½	50
Shipping Measurement (about) cub. ft.		28	40	50	75	93	166
Piping, Cocks, Tank and Condenser.	TELEGRAPHIC CODE WORD	Navy.	Naze.	Nenl.	Neck.	Needle.	Needy.
Weight (about) cwts.		¾	1½	2	3	3½	4½
Shipping Measurement (about) cub. ft.		8	10	12	15	20	25
Total Weight of Machinery, when under Steam cwts.		9	20	27	35	48	77
Indicated Horse-power (about)		4½	8	12	20	30	45
Length of Engine and Boiler Space ft. ins.		6' 6"	7' 9"	8' 6"	9' 6"	11' 0"	12' 0"

For Particulars of Vertical Water Tube Launch Boilers, see pages 44 and 45, Section B.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

Telegrams: "MUMFORD, COLCHESTER."

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Compound Surface Condensing Engines,

FOR YACHTS, TUGS AND CARGO BOATS.

AS SUPPLIED TO H.M. ADMIRALTY.

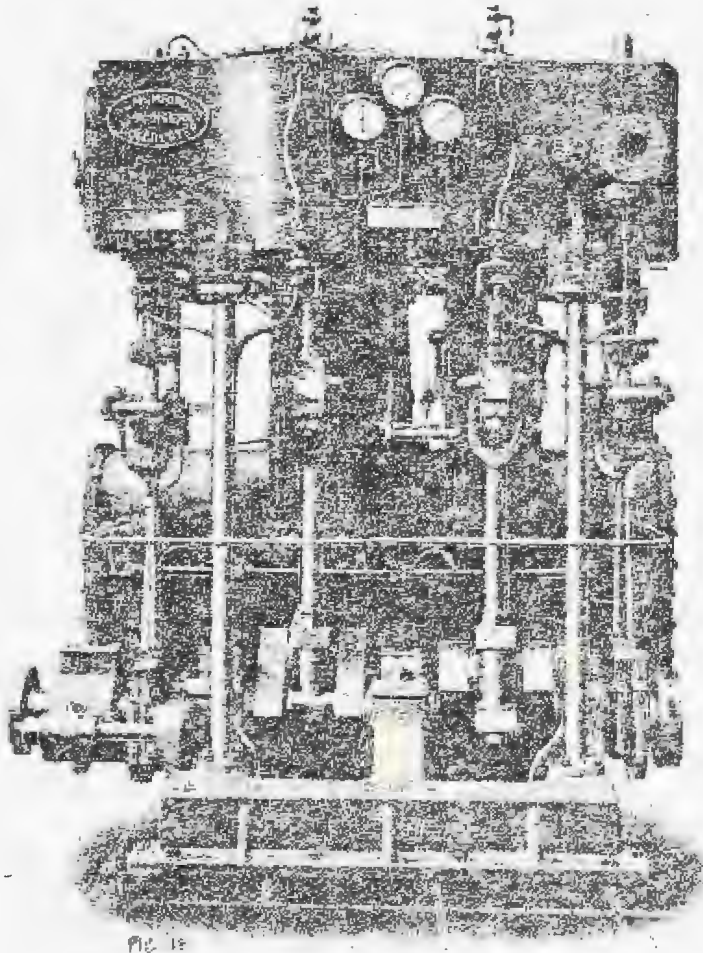


FIG. 13

FIG. 13. REPRODUCED FROM A PHOTOGRAPH.

Sizes of Cylinders 14 ins. and 28 ins. \times 18 ins. stroke.

The Compound Surface Condensing Engine illustrated above is of considerably greater power than those shown on preceding page, and is intended for Yachts, Tugs and Cargo Boats of considerable tonnage.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

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A. G. MUMFORD, LTD.,

CONTRACTORS to the ADMIRALTY, WAR OFFICE, INDIA OFFICE, CROWN AGENTS for the COLONIES, SPANISH and other FOREIGN GOVERNMENTS, &c.

Compound Surface Condensing Engines.

AWARDED SILVER MEDAL, LIVERPOOL INTERNATIONAL EXHIBITION, 1886.

AWARDED GOLD MEDAL, CARDIFF INTERNATIONAL EXHIBITION, 1888.

DESCRIPTION.

The Engine shown in Fig 118, page 16, is of much greater power than those previously described and is intended for Yachts, Tugs and Cargo Boats of considerable tonnage. The illustration is from a photograph of size No. 15, having Cylinders 14 ins. and 28 ins. x 18 ins. stroke.

These Engines are built in the most substantial manner, and are capable of withstanding any amount of work which may be demanded of them, being suitable for hard and continuous running. At the same time, the design has been studied in order to combine lightness of weight with maximum strength.

As in the Engine shown in Fig. 100, on page 14, the Condenser, which is likewise secured to the Foundation Plate, has Columns cast upon it to support the Inverted Cylinders, which latter are stayed in front by strong forged Steel Columns. The Cylinders are lagged in the same manner and fitted with similar mountings, the back Columns by which they are upheld carrying guides for the Crossheads and Guide Slippers.

The four Main Bearings, which are fitted in the Bedplate, are made for extra long Journals.

All Pumps are carried on the Condenser, and are actuated by Links and Levers from the Low Pressure Crosshead.

The Crank Shaft, with Coupling and Thrust Collars, is made from best forged steel, as are also the Piston and Connecting Rods, Valve Rods and Levers.

The Stop Valve and all small fittings are of the same substantial character as obtains throughout the Engine.

Continuous lubrication is provided for Crossheads and Crankpins, as well as Magazine Oil Boxes for all other journals and working parts.

For Outline Specification, Sizes, Weights, and Measurements, see pages 18 and 19.

For Prices of these Engines, see page 3 of separate List at end of Catalogue.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

Telegrams: "MUMFORD, COLCHESTER."

Compound Surface Condensing Marine Engines and Propelling Gear.

Shown on pages 14 & 16.

OUTLINE SPECIFICATION.

Engines. —Pair of Compound, Inverted Cylinder, Direct-acting Screw Engines. Horizontal Condenser, cast with back frames, or separate, as desired. Front Columns of steel, turned and polished. Cylinders lagged with felt and polished teak, secured with brass bands. Pistons fitted with cast iron rings and inside spring rings. Piston and Connecting Rods of best forged steel, polished and fitted with gun-metal bearings. Link motion Reversing Gear, with large bearing surfaces and steel pins working in gun-metal bushes, the latter being made adjustable for larger sizes. Eccentrics fitted with gun-metal straps. Crank Shaft from one forging, with solid Coupling and Thrust Collars, in best forged steel, machined all over. Thrust Block of gun-metal of the horseshoe type, adjustable, running in oil bath, and accessible from Engine Room. Scantlings to Lloyd's requirements. Main bearings of best gun-metal, with extra large surfaces. Condenser with large cooling surface, best solid-drawn brass tubes, brass tube plate, screwed ferrules and cotton packing. Strong webbed Bed Plate, planed to receive Columns and bored for Crank Shaft Brasses. Air, Circulating, Feed and Bilge Pumps, either worked direct or by rocking levers, according to size and pattern. Feed and Bilge Pumps of gun-metal throughout. Air and Circulating Pumps fitted with gun-metal liners, buckets, valve-seats and guards, and with rods of rolled Naval brass. All necessary Lubricating Boxes, with cocks and pipes. Water Service to bearings for the larger sizes. Starting Valve or Cock. Arrangement for barring. Reversing, either by lever or wheel as may be desired.

Propeller, Shafting, &c. —Shafting of Forged Steel, with solid couplings. Scantlings to Lloyd's requirements. Bolts and nuts turned and fitted. Propeller Shaft, brass lined at stern-tube bearings. Pillow Block. Cast Iron Stern-tube, with strong flanged nut outside and stuffing box at inner end, gun-metal gland and gun-metal neck bush. Gun-metal Bushes at each end of lignum-vitæ. Cast Iron Propeller.

Boiler. —Horizontal, Return-tube, of ample heating and grate surface to supply the indicated horsepower specified, when steaming easily. Constructed of steel throughout. All Plates annealed after being worked up. Plates, Riveting and Staying to Lloyd's requirements for meeting the working pressure. Plate edges planed and rivet holes drilled. Designed with a view to accessibility, internally, and supplied with Manhole and Mudhole Doors. Smoke Boxes fitted with Shield plates. Funnels encased. Constructed for a working pressure of 110 lbs. per square inch, and tested by hydraulic power to 220 lbs. per square inch. Furnace Fittings, Double Lock-up Safety Valves, Main Stop Valve, Auxiliary Valve, Two Glass Water Gauges, Scum and Blow-off Cocks, Steam Jet to Funnel, Two Feed Check Valves, and Steam Whistle. Anti-Priming Pipe, and suitable Zinc Slabs.

Donkey Pump. —A Donkey Pump of the "Favorite" fly-wheel type for the smaller sizes of boiler, and either "Favorite" or "Duplex" type for the larger. All necessary connections for pumping from hot well, sea, or bilge, to deliver to the boiler, or overboard.

Piping, Cocks, &c. —All necessary Copper Pipes, in straight lengths, with loose flanges ready for brazing. All Cocks and Valves for boats' bottoms, with connections for wood or iron vessels.

For Main Dimensions, Weights and Shipping Dimensions, see page 19.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

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Compound Surface Condensing Marine Engines and Propelling Gear.

MAIN DIMENSIONS, APPROXIMATE WEIGHTS AND SHIPPING MEASUREMENTS.

TELEGRAPHIC CODE WORD.	Ox.	Owl.	Onion.	Oak.	Oar.	Oasis.	Oat.	Oakum.	Oath.
Engine No.	7	8	9	10	11	12	13	14	15
H.P. Cylinder, dia. ins.	5 $\frac{1}{2}$	6	7	8	9	10	11	12	14
L.P. Cylinder, dia. ins.	10	12	14	16	18	20	22	24	28
Stroke ins.	6	7	8	10	12	14	16	16	18
Weight (about) cwts.	8	11 $\frac{3}{4}$	25	43	56	75	110	120	146
Shipping Measurement (about) cub. ft.	40	47	71	136	163	227	420	500	700
TELEGRAPHIC CODE WORD.	Object.	Obit.	Obscure	Oblong.	Octave.	Odour.	Oculist.	Odium.	Octagon.
Propeller and Shafting, &c.									
Propeller, dia. ins.	33 $\frac{1}{2}$	36	38	43	54	56	59	62	72
Ditto, pitch ins.	42	45	51	69	84	87	93	93	129
Length of Shafting from face of Engine Coupling to front of Propeller ft.	10	11	14	15	16	17	18	20	22
Length of Stern-tube between Flanges ft. ins.	3' 2"	3' 9"	4' 6"	5' 0"	5' 0"	5' 6"	5' 6"	6' 0"	7' 0"
Weight (about) cwts.	2 $\frac{1}{2}$	3	4	8	14	17 $\frac{1}{2}$	21	23	35
Shipping Measurement (about) cub. ft.	15	18	28	37	52	65	70	77	102
TELEGRAPHIC CODE WORD.	Ocular.	Offend.	Officer.	Offing.	Ogee.	Ogle.	Ogre.	Oil.	Oilman.
Boiler and Fittings.									
Diameter ft. ins.	4' 3"	4' 6"	5' 3"	5' 9"	7' 0"	7' 3"	7' 9"	8' 9"	9' 6"
Length ft. ins.	4' 6"	5' 0"	5' 6"	6' 6"	7' 6"	7' 6"	7' 6"	8' 9"	8' 9"
Heating Surface sq. ft.	100	160	210	280	360	440	500	640	800
Grate sq. ft.	4 $\frac{1}{2}$	6 $\frac{1}{2}$	8	10 $\frac{1}{2}$	15	17	20	25	31
Weight (about) cwts.	44 $\frac{1}{2}$	55 $\frac{1}{2}$	72	92	148	170	178	245	300
Shipping Measurement (about) cub. ft.	168	192	220	300	500	640	700	1100	1200
TELEGRAPHIC CODE WORD.	Ointment	Ohio.	Olive.	Ombre.	Omegs	Omeu.	Onset.	Oayx.	Coze.
Piping and Cocks.									
Weight (about) cwts.	1 $\frac{1}{2}$	2	3	4	6	8	9	10	13
Shipping Measurement (about) cub. ft.	6	9	15	25	40	55	70	85	100
TELEGRAPHIC CODE WORD.	Oyster.	Orange.	Orgn.	Orbit.	Orator.	Ore.	Origin.	Oven.	Outcry.
Donkey Pump and Connection.									
Weight (about) cwts.	1	1	1 $\frac{3}{4}$	1 $\frac{3}{4}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$	4 $\frac{3}{4}$	4 $\frac{3}{4}$	7 $\frac{1}{2}$
Shipping Measurement ... cub. ft.	4 $\frac{1}{2}$	4 $\frac{1}{2}$	7 $\frac{1}{2}$	7 $\frac{1}{2}$	13	13	17	17	27
Total Weight of Machinery, under Steam (about) cwts.	73	100	140	190	290	390	490	545	675
Indicated Horse-power (about) ...	25	40	50	70	90	110	125	160	200
Length of Engine and Boiler space ft. ins.	12' 0"	13' 6"	15' 0"	16' 0"	19' 6"	20' 3"	21' 0"	22' 6"	26' 0"

For Specification, see page 18.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

Telegrams: "MUMFORD, COLCHESTER."

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Compound Surface Condensing Engines,

FOR HIGH SPEEDS.

AS SUPPLIED TO H.M. ADMIRALTY FOR VELETTE BOATS.

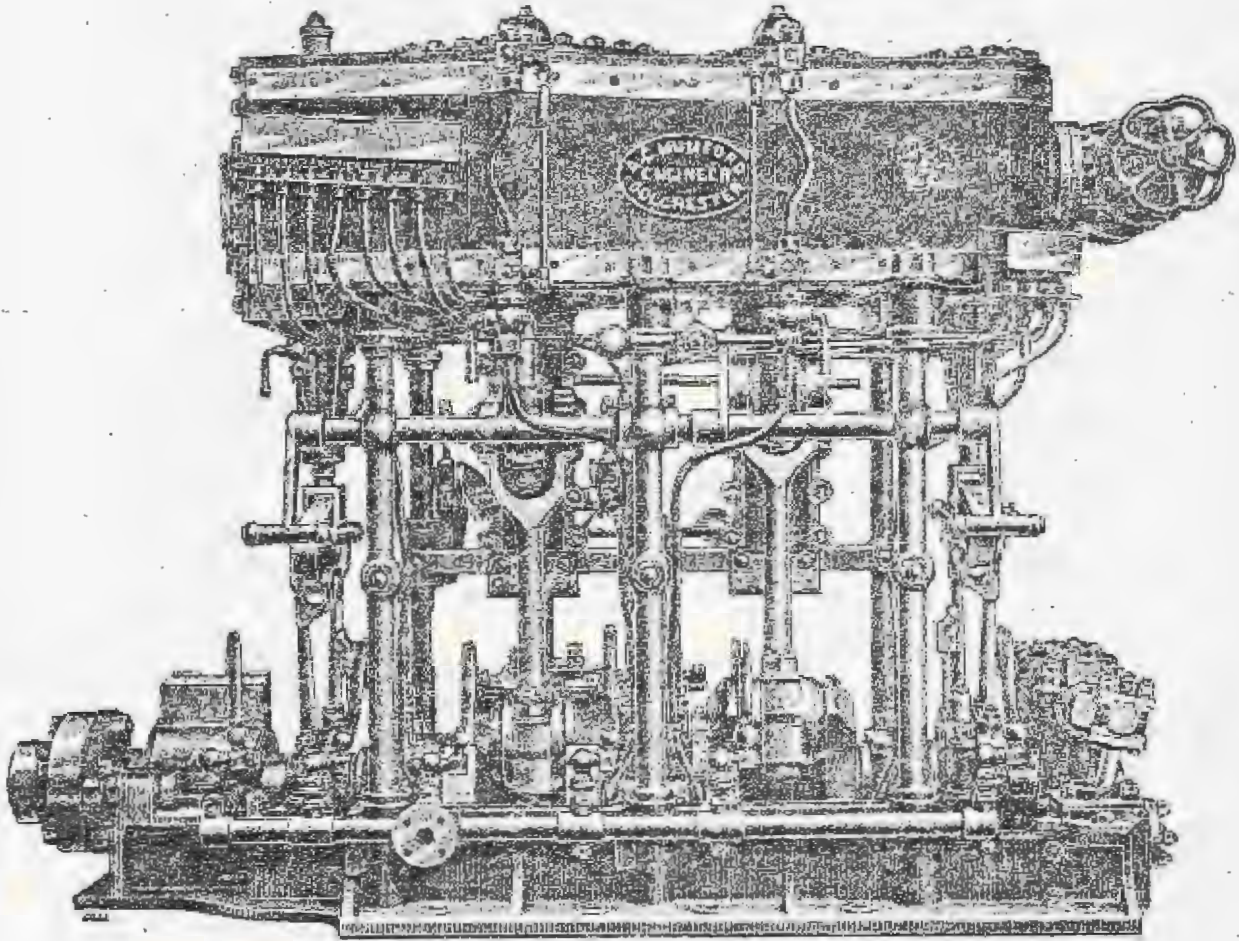


FIG. 4. REPRODUCED FROM A PHOTOGRAPH.

Size of Cylinders 8 ins. and 16 ins. \times 9 ins. stroke.

These Engines are very compact and strongly constructed and occupy a comparatively small amount of space in proportion to the power developed.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

Telegrams: "MUMFORD, COLCHESTER."

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Compound Surface Condensing Engines,

FOR HIGH SPEEDS.

AS SUPPLIED TO H.M. ADMIRALTY FOR VEDETTE BOATS.

See Fig. 4, page 20.

The construction of these Engines has of necessity demanded and received the most careful study in working out details, in order to meet the strains they are required to withstand in long and continuous running at **500 Revolutions per minute**. They are therefore of the most substantial construction, as will be seen by referring to the illustration.

DESCRIPTION.

Bedplate.—Very deep in section, well webbed and strengthened for supporting the six Steel Columns, upon which the inverted Cylinders are mounted and secured. These Columns are stiffened by distance bolts. Three Main Bearing Pedestals are cast in the Bedplate, which is extended at the forward end to carry the Feed Pumps.

Steam Cylinders.—Two, cast together with Steam Chests, lagged with polished teak or mahogany and fitted with Stop Valve, Grease and Drain Cocks and Drain Pipes. Size shown in illustration, 8 ins. and 16 ins. \times 9 ins. Stroke.

Motion Work.—The Crank Shaft, with Coupling and Thrust Collars, is forged in one piece of best steel. The Piston and Connecting Rods, Crossheads, Valve Rods, Reversing Shaft, Levers, Links and Auxiliary Shaft for Pumps, are made of the best steel. The proportions and workmanship are first class and perfect confidence can be placed in the substantial construction of the whole of the machinery. Provision is made in the Starboard Columns for the Reversing Shaft.

Lubrication.—Continuous lubrication is provided for Crank Pins and Crosshead Pins from Oil Reservoir. All other working parts are efficiently lubricated by separate Oil Boxes.

Feed and Air Pumps.—Bolted to forward end of Bed Plate and driven at slow speed by worm wheel gearing from Engine Crank Shaft. Air Pump is driven direct by levers from Piston Rod Crosshead.

Circulating Pump.—Of independent centrifugal type, driven by small direct-coupled Engine.

Water Service.—An efficient Water Service is fitted to all Main Bearings.

Condenser.—The Condenser is carried independently of the Engine, and is fitted with brass tube plates and tubes, with large cooling surface.

ALL ENGINES ARE TESTED BEFORE DELIVERY.

Prices on application.

These Engines are made in various sizes.

CULVER STREET ENGINEERING WORKS, COLCHESTER.

Telegrams: "MUMFORD, COLCHESTER."