E. L. KEMPTNER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 8, 1912.

1,122,127.

Patented Dec. 22, 1914.

2 SHEETS—SHEET 1.

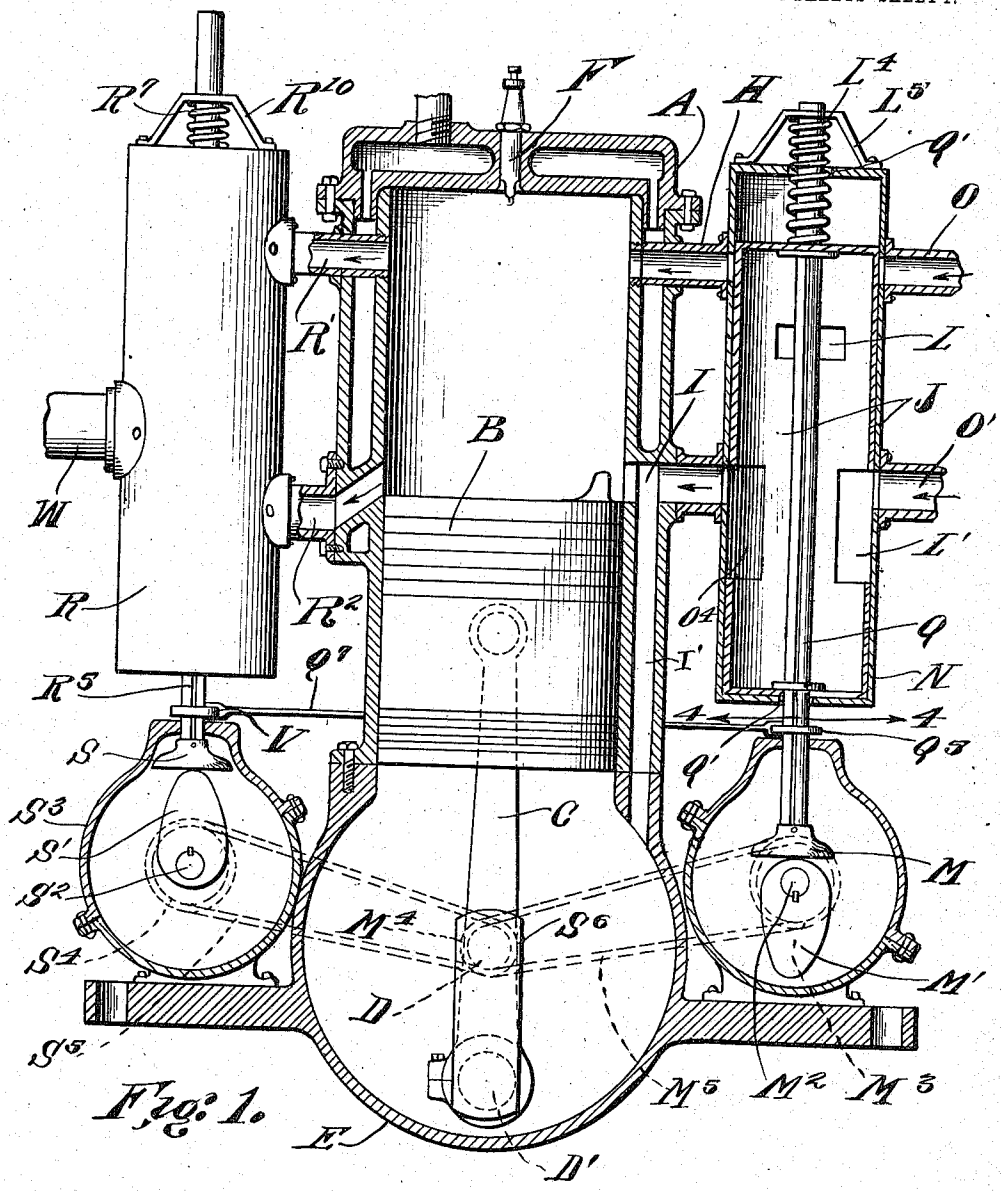


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

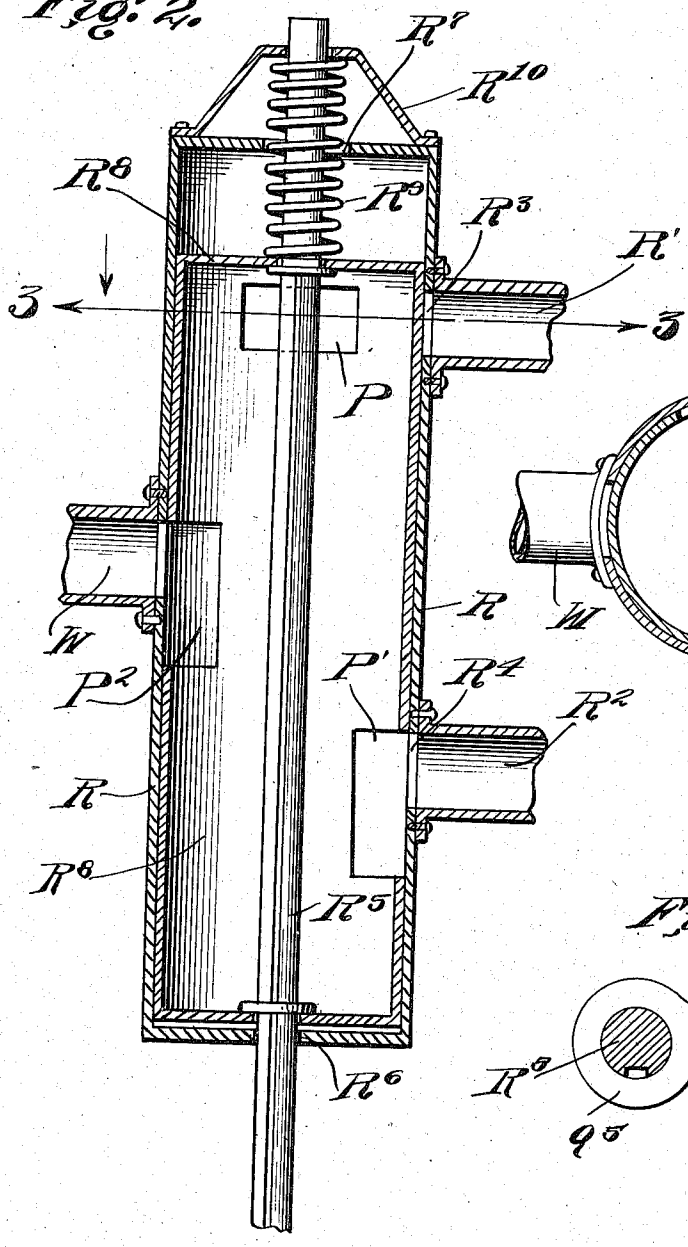


Fig. 3.

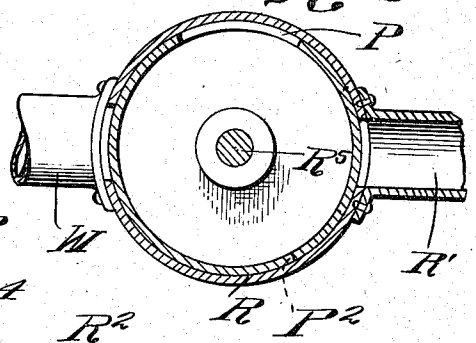
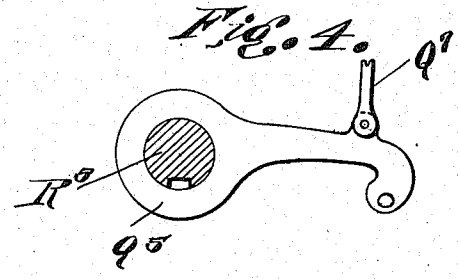


Fig. 4.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,122,127. Specification of Letters Patent. Patented Dec. 22, 1914.

Application filed October 8, 1912. Serial No. 724,602.

To all whom it may concern:

Be it known that I, EWING L. KEMPTNER, a citizen of the United States, residing at Muscatine, in the county of Muscatine and State of Iowa, have invented certain new and useful Improvements in Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form part of this specification.

This invention relates to new and useful improvements in internal combustion engines and especially to an engine which may be readily converted from a two to a four cycle engine or vice versa, thus making it possible to adapt the engine as a four cycle type on good roads and as a two cycle upon grades, thereby increasing the power appreciably.

The invention consists further in an engine of this type which will be economical in working, making it possible to use high power only where necessary and consists in various details of construction and combinations and arrangements of parts which will be hereinafter fully described, shown in the accompanying drawings and then specifically defined in the appended claims.

My invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a vertical central sectional view through an engine made in accordance with my invention. Fig. 2 is an enlarged detail sectional view through one of the sleeve valves. Fig. 3 is a sectional view on line 3—3 of Fig. 2, and Fig. 4 is a sectional view on line 4—4 of Fig. 1.

Reference now being had to the details of the drawings by letter, A designates a cylinder of the conventional type of internal combustion engines having a piston B therein pivotally connected to a pitman C which in turn is pivoted to a pin D′ of the crank shaft D which is journaled in suitable bearings in the opposite walls of the crank chamber E. The usual sparking device F is provided in the upper portion of the cylinder and the two fuel admission ports H and I lead through the water jacket of the cylinder and communicate with the interior thereof at suitable locations. Positioned adjacent to the cylinder is a valve casing N with which the two pipes H and I communicate, and O and O′ designate two pipes leading into the valve casing at suitable locations, preferably near the opposite ends thereof, adapted to lead from the intake of a manifold, not shown. When the apparatus is adapted for operation as a four-cycle engine, the fuel enters the pipe O in the direction of the arrow in Fig. 1 and, when adapted as a two-cycle engine, the fuel enters through the pipe O′.

A valve rod Q is adapted to have a longitudinal as well as a rotary movement and is mounted in apertures Q′ formed in the upper and lower ends of the valve casing, and mounted to reciprocate and rotate with said rod is a sleeve valve J. The upper portion of the wall of the valve J is provided with two oppositely-disposed ports L which are adapted, when said valve is in certain positions, to register with the pipes H and O respectively. A portion of the wall of the valve is provided with two elongated ports O^4 and L′ which are adapted to register with the ports I and O′ respectively as the sleeve reciprocates and when operating as a two-cycle engine. A spring L^4 is mounted about the upper portion of the rod Q and bears between the top of the sleeve piston J and a plate L^5 having an aperture for the reception of the upper end of the rod Q.

Fixed to the rod Q is a lever Q^5 to which a rod Q^7 is adapted to be fastened, as shown in Fig. 4 of the drawings, and which is provided for the purpose of rocking the piston valve when it is desired to convert the apparatus from a two to a four-cycle engine or vice versa.

It will be noted that the ports O^4 and L′ in the valve J for the two cycle arrangement are longer than the ports in the valve cage N and thus the upward and downward movement of the valve, when the engine is working in the two cycle, does not prevent the intake of the charge of gas from entering the crank case, and upper portion of the piston acts as a valve to open the intake to the explosion chamber, a check valve in the manifold and the carbureter, not shown, preventing the charge from blowing back out.

The lower end of the rod Q is fastened to a shoe M which rides upon the cam M′ keyed to the shaft M^2 and which shaft carries a sprocket wheel M^3 about which and a similar sprocket wheel M^4, fixed to the crank shaft and preferably of smaller diameter than the sprocket wheel M^3, a sprocket chain M^5 travels, forming a means for rotating the shaft M^2 and the cam which is keyed thereto in a ratio of one revolution of the latter to two revolutions of the crank shaft.

A rod Q^7 pivotally connects the two levers Q^5 and V and serves as a means for causing the same to be moved in unison with each other.

Upon the opposite side of the cylinder of the engine is an exhaust casing R which is similar in construction to the casing N and has two pipes R′ and R^2 which communicate with openings R^3 and R^4 formed in the wall of the casing and through which the engine is adapted to exhaust when utilized either as a two or four cycle type. A piston valve rod R^5 is adapted to have a rotary and longitudinal movement through apertures R^6 and R^7 at the bottom and top of the casing R, and a cylindrical sleeve valve R^8 is fixed to the rod R^5. A coiled spring R^9 is mounted upon the rod R^5 and bears intermediate the upper closed end of the sleeve valve R^8 and a plate R^{10} which is fixed to the upper end of the casing R and is apertured to allow the upper end of the stem R^5 to pass freely therethrough. The lower end of the stem R^5 has a shoe S fixed thereto adapted to ride upon the cam S′ which latter is keyed to the shaft S^2 journaled in suitable bearings in the casing S^3 and a sprocket wheel S^4 is fixed to the shaft S^2 and a sprocket chain S^5 passes about said sprocket wheel S^4 fixed to the shaft S^2 and a similar sprocket wheel S^6 fixed to the crank shaft D and preferably of half the diameter of the sprocket wheel S^4. By this arrangement of varying the diameters of the sprocket wheels S^4 and S^6, a similar ratio is obtained between the same as between the wheels M^3 and M^4 before described. An exit pipe W leads from the interior of the casing R to the atmosphere. Said sleeve valve R^8 is provided with the ports, designated respectively by letters P, P′ and P^2. Said port P is adapted, when the sleeve R^8 is in one position, to register with the opening R^3, while the port P′ is adapted to register with the opening R^4 when the sleeve valve is in another position. The port P^2 is designed to register with the pipe W to allow the products of combustion to exhaust to the atmosphere. The rod R^5 is adapted to be given an axial rocking motion through the medium of the lever V which is pivotally connected by the rod Q^7 with the lever Q^5.

In operation, when the engine is adapted to operate as a two cycle type, the port L′ in the sleeve valve J is positioned so as to register with the pipe O′ and in which position the fuel is allowed to enter the sleeve valve through the pipe O′ and pass through the ports L′, O^4 and I, which latter leads to and communicates with the crank case. When the piston reaches its outer limit and uncovers the port I, the charge, which has been compressed within the crank casing, is allowed to pass through the ports I′ and I into the combustion chamber where, upon the inner throw of the piston, it is compressed and exploded. The products of combustion exhaust through the port R^2 into the sleeve valve R^8, thence to the atmosphere through the port P and pipe W. It will be understood that, when the piston B moves forward in the compression of the charge and closes the port I, the suction formed in the crank case will cause a new supply of fuel to be drawn through the pipe O′, sleeve valve J and port I′ to the crank casing where, upon the outer throw of the piston, it will be compressed in readiness to be delivered to the combustion chamber when the piston reaches its outer limit and uncovers again the port I. As the pipe O′ communicates with the manifold having a check valve, it will be understood that the charge will be prevented from returning through the pipe O′ from the crank casing.

To adapt the engine for the four-cycle type, the operator merely actuates the rod Q′, causing the two sleeve valves J and R^8 to make a partial revolution, which will close the ports L′ and O^4 and the port P′, bringing the ports L into registration with the pipes O and H and the port P into registration with the port R^3, the port P^2 being still in registration with the exhaust pipe W. In this adjustment of the engine, the charge is admitted into the combustion chamber, compressed by the piston, exploded and, on the next inner throw of the piston, the products of combustion pass through the port R′ into the sleeve valve R^8 and thence through the port P^2 and pipe W to the atmosphere. On the next outer throw of the piston, a new charge is drawn in, compressed and exploded in the same manner, thus completing the cycle of the engine.

By the provision of an engine made in accordance with my invention, it will be noted that a simple and efficient means is afforded whereby an engine may be converted from a two to a four cycle type or vice versa by the simple manipulation of the lever mechanism, bringing the ports into proper registration with openings to allow the fuel to be admitted at certain predetermined moments, thus economizing in power when not needed for heavy work.

What I claim to be new is:—

1. A convertible two or four cycle type

engine comprising a cylinder, a piston therein, a crank shaft connected to the piston, a valve casing with fuel supply pipes leading thereto and passageways leading from the casing to the interior of the engine cylinder, a ported sleeve valve rotatably and longitudinally movable within said casing, a stem upon which said valve is mounted, cam mechanism driven by the crank shaft for moving said stem, means for rocking the stem to adjust the sleeve, an exhaust chamber communicating with the engine cylinder, a ported sleeve valve mounted in the exhaust chamber, and means for reciprocating the exhaust valve, and connections between the latter and the means for rocking said stem, the oscillating movement of the valves being to adapt the same for use, when reciprocated, to cause the apparatus to operate either as a two or four cycle engine, as set forth.

2. A convertible two or four cycle type engine comprising a cylinder, a piston therein, a crank shaft connected to the piston, a valve casing with fuel supply pipes leading thereto and passageways leading from the casing to the interior of the engine cylinder, a ported sleeve valve rotatably and longitudinally movable within said casing, a stem upon which said valve is mounted, cam mechanism driven by the crank shaft for moving said stem, and a handle fixed to the stem and affording means for rocking the same, an exhaust chamber communicating with the engine cylinder, a ported sleeve valve mounted in the exhaust chamber, means for reciprocating the exhaust valve, and connections between the latter and the means for rocking said stem, the oscillating movement of the valves being to adapt the same for use, when reciprocated, to cause the apparatus to operate either as a two or four cycle engine, as set forth.

3. A convertible two or four cycle type engine comprising a cylinder, a piston therein, a crank shaft connected to the piston, a valve casing with fuel supply pipes leading thereto and passageways leading from the casing to the interior of the engine cylinder, a ported sleeve valve rotatably and longitudinally movable within said casing, a stem upon which said valve is mounted, said stem having a foot thereon, a cam and rotatable shaft upon which the same is mounted adapted to contact with said foot to move the stem longitudinally, connections between the cam carrying and crank shafts, means for rocking the valve stem, an exhaust chamber communicating with the engine cylinder, a ported sleeve valve mounted in the exhaust chamber, and means for reciprocating the exhaust valve, and connections between the latter and the means for rocking said stem, the oscillating movement of the valves being to adapt the same for use, when reciprocated, to cause the apparatus to operate either as a two or four cycle engine, as set forth.

4. A convertible two or four cycle type engine comprising a cylinder, a piston therein, a crank shaft connected to the piston, a valve casing with fuel supply pipes leading thereto and passageways leading from the casing to the interior of the engine cylinder, a ported sleeve valve rotatably and longitudinally movable within said casing, a stem upon which said valve is mounted, said stem having a foot thereon, a cam and rotatable shaft upon which the same is mounted adapted to contact with said foot to move the stem longitudinally, connections between the cam carrying and crank shafts, an exhaust chamber, a ported sleeve valve therein, means for reciprocating the latter, connections between the exhaust chamber and the cylinder, and means for oscillating the inlet and exhaust valve, the oscillating movement of the valves being to adapt the same for use, when reciprocated, to cause the apparatus to operate either as a two or four cycle engine.

5. A convertible two or four cycle type engine comprising a cylinder, a piston therein, a crank shaft connected to the piston, a valve casing with fuel supply pipes leading thereto and passageways leading from the casing to the interior of the engine cylinder, a ported sleeve valve rotatably and longitudinally movable within said casing, a stem upon which said valve is mounted, said stem having a foot thereon, a cam and rotatable shaft upon which the same is mounted adapted to contact with said foot to move the stem longitudinally, connections between the cam carrying and crank shafts, sprocket wheels upon said shafts, chain connections between the sprocket wheels, an exhaust chamber, a ported sleeve valve therein, means for reciprocating the latter, connections between the exhaust chamber and the cylinder, and means for oscillating the inlet and exhaust valves, the oscillating movement of the valves being to adapt the same for use, when reciprocated, to cause the apparatus to operate either as a two or four cycle engine, as set forth.

6. A convertible two or four cycle type engine comprising a cylinder, a piston therein, a crank shaft connected to the piston, a valve casing with fuel supply pipes leading thereto and passageways leading from the casing to the interior of the engine cylinder, a ported sleeve valve mounted within the casing and having apertured ends, a valve stem passing through said ends and the ends of the casing, an apertured plate fastened to one end of the casing, a coiled spring mounted upon the stem and passing through one end of the casing and bearing intermediate said plate and the end of the valve, means

for imparting a longitudinal movement to the valve, a lever fixed to the stem for rocking the valve, an exhaust chamber, communicating passageways between the same and the cylinder of the engine, a ported sleeve valve in the exhaust chamber, means for reciprocating said valve inlet, and means for oscillating said inlet and exhaust valves, the oscillating movement of the valves being to adapt the same for use, when reciprocated, to cause the apparatus to operate either as a two or four cycle engine, as set forth.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

EWING LEWIS KEMPTNER.

Witnesses:

C. R. McKEAN,

LOUISE EVERSMEYER.