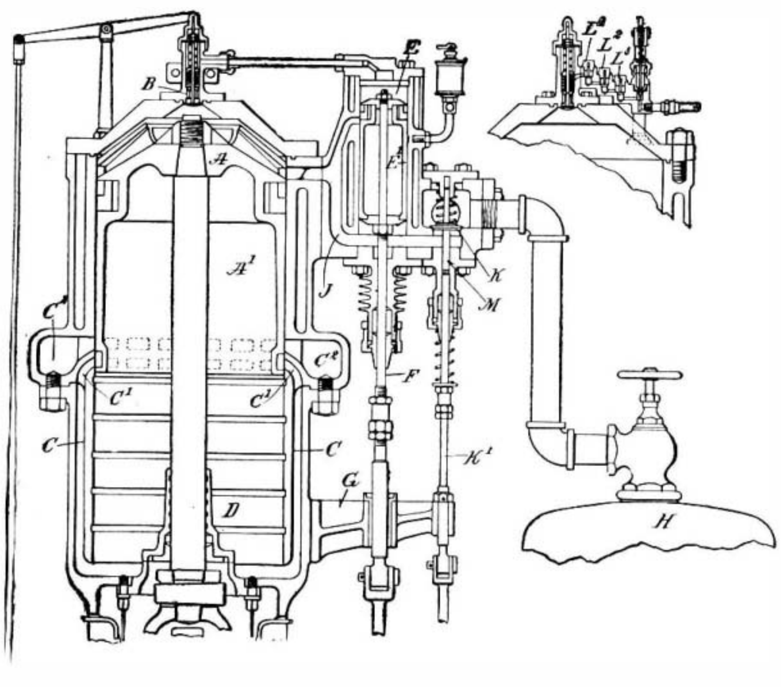
THE OSTERGREN FUEL OIL ENGINE.

Mr. Oscar P. Ostergren, well known to the readers of this journal as the inventor of a successful process of liquefying air, and as a mechanical engineer who has made some notable improvements in steam engine design, now comes forth with an invention in which he claims to have solved the problem of utilizing kerosene, heavy oil, or crude oil in an engine without any danger, without the attendant objectionable odors and deposits, and with but a tithe of the operative cost of present types of internal combustion engines. The invention in question, so far from being an untried mechanical device, has been successfully introduced by the Fuel Oil Power Company, 50 Wall Street, New York. There are in progress of construction a 25 horse power reversible marine engine and also a 30 horse power four-cylinder reversible self-starting automobile engine, the designs of which at present are not for publication. The accompanying illustrations, however, represent a 50 horse power stationary engine in perspective and in section. In order that a statement of the general merits of the invention may be appreciated at its true worth, some explanation of the operation becomes necessary.

Broadly considered, the apparatus comprises three elements—the engine itself, a pressure device for feeding oil to the engine, and a compressed air reservoir for starting the engine automatically. The engine pictured is of the single-cylinder, two-cycle type. Its hollowed trunk-piston A is finished off with a conical cap conforming in shape with the cylinder-head, on which a spring-pressed poppet valve B is mounted for the injection of the oil. As the piston A of the engine moves down, the air within its hollowed or recessed portion A^1 is compressed, driven into the air-jacket C, then through the annular port C^1, and into the cylinder. The blast of air thus forced into the cylinder discharges the previously burnt gases through the annular port C^2, and leaves in their stead fresh, pure air, which, after compression, and simultaneous elevation of temperature, is ready to receive the fuel at the proper period. The evacuated gases are not discharged into the atmosphere directly, but are allowed to flow from the annular conduit surrounding the exhaust port into a fuel preheater in which a worm-shaped fuel conduit is contained.

On its upstroke the piston A closes both ports C^1 and C^2. The suction valve D is now opened, whereby air is admitted into the cylinder. The valve is kept open during the upstroke, but the pressure in the cylinder of the air thus admitted is such that on the downstroke of the engine it does not register more than seven pounds above the atmospheric pressure. By the proper adjustment of the suction valve parts considerable latitude in the amount of this pressure can be obtained in order to vary the rapidity of the discharge of the burnt gases.

As the piston continues on its upstroke, a part of the air is driven through the duct I into the compression chamber E of the auxiliary pressure device, and thence into the chamber of the valve B. When the piston has completed about three-fourths of its upstroke, a cam on the engine-shaft L will move the rod F so as to close the inlet from the main cylinder. Both pistons A and E^1 have up to this point been moved at such a rate that the pressure in the chamber of the poppet valve B and the pressure in the main cylinder are equal. Such is the shape of the cam on the engine shaft that the rod F and piston E^1 will move very rapidly while the motion of piston A is retarding toward upper dead center. This condition, assisted by means of the large difference in proportion of final clearance volumes in the two compressors, soon causes the pressure in the chamber E and the poppet-valve chamber to exceed that in the main cylinder. Consequently when the piston A has completed its upstroke and the piston E^1 is about half way up, the pressure in the poppet-valve chamber is such that the valve B is opened. The charge of oil contained within the valve chamber is now forced into the main cylinder head, under the constantly increasing pressure of the piston E^1 as it completes its upstroke. Combustion now takes place continually until the charge is consumed. Such is the shape of the cam controlling the movements of the piston rod F, that the piston E^1 does not complete its upstroke until the engine-piston A has finished one-quarter of its downstroke. During this interval, fuel is forced into the combustion-chamber



SECTION OF A SINGLE-CYLINDER OSTERGREN FUEL-OIL ENGINE.

and is cut off only when the increasing pressure therein closes the valve B. When the piston A has completed the second quarter of its downstroks, the piston E^1 will still be held up by its cam. Part of the gases escape through the duct J, passing the valve K, into the compressed-air reservoir H, but only when the pressure in the reservoir is less than that of the gases and the spring K.

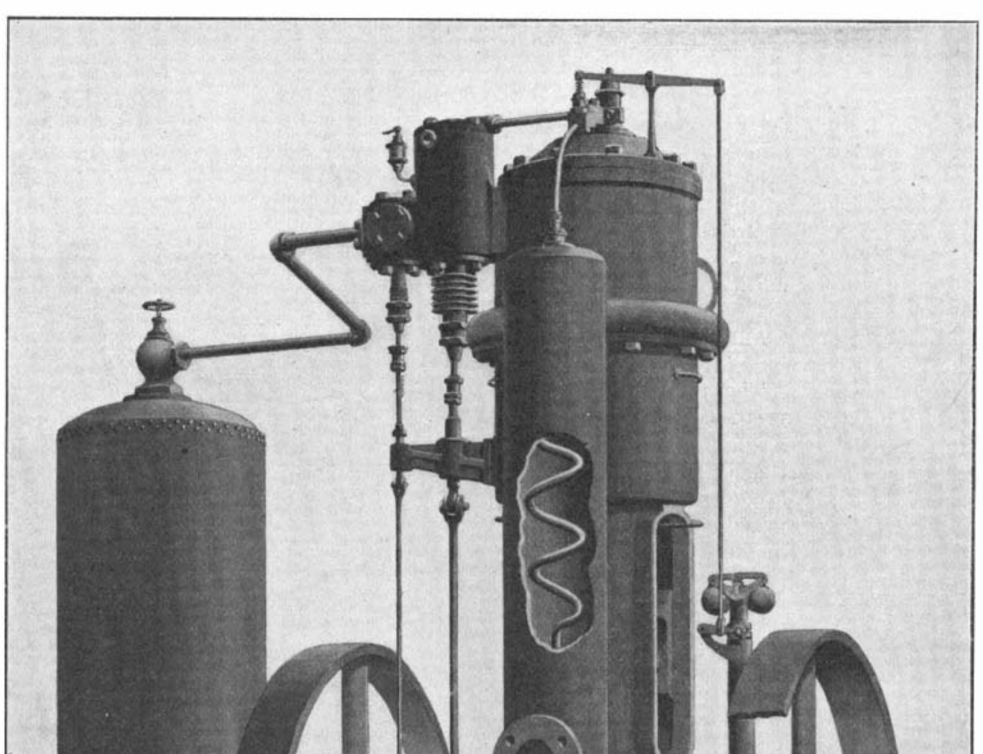
Not until the last quarter of the downstroke does the piston E^1 begin to drop. When the engine-piston A has completed its downstroke, the auxiliary piston has returned to its initial position, that is, the position shown in our sectional view. As it falls, the piston E sucks a charge of oil into the poppet-valve chamber B. The oil is fed by gravity or by pressure from a tank into the worm of the previously mentioned pre-heater, and raised to about the height of the three check valves, L^1, L^2, L^3, by which the oil is prevented from flowing back under the pressure of the upstroke of the piston A. A valve in the pipe leading from the pre-heater coil is connected with the centrifugal governor of the engine, so that the feeding of the fuel is controlled in accordance with the requirements of speed and load at any particular moment.

The pressure within the compressed-air reservoir H is such that the main piston in one of the cylinders of a two-cylinder engine is easily driven down; and the piston in the other cylinder raised in order to produce a sufficient compression to insure ignition even with cold fuel oil. With a single cylinder, the air from the reservoir drives the piston down, the momentum of the flywheel forcing the piston up again in order to obtain sufficient compression. If the engine shaft be cranked and a relief cock at the top of the cylinder left open until the air from the reservoir is allowed to enter, the starting of the engine is facilitated. Starting is thus effected by lifting the valve K by a cam on which the foot of the rod K^1 rests.

The compressed air of the reservoir cannot be admitted to the cylinder through the ducts J and I when the piston is at dead center, because at that moment the outlet duct I is closed. Not until the piston is carried past the dead center can air be allowed to enter.

Summing up the meritorious features of this engine, it becomes apparent that the quick though gradual combustion of the fuel renders it possible to subject the cylinder charge to great pressure. As soon as the engine has been started by electric spark, the ignition is effected by reason of the high compression in connection with the raised temperature of the atomized oil. By flushing the cylinder with atmospheric air before injecting the fuel, the well-known impediments of the two-cycle system, chiefly waste of fuel in scavenging and premature ignition are avoided.

An impulse at every downstroke of the piston is obtained, thereby increasing the power development and efficiency even above the considerable increase obtained by high compression alone. The peculiar conical shape of the piston and the cylinder head increases the capacity for heat absorption and radiation, and renders it possible to divide the space containing the charge into a central portion favorable for immediate ignition. From this central portion compartments ramify into which the flame can enter only as the mixing of the vapor and atmospheric air progresses. The oil, spread in a fine mist, is consumed because of ignition by compression, without harmful consequences if it should be too liberally supplied. The ignition does not start in any one particular spot, as when an electrical spark is employed, but at any point within the combustion-chamber where the conditions are most favorable.



OSTERGREN 50 HORSE POWER FUEL-OIL ENGINE.

A "Mob" Cartridge for Use in Strikes.

The many strikes of late years have led army officers to direct their inventive skill to the devising of a bullet that will be not more deadly to armed mobs, but much less dangerous than the one now in use. A bullet from the present rifle will pierce 18 inches of pine at 500 yards; the human body has only a resistance of 3 inches of this wood. The Ordnance Department has therefore devised what is now popularly called the "mob cartridge," but which the Department euphemistically terms "multi-ball cartridge, caliber 30."

The cartridge is composed of a service case charged with a full charge, about 34 grains of smokeless powder, and two round balls held in the neck of the case by a cannulure at the lower end and a crimp at the upper. The balls are made of a mixture of lead and tin in the proportion of 16 to 1, and are slightly coated with paraffine. The diameter of the ball is 0.308 inch, and the weight is 42 grains. The cartridges have sufficient accuracy for effective use at 200 yards, at which range a slight elevation is required. At one hundred yards it is necessary to fire point blank.