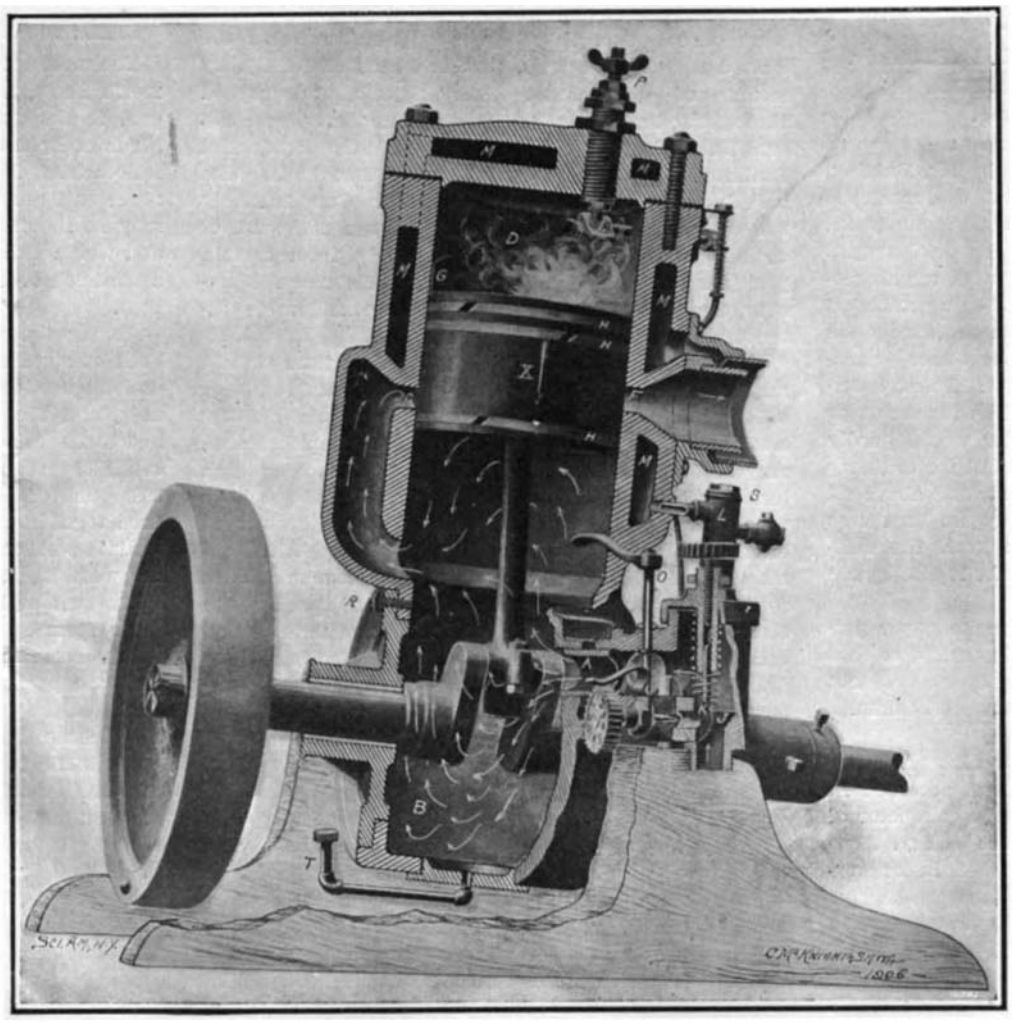
A TYPICAL TWO-CYCLE MARINE MOTOR.

The cross-sectional cut shown herewith gives a very good idea of the interior construction of a Lozier marine two-cycle engine. This engine may be taken as a typical example of the two-cycle type. The piston, *X* (which is fitted with rings, *HHH*), is shown moving downward on the power stroke, being propelled by the burning gases in the cylinder, *D*. The movable electrode, *E*, of the igniter is shown separated from the insulated pin, *P*, which it touched and quickly snapped away from when the piston was at the top of the stroke. Upon the breaking of the circuit a spark was produced, and this exploded the gases. As soon as the piston uncovers the port, *F*, the burnt gases will blow out through the exhaust pipe (which is water-jacketed) by means of their own pressure. A moment later, when at the end of its downward stroke, the piston uncovers the inlet port, *C*, whereupon the compressed charge in the crankcase, *B*, will expand into the cylinder, *D*, being directed upward by the deflector plate, *G*. The piston will then move upward, and compress this fresh charge. At the same time it will produce suction in the pipe, *A*, and will raise the valve, *J*, thus allowing gasoline entering through the pipe, *K*, to flow past the needle valve (which terminates in the seat of valve, *J*), and be drawn through the intervening passages and pipe, *A*, into the crankcase, where it is compressed on the next downward stroke of the piston. An adjustable screw regulates the lift of the valve, *J*, and the needle valve can also be set for the proper amount of fuel. At the base of the rod, *O*, is a butterfly throttle valve used for throttling the mixture. The mechanism which operates the igniter is seen on the right of the motor cylinder. The pump, *L*, draws in water through the check valve, *S*, and circulates it through the water jackets, *M*. This pump is operated by an eccentric. The pipe, *T*, is used for introducing a certain amount of oil into the crankcase. This serves to lubricate the crank and wristpin by means of the splash. The main crankshaft bearings are lubricated by grease cups. The above description will give the novice some idea of the construction of the two-cycle motor.



CROSS-SECTION OF TYPICAL TWO-CYCLE MARINE MOTOR.

ELECTRIC LAUNCH WITH RECHARGING EQUIPMENT.

An improvement in electric launches, whereby they are made independent of an outside source of current for recharging the batteries, has been brought out by the Electric Launch Company on their 1906 pleasure craft. This consists of a horizontal double-opposed-cylinder motor placed just in front of the electric motor and adapted so as to be connected with it by a jaw clutch when, at the end of the run, it is desired to recharge the battery. The gasoline motor has a portable fuel tank, which may be filled, placed outside the boat, and connected to the carbureter through a flexible pipe when it is desired to recharge the batteries. This can be accomplished in three or four hours. Both motors are placed at the rear of the boat under the floor, which is raised some inches above the main floor at this point. The batteries are placed in the bottom of the boat forward of the motors. In case of emergency, or if more speed is wanted, the gasoline motor can be run in conjunction with the electric motor provided gasoline is carried on board. It is always started by the electric motor, and no cranking is necessary. Jaw clutches are provided between the motors and between the electric motor and the propeller shaft. The arrangement is an ideal one, as it makes possible the use of the silent electric launch under all conditions; while, with the battery charged, there is never any doubt about starting and taking a sail when one wishes. Ladies or children can operate these boats as readily as can men. For recharging *in situ* gasoline motors of from 4 to 10 horse-power are fitted according to the size of the launch. These boats range in speed from 7 to 9 miles an hour under electric propulsion, and from 10 to 12 with the motors combined. They have a radius on a charge of 50, 65, or 90 miles according to the size of the battery installed. Forty 150 ampere-hour cells is the smallest battery used. The 8-horse-power electric motor develops normally about 5 horse-power and consumes 30 amperes of current for the 7-miles-an-hour speed.

THE NEW "SPEEDWAY" MARINE ENGINE.

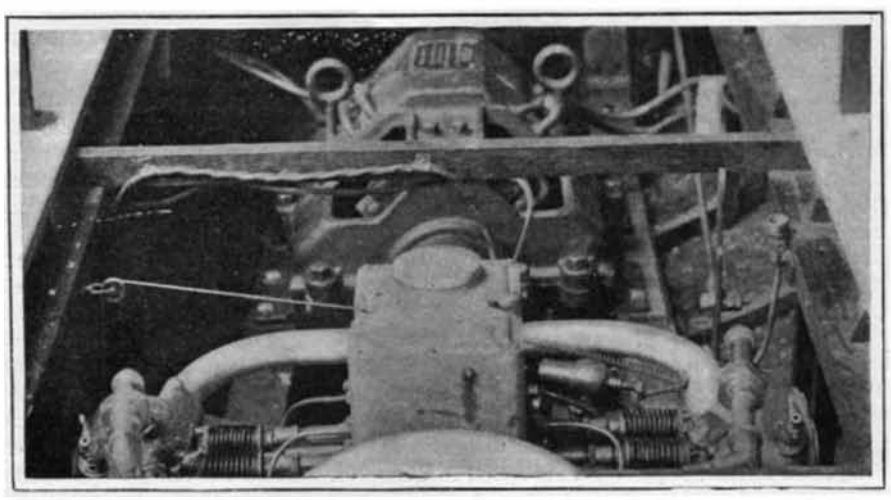
One of our illustrations represents a four-cylinder "Speedway" gasoline engine of 6-inch cylinder bore by 6-inch stroke, capable of developing 40 horse-power at 850 revolutions per minute.

These engines, of the type shown in cut, work on the four-cycle principle, and are designed with a reversing clutch for marine use. The engine shown is adapted for use in either pleasure cruisers or working boats. A lighter stanchion engine is built for high-speed motor boats. The sizes of these four-cycle motors range from 8 to 150 horse-power, the number of cylinders being ordinarily four and six.

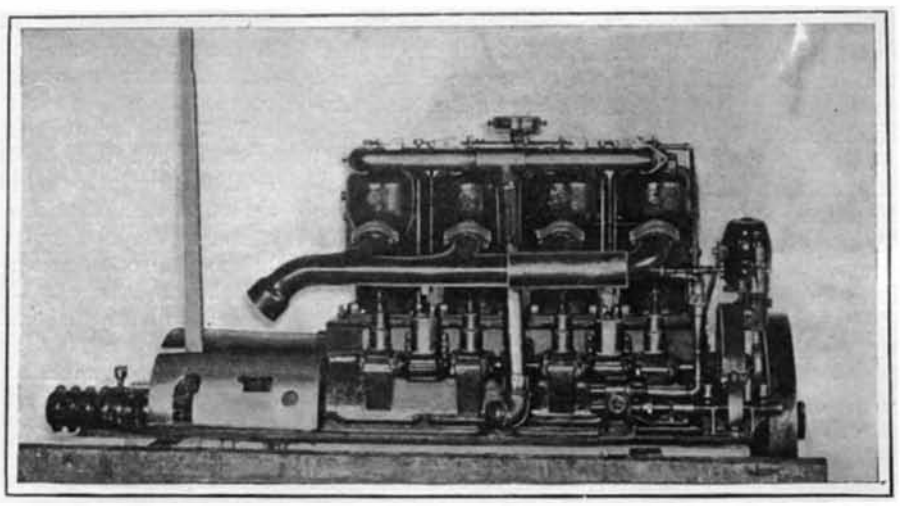
The cut represents the standard type, with cast-iron base and frame in two separate parts. The camshaft is on the outside of the frame, thus making it possible to take this shaft out easily without dismantling the engine. The cylinders are cast separately, with a pocket on one side for the exhaust valve, which is operated by a direct lift from the cam. The inlet valve is located directly over the exhaust, and is opened by a downward push, which is obtained by a reciprocating rod operated by the inlet cam. The rod passing up one side of the cylinder pushes on one end of a lever bracketed on top of the cylinder, the other end of which lever opens the valve. The relative position of the exhaust and inlet valves is advantageous, as the cool, incoming gas is obliged to pass over the hot exhaust valve, thus helping to keep it cool and lengthening its life, by preventing the distortion and deterioration which so often take place from overheating this valve. The pistons and connecting rods of these engines are made as light as is consistent with good practice, thus permitting high piston speed with minimum vibration. All bearings are of ample size, to insure long service and an absence of excessive heating. The valves can be removed and reground with the removal of but a few simple parts. The problem of oil tightness has been satisfactorily solved, as the engine is practically oil tight. No leaky joints are to be found, as is so often the case where screw connections are used in the water pipes. The engines are also designed to be pleasing to the eye, with well-rounded cylinders, polished cast-bronze water pipes, inlet pipes, and inlet valve covers. The engines are not designed on the lines of an automobile engine, but according to safe mechanical construction, which would be acceptable in any stationary engine intended to run for long periods without stopping. The accessibility of all important parts of the engine—a feature so often overlooked in gas engine design—has also been carefully worked out. Throughout the best material is used, such as nickel-steel crankshafts and exhaust valves, prosphor-bronze bushings in the upper end on connecting rods, and in other places where bronze bearings are used. The engine parts are made to jigs as far as possible, thus making it easy to replace parts quickly and satisfactorily. Ball-bearing thrusts are used, and these are carefully protected from water. The larger sizes of these engines are designed to be started by compressed air Several sizes of two-cycle "Speedway" motors are also built by this company, embodying all the up-to-date devices.

The reversing clutch used with four-cycle engines is of the planetary type. All cut spur gears are of steel of the finest material and used extensively. The friction clutch is of special design and of more than usual power. It is easily manipulated, and so constructed that the wear is very slight. Adjustment is simple and quickly made. For high-speed boats, where the utmost power possible is required to be developed by the engine, a clutch that is absolutely positive is used, friction not being depended upon to rotate the shaft. This arrangement embodies an entirely novel design brought out by this company during the fall of 1905, a patent for which has been applied for. It is so constructed that no matter how much power is applied, it cannot slip in any manner.

The manufacturers' special claims for these engines are: Up-to-date design, superior material and workmanship, and a resultant reliability, high efficiency, and durability.



GASOLINE MOTOR DIRECT-CONNECTED TO ELECTRIC MOTOR FOR RECHARGING THE BATTERIES OF AN ELECTRIC LAUNCH.



40 H. P. MARINE MOTOR WITH CLUTCH AND REVERSE DRUM. THE IGNITION DYNAMO IS PLACED ON END ABOVE THE FLYWHEEL.