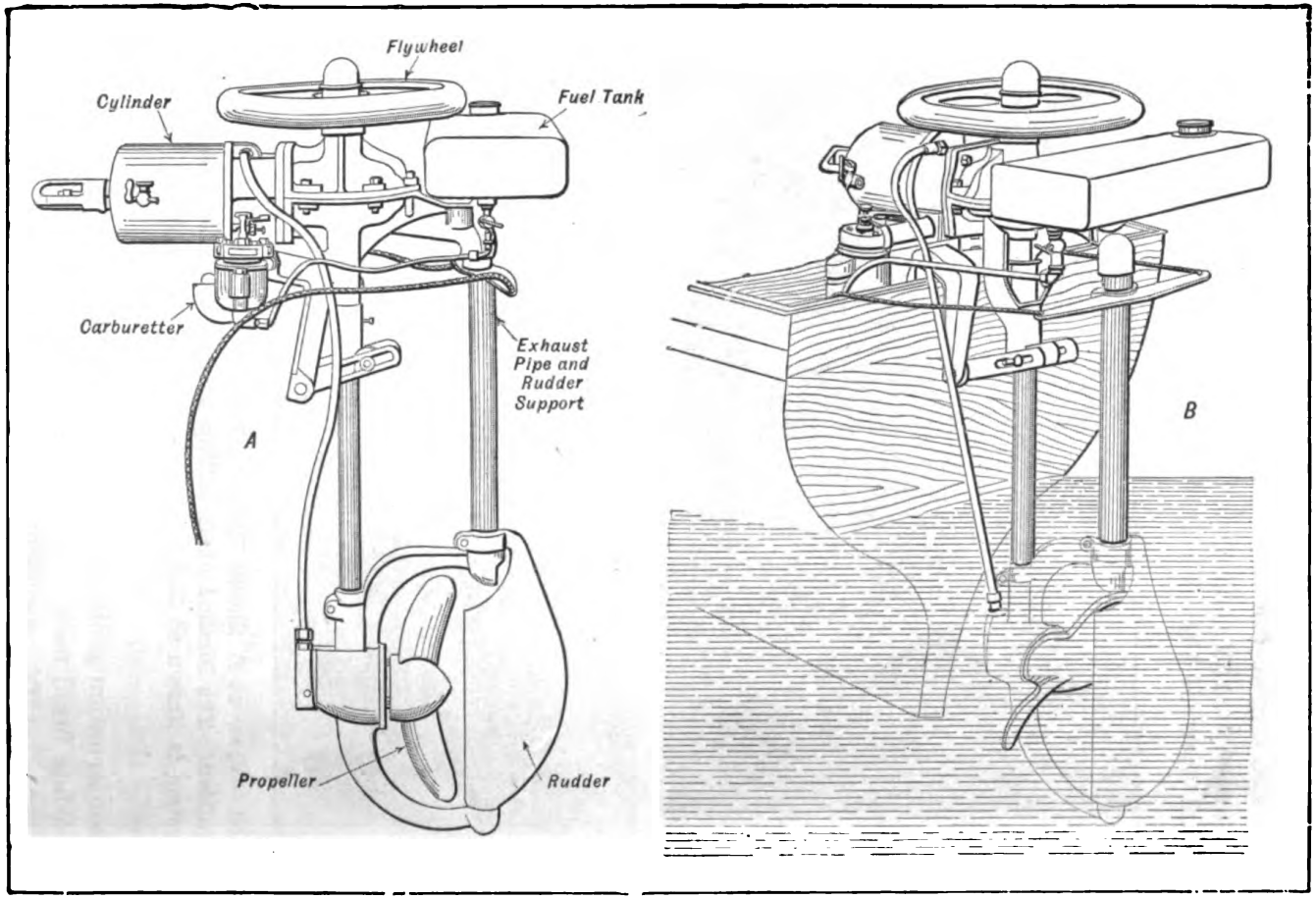


Fig. 189.—View of the Waterman Outboard Power Plant, Complete and Ready for Installation at A, and Method of Application to Rowboat Stern at B

OUTBOARD MOTORS

Originally designed for rowboat use, its scope has been so broadened, that to-day you will find outboard motors used on canoes, sharp-pointed skiffs, duck-boats, house-boats, sail-boats, yachts, tenders, dingies, scows, work-boats, rafts, catamarans—in fact, every kind of craft within the range of power. So varied are the uses that these compact power plants have sometimes been called the "universal motor."

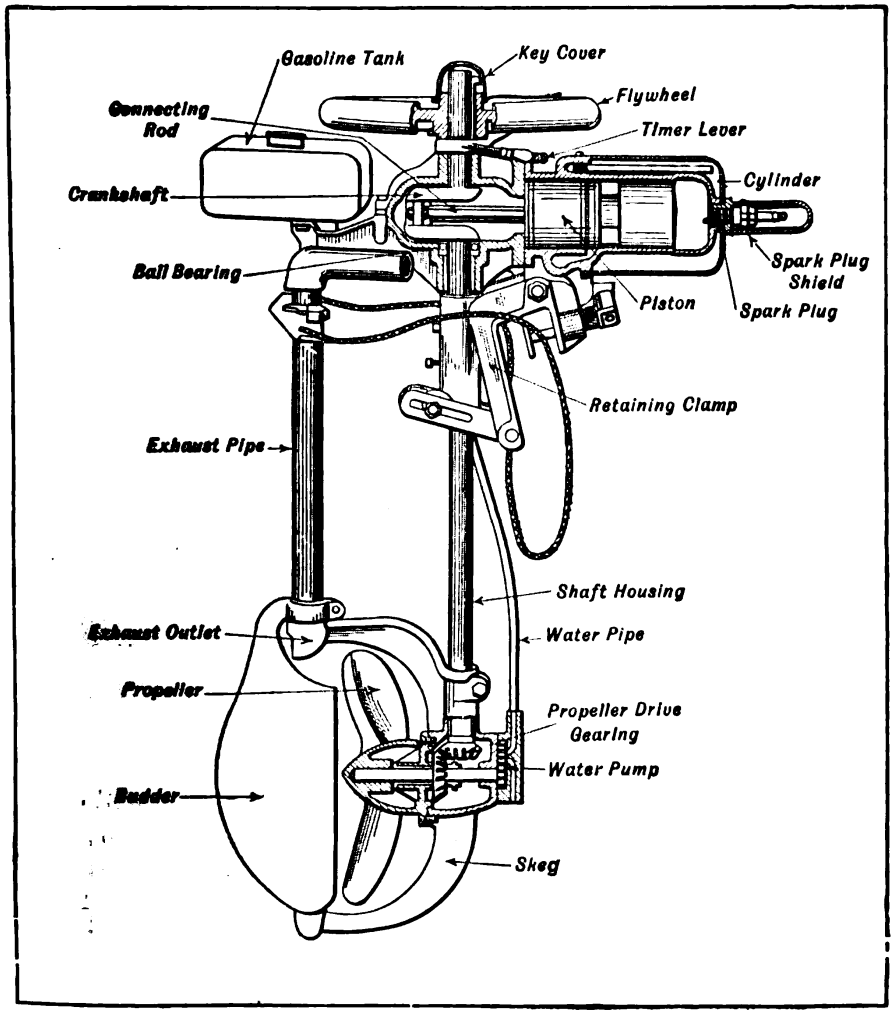


Fig. 190.—Sectional View Detailing Internal Construction of the Waterman Outboard Motor

This engine, or complete power plant, can be shipped like a rudder, and actually takes the place of a rudder, besides driving the boat. Fig. 189, A, shows it ready for use. The ignition equipment may be placed in any part of the boat—usually it is near the stern. Fig. 189, B, illustrates how to attach it, and the construction. This engine may be quickly attached to or de-

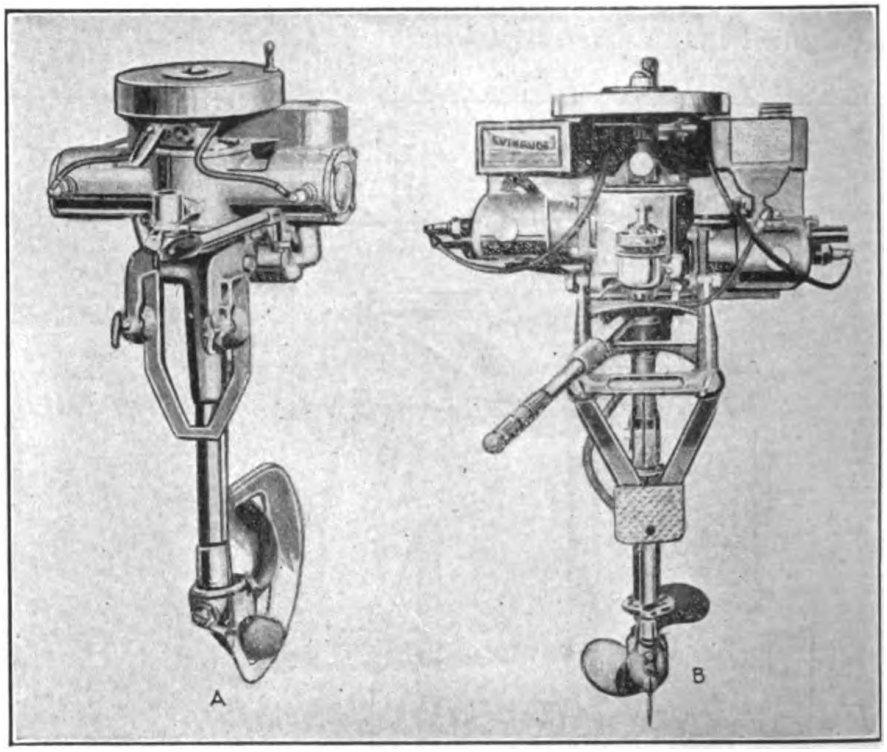


Fig. 191.—Two-cylinder Outboard Motors. A, Koban Design; B, Evinrude Type

tached from any rowboat, and fills a distinct want. It will enable one to convert a rowboat into a motor-boat in a very short space of time.

The sectional view at Fig. 190 shows clearly the construction of the small power plant with its auxiliaries conveniently placed, the method of propeller drive through bevel gears, and the very effective and ingenious attaching bracket. The general construction is the same as inboard motors.

The Koban has two cylinders directly opposed, which fire simultaneously. This construction entirely removes vibration and gives a perfect balance of all working parts. Single-cylinder rowboat motors vibrate, and as a consequence shake the boat to some extent, especially if it is of light construction. It is designed to run between 200 and 900 revolutions per minute and develops in excess of 3 H.P. All parts have been designed to give maximum service. All the wearing surfaces are liberal in area. The cylinders are 2⅝″ bore and 2⅜″ stroke. The compactness of this motor is clearly shown at Fig. 191, A.

The adjustment for height of boat is accomplished by a special sleeve sliding within an extension to the lower bearing. This gives an adjustment of 18″ minimum distance and 24″ maximum

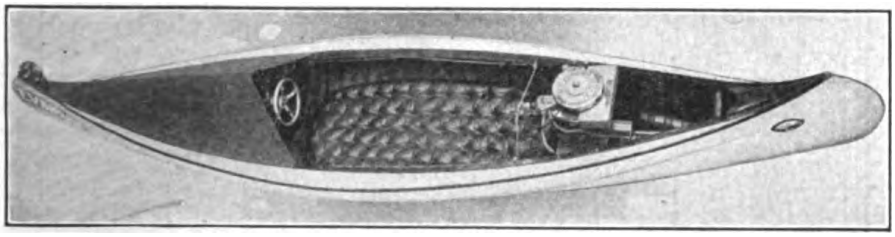
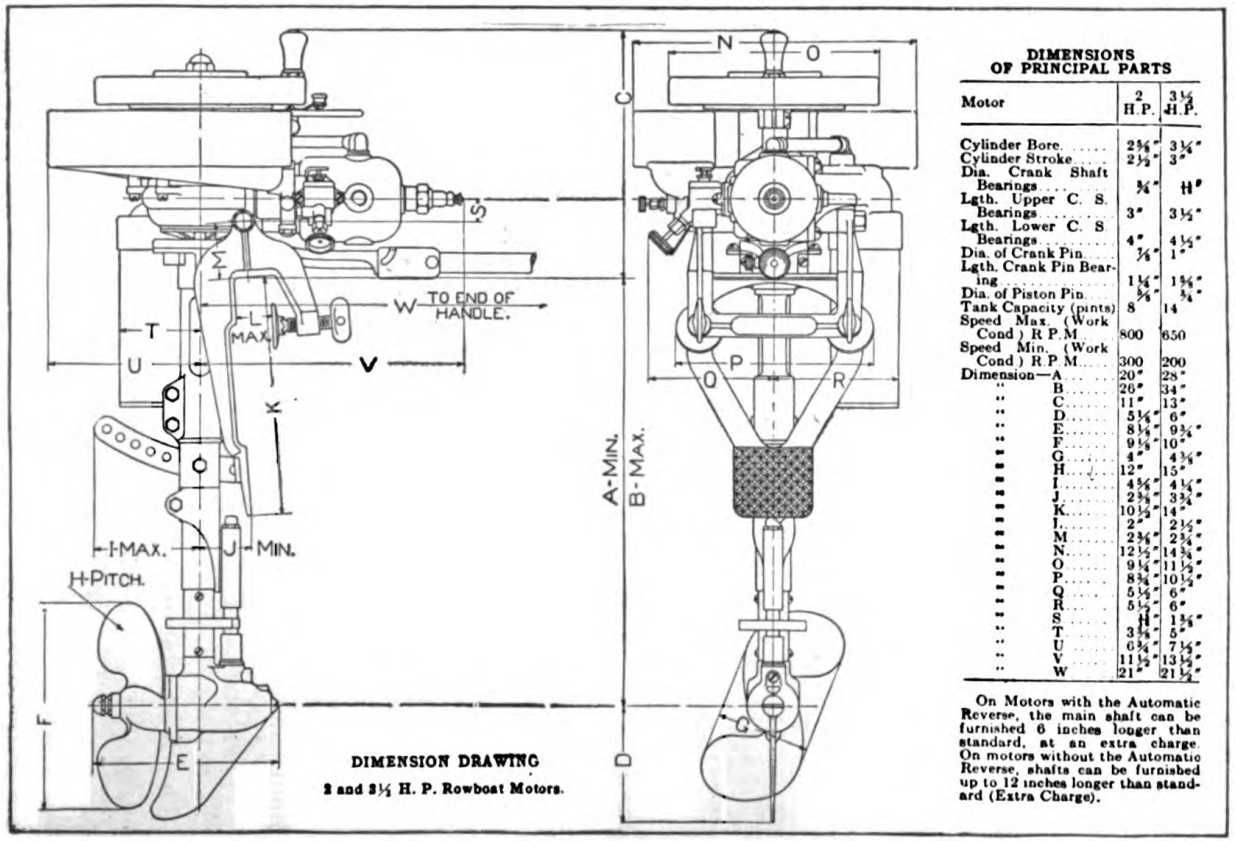


Fig. 192.—Evinrude Motor Applied to Canoe Propulsion

distance from the top of the boat to the center of the propeller. With this range of adjustment it accommodates itself to almost any height rowboat. The Koban is practical to use on sail-boats, although a wooden block will have to be bolted to the aft deck to hold the motor. If the draft of the boat requires it a special length shaft 6″ longer than standard can be furnished at a slight extra cost.

The boat clamps are designed for maximum strength and rigidity. They are made so that the motor can be quickly and easily clamped to any kind of boat. A specially designed rosette with interfitting teeth furnishes simple adjustment to take care of all variations in the design of boats. These brackets accommodate themselves to any angle as great as 45 degrees. It will adjust itself to any kind of a square stern rowboat. For pointed stern rowboats a special attachment is furnished. The Koban weighs 75 pounds, subject to slight variation in weight of castings.



DIMENSIONS OF PRINCIPAL PARTS

Motor	2 H.P.	3½ H.P.
Cylinder Bore	2⅜"	3¼"
Cylinder Stroke	2½"	3"
Dia. Crank Shaft Bearings	¾"	¾"
Lgth. Upper C. S. Bearings	3"	3½"
Lgth. Lower C. S. Bearings	4"	4½"
Dia. of Crank Pin	⅞"	1"
Lgth. Crank Pin Bearing	1¼"	1⅜"
Dia. of Piston Pin	⅝"	¾"
Tank Capacity (pints)	8	14
Speed Max. (Work Cond.) R.P.M.	800	650
Speed Min. (Work Cond.) R.P.M.	300	200
Dimension—A	20"	28"
" B	26"	34"
" C	11"	13"
" D	5⅛"	6"
" E	8⅛"	9¾"
" F	9⅛"	10"
" G	4"	4⅜"
" H	12"	15"
" I	4¾"	4¼"
" J	2¾"	3¾"
" K	10½"	14"
" L	2"	2½"
" M	2¾"	2¾"
" N	12½"	14¾"
" O	9¼"	11½"
" P	8¾"	10½"
" Q	5¼"	6"
" R	5½"	6"
" S	H	1⅜"
" T	3⅝"	5"
" U	6¾"	7½"
" V	11½"	13½"
" W	21"	21½"

On Motors with the Automatic Reverse, the main shaft can be furnished 6 inches longer than standard, at an extra charge. On motors without the Automatic Reverse, shafts can be furnished up to 12 inches longer than standard (Extra Charge).

Fig. 193.—Dimension Drawing of Evinrude Rowboat Motors

EVINRUDE MOTORS

Portability is a big feature of the outboard motor. In its canvas carrying case it is carried like a satchel. Autoists can place it in the tonneau, trunk rack, or on the running board. In the special trunk, or shipping case, it can be checked as baggage. Attaching to any rowboat is a simple matter for anyone. After the final run and inspection, on the testing tank,

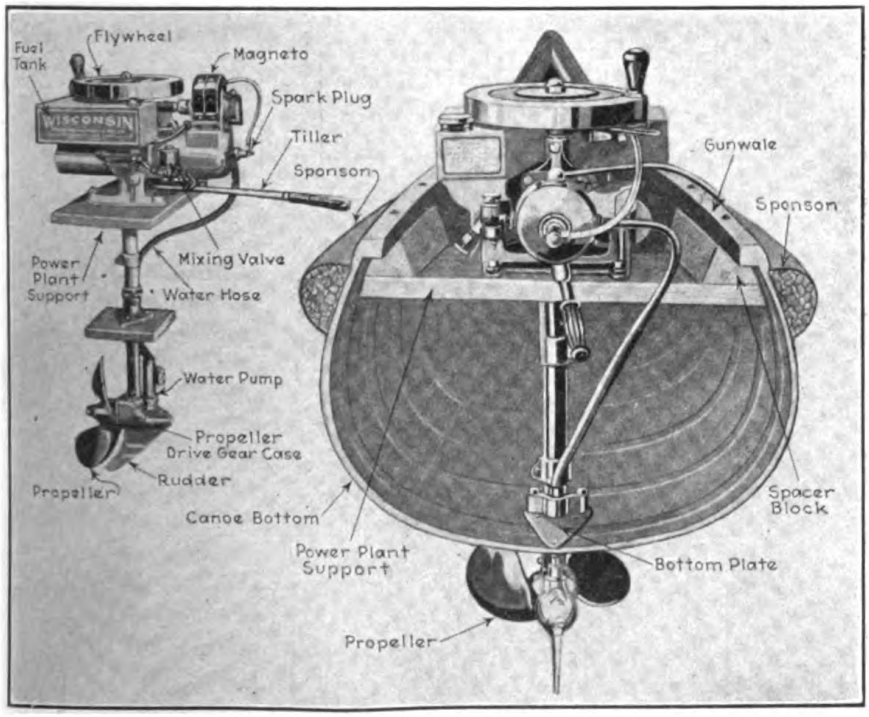
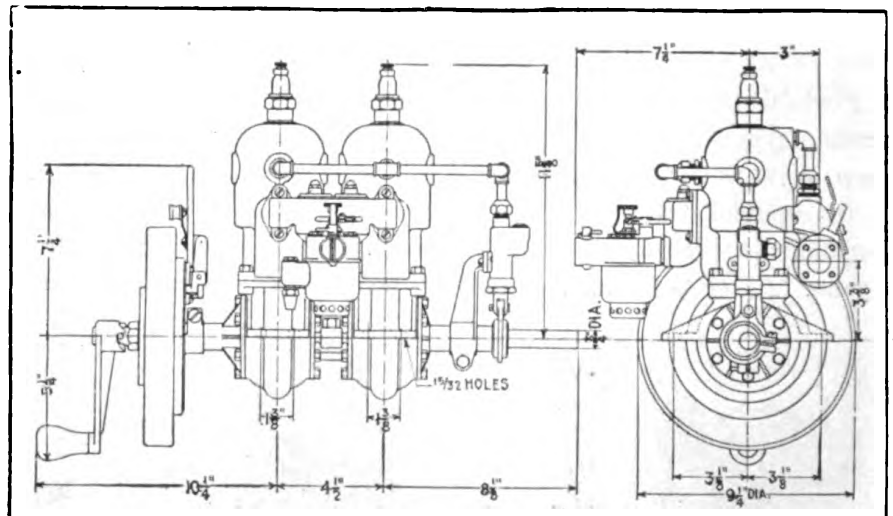


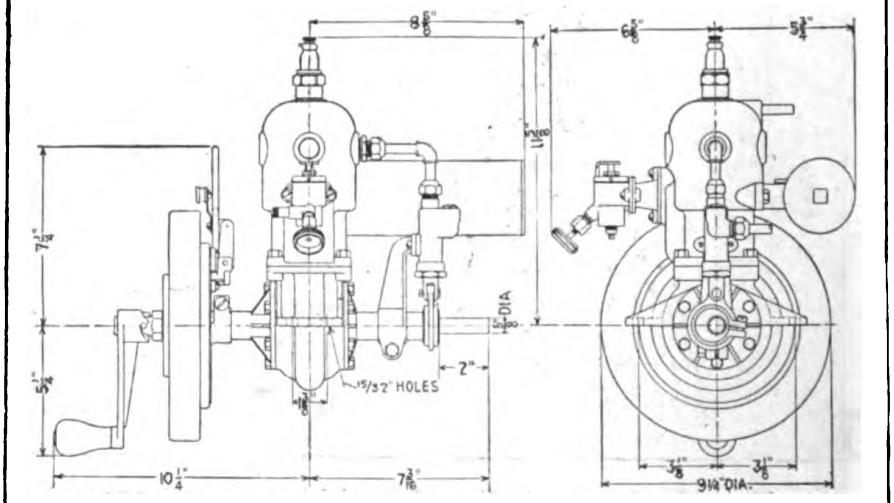
Fig. 194.—View Showing Application of Special Wisconsin Canoe Motor

each outboard motor is packed, without disassembling, into a full-length shipping case. On removal, it is ready to go onto the boat. Drop it over the stern-board, and turn up the thumb-screws with your fingers. If the stern-board is of more than ordinary depth or angle, the propeller sleeve can be quickly adjusted to fit. There are no connections to make, no holes to be bored, no extra tools required. The matter of attaching is simplicity itself—previous mechanical knowledge is by no means necessary.

The operation of the outboard motors such as the "Evinrude"



Dimension Drawing 2-Cylinder Inboard Motor.



Dimension Drawing Single Cylinder Inboard Motor.

Fig. 195.—Dimension Drawings of Small Motors

is really surprisingly easy, because of the very simple and complete instructions. After pouring the gasoline and oil, mixed, into the tank, you are ready to start. Give the flywheel a quick pull, and away you go. Push the timer lever to the right and you go faster. Shove it to the left and you slow down. To stop, merely push the time-lever button. Steer by swinging the tiller handle, which, in turn, causes the entire propeller sleeve to swing.

There is no rudder to bother with. The lubrication, mixed with the gasoline, is automatically taken care of and the motor is clean. The cost of operation is very slight, as a tank of gasoline and oil, mixed, lasts from three to four hours of steady running at full speed. Many owners report an average of 25 to 30 miles on a gallon of gasoline.

The Evinrude is also made in a two-cylinder form, as shown at Fig. 119, B. It is of the four-cycle type, the cylinders firing alternately and, owing to the steady application of power, it runs with very little vibration. It is not as portable as the single cylinder, because of its greater weight, and is intended for commercial applications or semi-permanent installation.

BUFFALO CRUISER AND RUNABOUT TYPE

The Buffalo cruiser and runabout type is designed for cruisers and fast runabouts. They are sturdy engines of medium weight and speed, the idea being to produce an engine that would combine all the qualities of reliability and endurance under long strain which have made Buffalo engines famous, and at the same time not exceed the weight limits of the fairly light cruising boat. These cruiser and runabout engines are built in four sizes. All are similar in the more important points of design, but there are some details wherein the 16-20 H.P. and 25-30 H.P. differ in general appearance from the 40-60 H.P. and the 50-80 H.P., so both models are described.

SOME POINTS OF CONSTRUCTION

Base and crank chamber can be supplied in either iron or aluminum, but iron is considered as regular equipment. The base is of the solid extension type. There are three main crankshaft bearings lined with removable die-cast babbitt. Cylinders are of close-grained gray iron, cast in pairs. They are thoroughly water-jacketed and have large inspection panels which simplify cleaning the water jackets. All cylinders are first rough machined and heat treated, then finish machined and water tested.

The crankshaft is of forged alloy steel, heat treated, all journals and pins being ground to size. It has large diameter, giving not only increased strength, but greater bearing surface. On the 40-60 H.P. and the 50-80 H.P. the camshaft is operated by a