

Elco

SIX CYLINDER MARINE ENGINE
MODEL F6



Manufactured by

THE ELCO WORKS

of the

ELECTRIC BOAT COMPANY

Established 1892

BAYONNE, NEW JERSEY, U.S.A.

Sales and Exhibit

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ELCO F6 MARINE ENGINE

INTRODUCTION

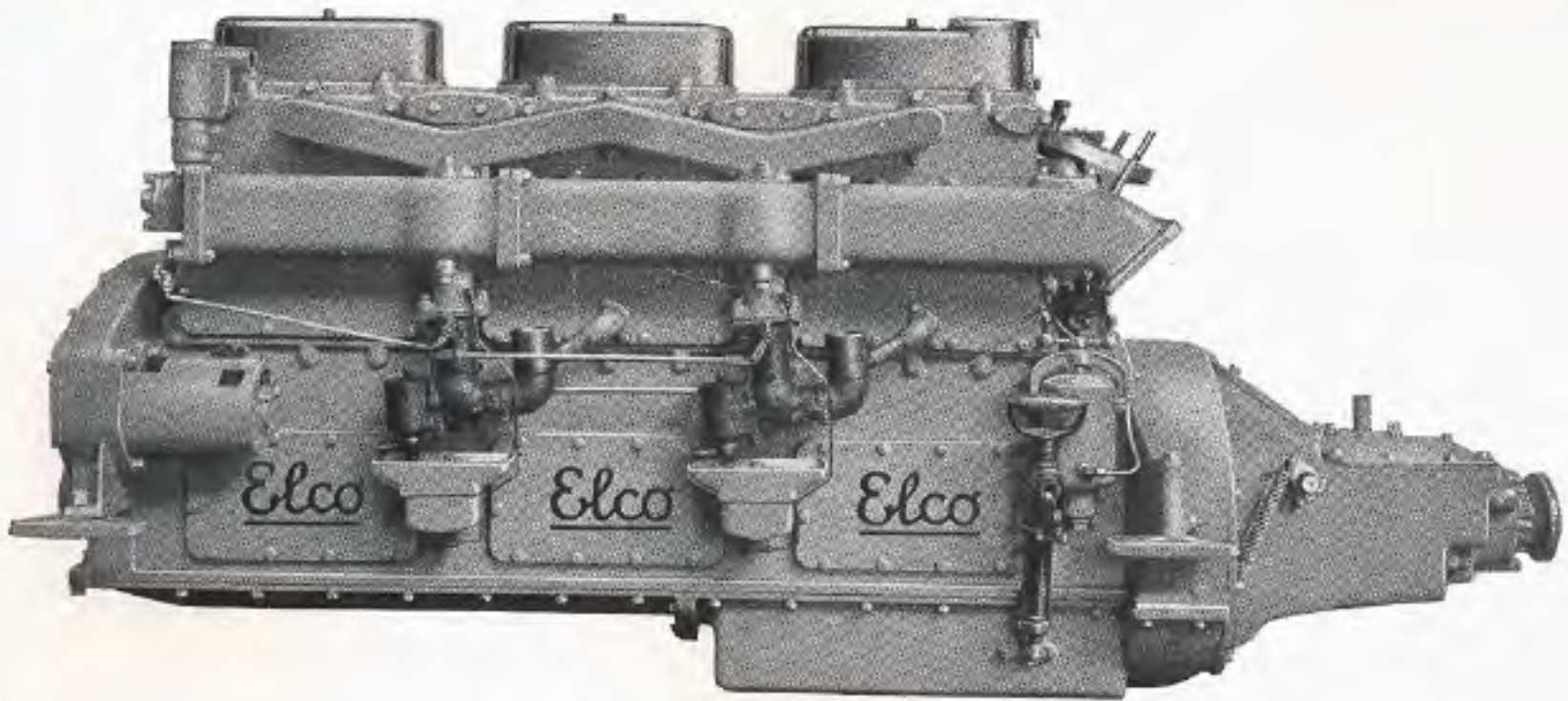
PROGRESS in any field always leaves its milestones, exemplified by new methods and processes, new models, and new products. The leader in any field owes his leadership more to having developed and promoted these improvements than to any other thing. To retain this hard-won leadership, vision is required, and high ideals, imagination, and at times audacity in carrying into effect seemingly impossible projects.

Established in 1892, the acknowledged leadership of The Elco Works in the motor-boat field is marked by various milestones. Its remarkable feat at the Chicago World's Fair in 1893, when during the infancy of electric power, it operated fifty-five electric launches and carried over a million passengers; its inception and development of the Standardized Motor Boat; its notable record during the War, when it built 550 eighty-foot Submarine Chasers for the British Admiralty in 488 days; its choice of a Standardized Engine to power its Standardized Boats, and its use of this engine for the past six years; these are but the larger milestones of its progress. Elco has always led the way.

It was fitting, then, that when search for an engine of greater power to propel the larger Motor Yachts failed to disclose one comparable in individual qualities to the famous Elco Marine Engine, Elco decided to design, develop and manufacture a new engine to fill this need. The same qualities of extreme reliability and freedom from trouble, ruggedness, compactness, smooth and quiet operation, accessibility, abundant power and high economy, qualities so marked in the Elco Marine Engine, were also to be built into the new engine. The same general principles of design, responsible for these qualities, were to be retained. Such improvements were to be incorporated as wide experience in the use of marine engines, and recent advances in engine design, had shown to be desirable. These were some of the ideals back of the new Elco engine.

How well Elco has achieved these ideals is perhaps best indicated by the engine itself, which is described in the following pages. The two years spent in its design and development, the very thorough and severe testing which the experimental engines received, the care with which each part was examined before receiving final approval—all show that this new engine has been fully developed and standardized before being put into production. Manufacture of these engines on a quantity basis is now under way in a large and well-equipped plant, where wide experience in fine engine building, accurate fixtures, and precision machines assure workmanship of the highest quality.

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Port Side of Elco F6 Marine Engine

General Description

THE new Elco F6 Marine Engine is a compact, fully enclosed unit of 6 cylinders, $4\frac{3}{4}$ -inch bore by 6-inch stroke. The backbone of the engine is formed by the semi-steel crankcase, a casting of unusual depth and great rigidity. The massive chrome-nickel steel crankshaft is carried by four bearings of generous size. These are bronze backed, lined with high-grade babbitt, and are of the close-limit interchangeable type, requiring no reaming or fitting. Bolted to a flange on the after end of the crankshaft, the flywheel acts as a buffer between the load and the engine, preventing shocks and vibrations from the propeller from being transmitted to the driving parts and promoting smoothness of running.

Bolted to the top of the crankcase are the three cylinder-block castings, each carrying a pair of removable liners forming the cylinder walls. Each block carries its own removable head, securely fastened to it by ten $\frac{5}{8}$ -inch cap-screws. An unusual feature of these engines is the type of valve arrangement and combustion chamber. The exhaust

valves are located at the sides of the cylinder blocks, with the intake valves directly over them in the heads, making this engine of the F-head type. The space between the intake and exhaust valves forms the high-turbulence combustion chamber, promoting more efficient combustion of the fuel. Among the other advantages of this arrangement are the extra large valves, superior valve cooling, and correct location of the intake manifold directly over the exhaust, providing hot-spots directly above the twin carburetors and eliminating all pockets in the intake system.

Lubrication is by full pressure to all major bearing surfaces, from a gear pump submerged in the oil. The large oil strainer is very accessibly located on the outside of the engine, and may be removed and replaced in a minimum of time. An oil drain pump is provided so that the oil may be easily and quickly removed when required.

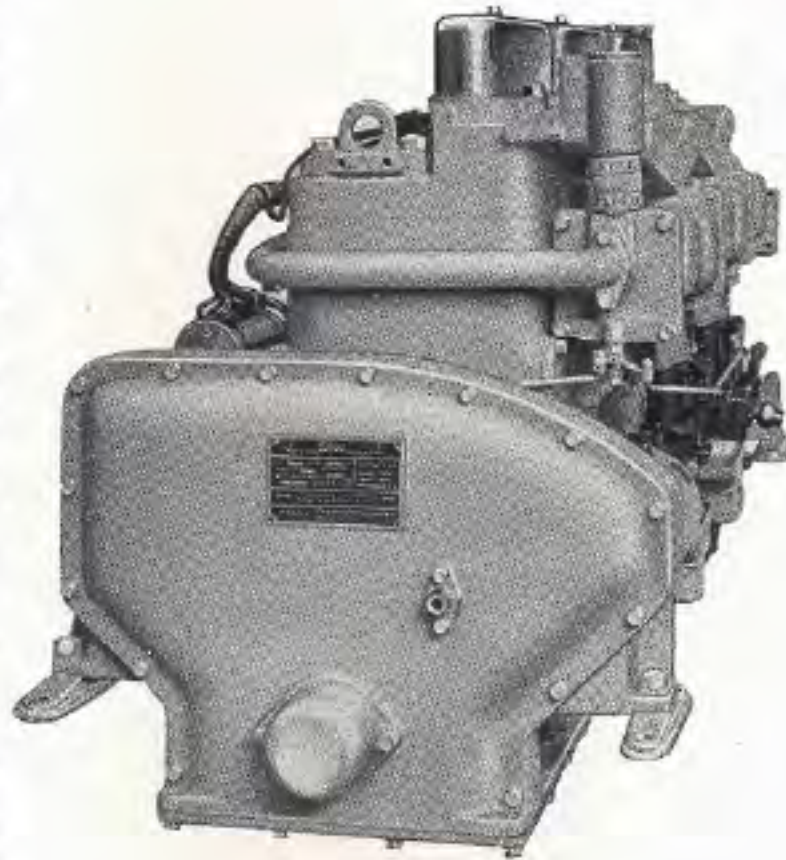
An important feature is that all accessory units are independently mounted and driven, and each may be readily removed without disturbing any other. The camshaft and

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accessory units are driven through a train of wide-faced, accurately-cut helical gears, providing a quiet, durable and trouble-free drive. Two entirely independent ignition systems are provided.

The reverse gear is a compact and quiet unit of the constant-mesh type, with a sliding jaw clutch for the forward, positive neutral, and reverse positions. Gears and shafts are of hardened chrome-nickel steel, and all are mounted on high-grade ball and roller bearings. The over-size multiple-disc clutch, located in the flywheel, requires no adjustment during the long life of the friction facings. A powerful clutch brake makes operation of the reverse gear exceptionally easy.

Taken as a whole, the new Elco Engine represents the highest development of marine engine design. Of high power, quiet and efficient, exceptionally smooth in operation, and as light in weight as is consistent with its rugged strength and great reliability, it combines all those qualities long considered essential in a marine engine, but so rarely attained.



View of Forward End

14 Notable Features of Elco F6 Engine Design

- 1—F-head type of valve arrangement, incorporating high-turbulence combustion chamber and extra large valves, and having several other advantages.
- 2—Accurately ground removable cylinder liners in removable cylinder blocks. Uniform cooling and expansion assured.
- 3—Chrome-nickel steel crankshaft, as hard as can be machined, held to close limits of static and dynamic balance.
- 4—Interchangeable type main bearings, held to very close limits of accuracy. No fitting required.
- 5—Lynite pistons of a new constant-clearance distortionless design, used with light-weight connecting rods drop-forged from high-grade steel. Pistons and rods selected for equal weight.
- 6—Two entirely separate ignition systems.
- 7—A separate mounting and separate drive for each auxiliary unit. Any one may be easily removed in a few minutes without disturbing the others.
- 8—New design gear water pump, of exceptional durability. Hardened rustless steel helical gears and rustless steel shaft and pin used.
- 9—Thermostatic control of water temperature, maintaining constant cylinder jacket temperature regardless of operating conditions. Largely eliminates crankcase oil dilution.
- 10—Positive and thoroughly reliable oiling system, with no outside pipe fittings.
- 11—Very accessible outside oil strainer, on pressure side of pump, easily and quickly cleaned.
- 12—Accessible oil drain pump for removing oil from engine.
- 13—Twin carburetors, with hot-spot passages through exhaust manifold to high-turbulence intake manifold, distributing uniform mixtures to each cylinder. Carburetors provided with self-draining fire-proof drip pans, and with air intakes directed upwards.
- 14—Constant-mesh reverse gear with sliding jaw clutch, having a positive neutral and the same speed in reverse as ahead. Operated in conjunction with a carefully balanced oversize multiple disc clutch of the non-adjustable type

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Specifications for Elco F6 Engine

SIZE AND TYPE. Six cylinder, 4 $\frac{3}{4}$ -inch bore by 6-inch stroke, four cycle, vertical.

CRANKCASE CONSTRUCTION. Crankcase casting of semi-steel, very deep box section, with heavily ribbed webs carrying four main bearings. Three large hand-holes in each side for inspection. Fly-wheel housing is a separate semi-steel casting, bolted and doweled to the crankcase. 4-Point suspension, with removable supporting feet.

CRANKSHAFT. Drop forging of chrome-nickel steel, double heat treated and accurately ground and lapped to size. Average hardness over 300 on Brinell test. Shaft is put in static and dynamic balance on the latest type of balancing machine, and is held to very close limits for balance. Diameter of all journals, 2 $\frac{5}{8}$ inches. Length of front journal, 3 $\frac{1}{4}$ inches. Length of all other journals, 4 inches. Crankpins, 2 $\frac{3}{8}$ inches diameter by 3 inches long.

MAIN BEARINGS. Removable shells of the bronze-backed type, lined with high grade babbitt. These are held to very close dimensional limits, are interchangeable and require no fitting.

CYLINDERS. Separate cylinder blocks of semi-steel, cast in pairs. Cylinder walls formed by removable semi-steel liners, accurately machined and ground to a high finish. Rubber ring gaskets at the

top and bottom of the liners prevent water leakage where they pass through the walls of the cylinder block.

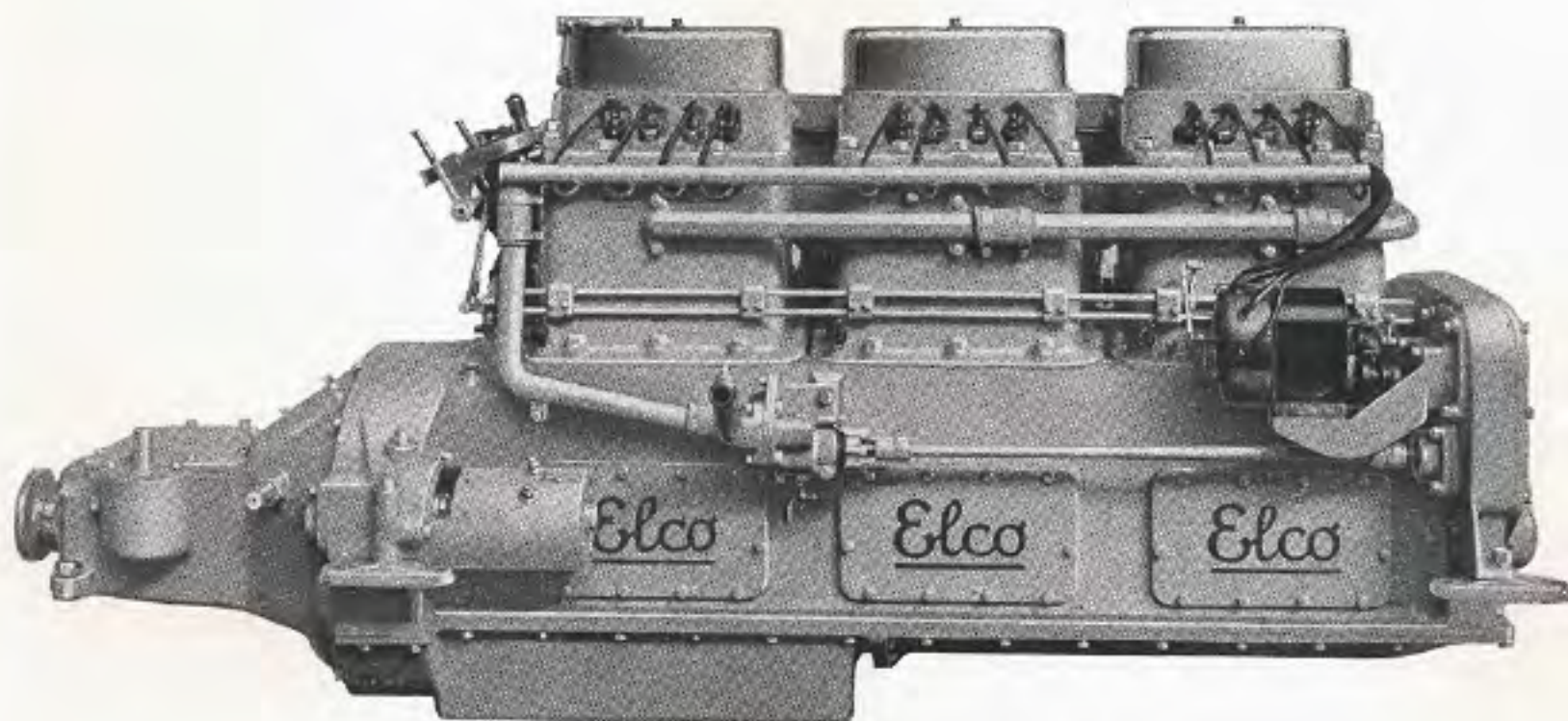
CYLINDER HEADS. Removable semi-steel castings of special design, forming the combustion chamber and carrying the inlet valves.

CONNECTING RODS. Drop forged of high grade steel, and heat treated. Light in weight yet very stiff. The cap is secured by four half-inch chrome-nickel steel bolts. Rods for each engine are selected for equal weight.

CONNECTING ROD BEARINGS. Big end bearings are removable shells of the bronze-backed type, lined with high grade babbitt. Shims are provided for adjustment. The upper end of the rod carries a bronze bushing for the piston pin.

PISTONS AND RINGS. Lynite pistons of Elco design, constant-clearance distortionless type. Accurately ground to size and selected by weight for each engine. Fitted with three plain rings and one oil-control ring.

PISTON PIN. Chrome-nickel steel, 1 $\frac{3}{8}$ -inch diameter, hardened and ground to very close limits. The pin floats in both the connecting rod and the piston, and is retained by snap rings in the piston bosses.



Starboard Side of Elco F6 Marine Engine

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CAMSHAFT. Drop-forged, machined all over, hardened and ground. 1 $\frac{3}{8}$ -inch diameter with large cams and extra large bearing surfaces.

TIMING GEARS. Accurately cut helical gears of steel and semi-steel, 1 $\frac{1}{2}$ inches wide.

VALVES. Clear diameter of valve ports, 2 $\frac{1}{4}$ inches. Intake valves of chrome-nickel steel. Exhaust valves of Thompson Silchrome steel.

OILING SYSTEM. Pressure from a submerged gear pump to crankshaft, connecting rod, piston pin, and camshaft bearings, and to overhead valve rockers. Timing gears flooded with oil from main oil line. All oil passages either drilled in castings or formed by large brass tubes, permanently fastened in place. No outside oil pipes used.

OIL PUMP. Gear type, mounted on bottom of crankcase and extending into oil sump. May be readily removed through handholes after removing two screws. Pump suction through coarse screen, arranged so that sediment or dirt in bottom of oil sump will not be

drawn into the pump. Pump is driven by hardened helical gears of chrome-nickel steel from the after end of the camshaft. Non-adjustable relief valve mounted on pump body.

OIL STRAINER. Fine mesh reinforced strainer of large area, located in a housing on outside of crankcase and taking the oil from the pressure side of the pump. Easily and quickly removed for cleaning.

WATER PUMP. New Elco design of gear pump of great durability. Hardened rustless steel helical gears and rustless steel shaft and pin used. Other parts of pump of high-grade bronze.

CARBURETION. The mixture from twin 1 $\frac{1}{2}$ -inch Stromberg carburetors flows through pipes extending through the center of the exhaust manifold, forming hot-spots. A special design of intake manifold distributes an even mixture to all cylinders. Carburetors are provided with air pipes extending upward to eliminate fire hazard from a back-fire.

CARBURETOR DRIP PANS. Mounted below each carburetor, of special fireproof design, self-draining type.

IGNITION. Two independent ignition systems, firing two sets of plugs. A Splitdorf SS-6 magneto with impulse coupling, and a Delco battery ignition system are used.

STARTING MOTOR AND GENERATOR. Two unit 12-volt Leece-Neville system.

TACHOMETER DRIVE. Provided on forward end of engine, S. A. E. standard connection.

CLUTCH. Elco design dry multiple disc type of excess capacity, located in flywheel. Non-adjustable. Powerful clutch brake provided.

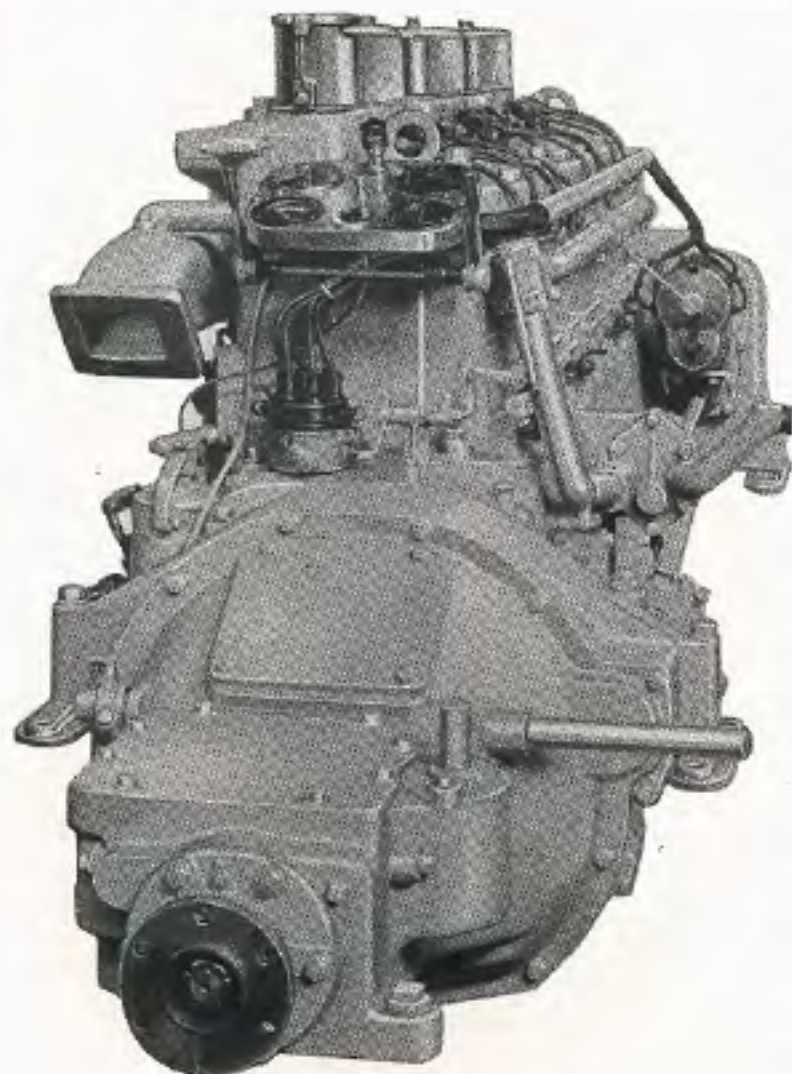
REVERSE GEAR. Elco design, constant mesh gear type, with sliding jaw clutch for engagement. Hardened chrome-nickel steel gears and shafts operate on ball and roller bearings. The reverse speed is the same as the forward, and the neutral is positive. Very compact, quiet, efficient, and easily operated.

POWER OUTPUT. Conservatively rated from 62 H.P. at 800 R.P.M. to 120 H.P. at 1600 R.P.M., these engines are capable of developing considerably more, as shown by dynamometer tests in the Elco laboratory.

WEIGHT. Completely equipped, approximately 1,850 pounds.

ROTATION. Standard rotation is for a left hand propeller.

FINISH. High grade engine enamel.



View of After End

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Equipment

The Elco F-6 engines are furnished completely equipped with all necessary auxiliary units, and are ready to run when received by the purchaser. The following equipment, not specifically mentioned elsewhere, is also included:

Polished aluminum instrument board, on which are mounted oil pressure gauge, ammeter, starting push button, carburetor choke control, instrument board light, and both ignition switches.

Hand control levers, mounted on instrument board and connected to carburetors, magneto, and distributor.

90 ampere hour—12 volt storage battery, charged dry.

Magnetic starting switch.

Generator cut-out.

12-volt ignition coil.

Universal clutch and reverse gear levers.

Propeller shaft coupling, bored for 1½-inch S. A. E. standard taper, and provided with bolts and nuts.

Exhaust pipe flange tapped for 2½-inch iron pipe, with gasket, bolts and nuts.

Hand starting bar.

Oil drain pump shut-off cock.

Complete set of tools.

Instruction book with parts price list.

PRICE. Complete with the above equipment, \$2,450.00, F.O.B. Bayonne, N. J.

TERMS. 25% of price with order, balance payable on delivery, or subject to sight draft attached to Bill of Lading.

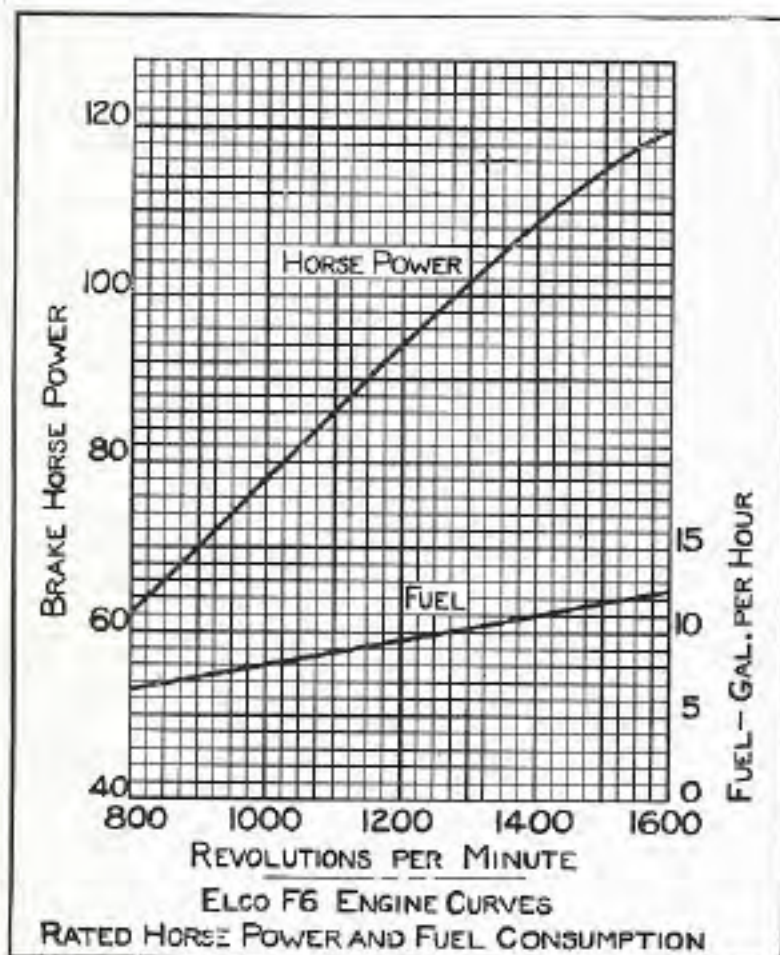
For Export Shipment

Extra crating charge, \$25.00. Approximate size of crate, 94" x 43" x 34"—80 cubic feet. Approximate shipping weight—2,200 pounds.

Guarantee

We guarantee all new Elco F6 Engines against defective material and workmanship for a period of one year from the date of shipment, and we will exchange free of charge, F. O. B. our factory, any part broken by reason of such defects, provided such part is sent prepaid to our factory, properly tagged with the name and address of the sender, and the model and serial number of the engine from which it was taken, and provided that our examination shall disclose to our satisfaction the defectiveness of such part. Standard trade accessories, such as carburetors, electrical equipment, etc., are not included in this guarantee, since they are separately warranted by their respective manufacturers. We guarantee every engine to have been thoroughly tested and inspected before shipment, and to have developed not less than its full rated horsepower.

We reserve the right to make changes or improvements at any time without incurring any obligations to install same on engines previously built.

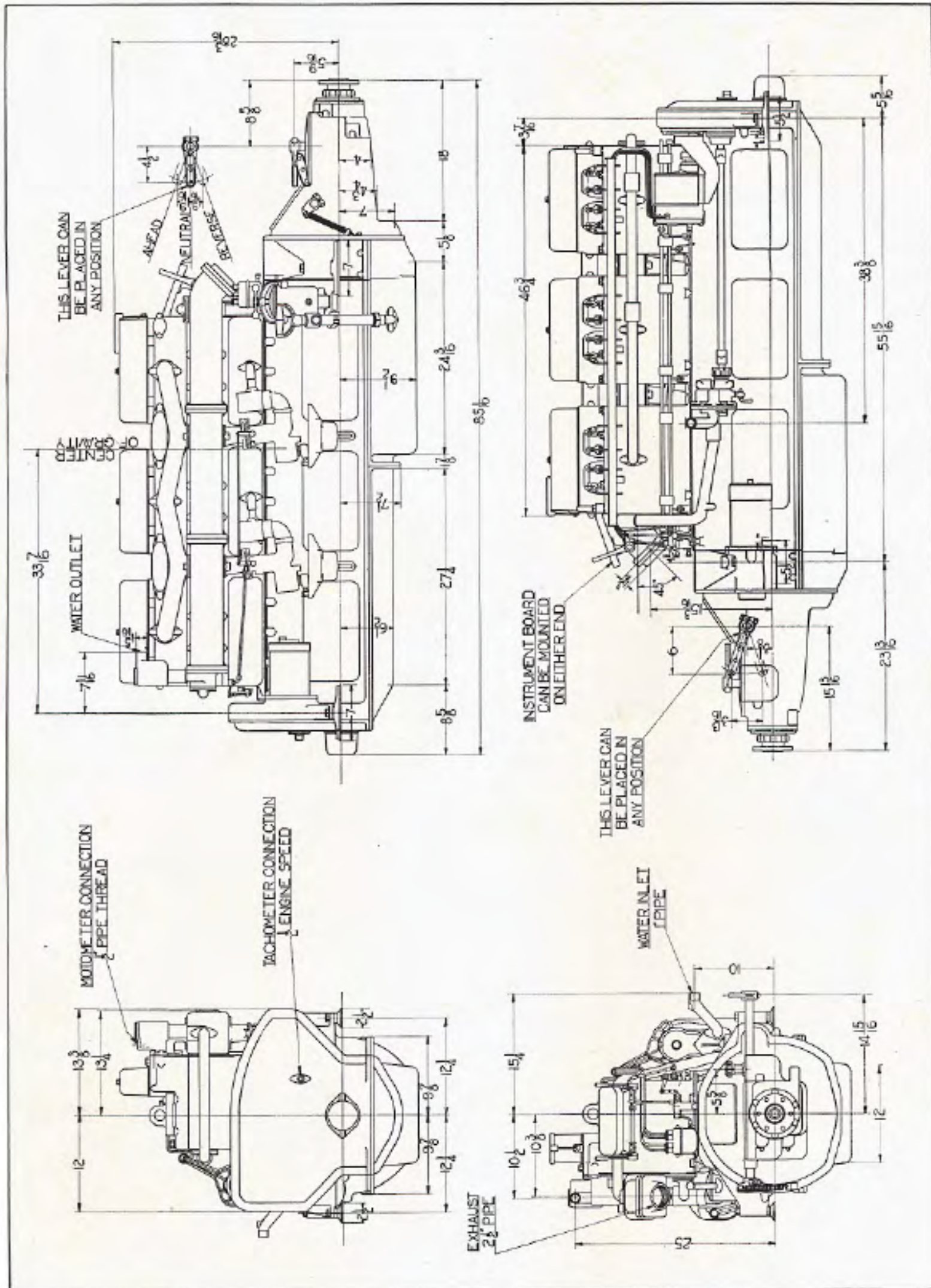


Instructions for Ordering

Model F6L, turning a left hand propeller, is the standard model and will be shipped on all orders for single engines. When ordering engines for a twin-screw boat, specify one each of models F6L and F6R.

Specify whether instrument board is desired on the forward or after end of the engine. Unless otherwise specified, engines will generally come through with the instrument board on the forward end.

Give complete shipping directions.



Installation Drawing of Eko F-6 Engine