C. H. SERGEANT.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 8, 1907.

973,140. Patented Oct. 18, 1910.

2 SHEETS—SHEET 1.

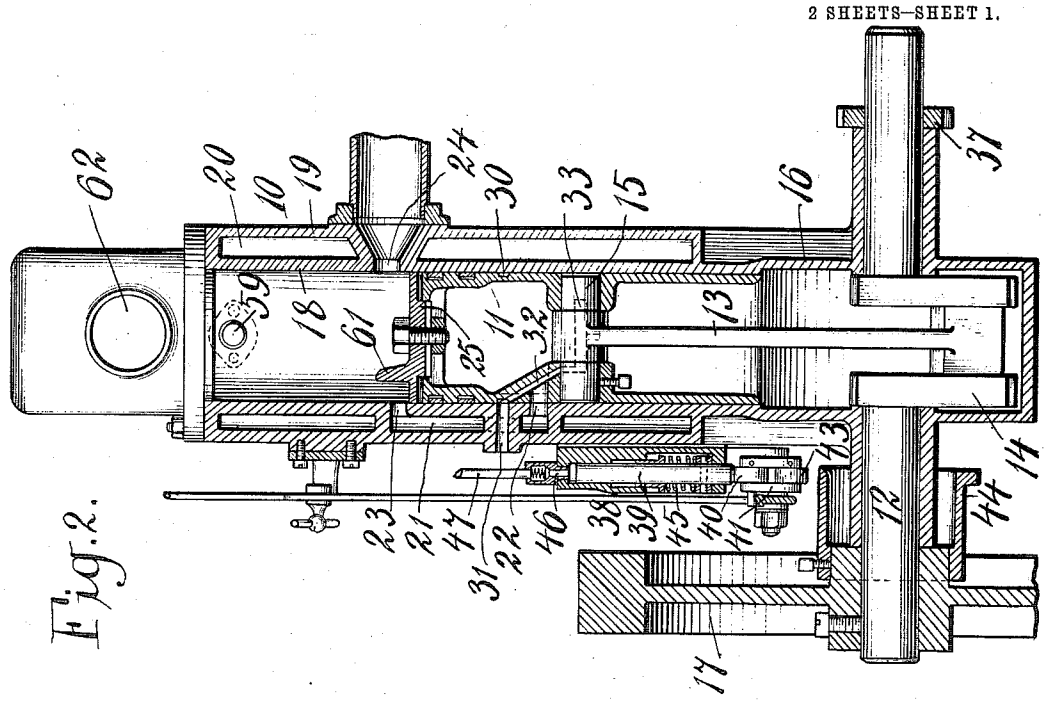

Fig. 2.

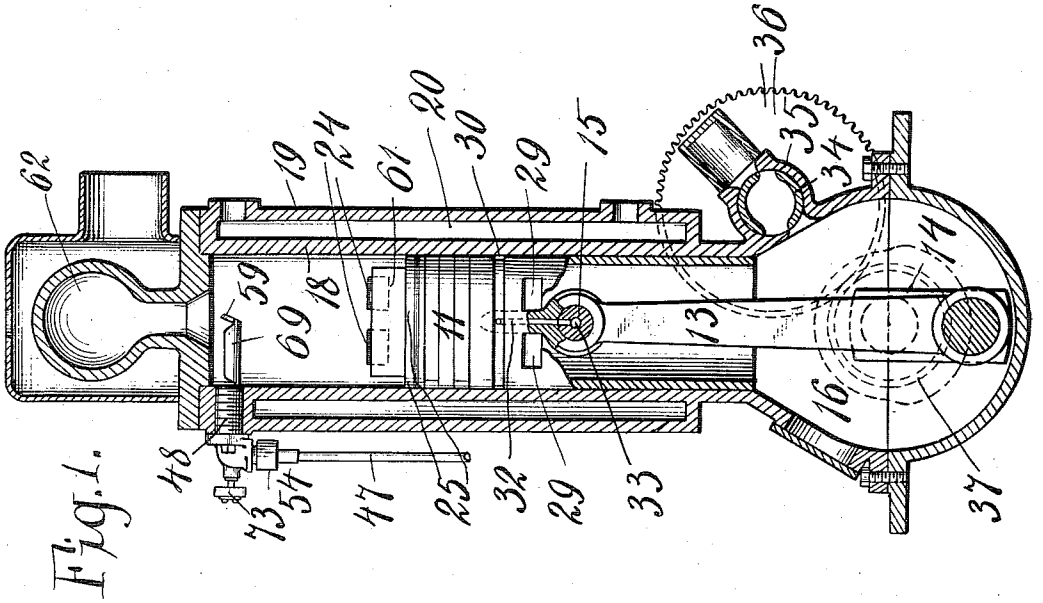

Fig. 1.

WITNESSES:

Gust. A. Klimek

L. Hauerstein

INVENTOR

Charles H. Sergeant

BY

Chapin & Hayward

his ATTORNEYS

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2 SHEETS—SHEET 2.

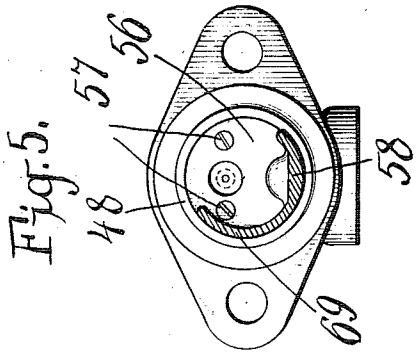

Fig. 5.

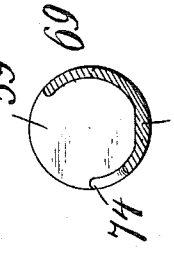

Fig. 6.

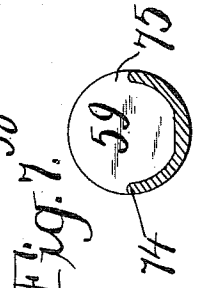

Fig. 7.

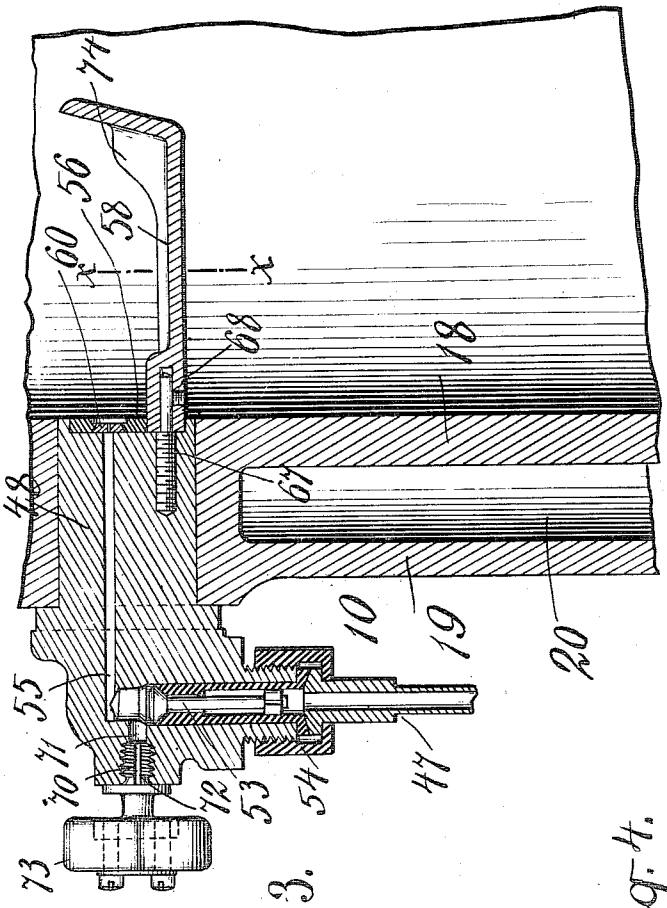

Fig. 3.

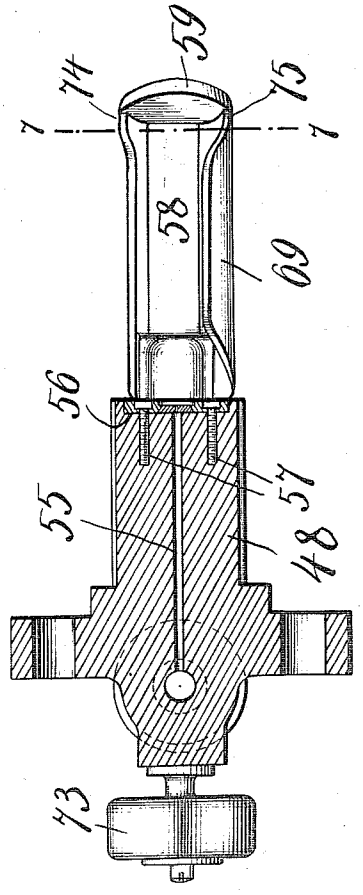

Fig. 4.

WITNESSES:

Gust. Klimek

L. Hauerstein

INVENTOR

Charles H. Sergeant

BY

Chapin & Raymond

his ATTORNEYS

UNITED STATES PATENT OFFICE.

CHARLES H. SERGEANT, OF BRIDGEPORT, CONNECTICUT.

INTERNAL-COMBUSTION ENGINE.

973,140. Specification of Letters Patent. Patented Oct. 18, 1910.

Application filed October 3, 1907. Serial No. 396,377.

To all whom it may concern:

Be it known that I, CHARLES H. SERGEANT, a citizen of the United States of America, and a resident of Bridgeport, county of Fairfield, State of Connecticut, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in internal combustion engines, and particularly to internal combustion engines of the two-cycle type, in which a power stroke is produced in each cylinder for each revolution of the engine.

My invention relates specifically to improvements in means for admitting and distributing fuel in the cylinder, and has for its object the better distribution of the fuel, whereby combustion thereof upon ignition will be rapid and complete.

My invention also relates to a means for emptying certain of the fuel admission passages after the engine has been brought to rest, whereby to prevent their becoming choked and clogged, and in certain novel details of construction and combinations of parts as will hereinafter be more fully set forth.

In order that my invention may be thoroughly understood, I will now proceed to describe an embodiment thereof, having reference to the accompanying drawings, and will then point out the novel features in claims.

In the drawings: Figure 1 is a view in central vertical transverse section of an engine containing an embodiment of my invention. Fig. 2 is a view in central vertical longitudinal section of the same. Fig. 3 is an enlarged detail view in central vertical transverse section of the upper part of the cylinder, showing particularly the fuel feeding and distributing device. Fig. 4 is a view in horizontal section through the said device. Fig. 5 is a view in transverse vertical section through the distributer, the plane of section being taken substantially upon the line x—x of Fig. 3 and looking in the direction of the point of support of the said device. Fig. 6 is a similar sectional view upon the same line but looking in the opposite direction. Fig. 7 is a view in transverse section through the distributer upon substantially the plane of the line 7—7 of Fig. 4.

The engine in general comprises a cylinder 10, a piston 11 mounted to reciprocate therein, a crank shaft 12, and a connecting rod 13, said connecting rod pivoted at one end to the cranked portion 14 of the shaft 12, and at the other end to a pivot pin 15 secured to the piston. The cranked portion 14 of the crank shaft is arranged within a closed crank casing 16, and the crank shaft 12 carries the usual balance fly-wheel 17.

The cylinder 10 comprises an inner shell 18, which constitutes the cylinder proper, and an outer shell 19 which forms a jacket for the said cylinder, and serves to inclose a space 20 for water or other cooling medium. The cylinder is provided with an air inlet passage 21, which penetrates the cylinder at two points 22 and 23. Ports are formed at these points, the port 22 serving to admit air from the crank casing 16 into the passage 21, and the port 23 to discharge same into the upper end of the cylinder 18. The cylinder is also provided at a point substantially opposite the port 23, with an exhaust port 24, through which the products of combustion are finally discharged.

At its lower end the piston is completely open into the crank casing 16, whereby air admitted into the crank casing will pass freely up into the said piston. The piston is then provided with two ports 29, which register with the port 22 at the moment the piston is at the lowermost portion of its stroke. At this time, therefore, there will be free communication between the crank casing and the upper end of the cylinder through the passage 21. The piston is further provided with a circumferential groove 30 which constitutes an oil ring, said circumferential groove arranged to register at times with an oil inlet 31 with which the cylinder is provided. A conduit 32 leads from the groove 30 to the pivot pin 15 for the connecting rod, and the said pivot pin is provided with a passage 33 in communication with the said conduit 32, which passage leads to the interior of the pin so as to form a means for lubricating the pivotal connection between the connecting rod 13 and the said pin.

Air is preferably admitted to the crank

casing 16 by means of a positively operated rotary air valve 34, said valve being mounted in a valve casing 35 arranged at the side of the crank casing, and the said valve arranged to be rotated through gearing herein comprising a spur-gear 36 mounted upon a stem of the valve 35, and a pinion 37 mounted upon the crank shaft 12.

The engine is provided with a fuel pump 38, the casing of which is secured to the cylinder 10 near the lower end thereof. The said pump includes a plunger 39, the lower end of which rests upon an anti-friction roller 40 carried by a cam following member 41. The said cam following member being provided with another anti-friction roller 43, which is adapted to be operated by a cam 44 secured upon the hub of the fly-wheel 17, or some other part secured to, and adapted to rotate with, the crank shaft 12. When permitted to do so, the cam follower will rest with its roller 43 upon the cam 44, under the influence of a spring 45, which normally presses the plunger down upon the said cam follower. The pump is connected to a suitable source of oil supply, and, at each stroke, discharges a certain amount of oil past the discharge valve 46 along the pipe 47 to the oil fitting 48 and thence to the upper end of the cylinder.

The oil fitting 48 comprises a member which is fitted to an opening through the wall of the cylinder 10 at the upper end and which penetrates from the exterior to the interior thereof, a check valve 53 being carried by said fitting, and a union 54 is provided to connect the upper end of the oil pipe 47 therewith. An inlet port or passage 55 leads through the fitting to the interior of the cylinder, the said inlet port or passage being carefully arranged so that the discharge end thereof is the highest of any point between itself and the pump, whereby there can by no possibility be any airlock therein, as so often happens in inlet passages where there is some point therein higher than the discharge point. The oil fitting is provided with a cap piece 56 at the inner side thereof, said cap piece being removably secured thereto as by screws 57. Between the cap piece 56 and the inner face of the coil fitting 48 there is provided a removable washer 60 in which there is a fine orifice which forms a nozzle through which the fuel is injected. This washer may be removed and replaced when desired, whereby different washers having various sized holes may be employed according to the fuel used. Also secured to the inner face of the oil fitting 48, and projecting radially within the cylinder, is a device which I herein term a distributer. This distributer comprises a stem 58 constructed in the form of a shallow trough, and a dash plate 59 secured to the said stem or trough at the end thereof farthest away from the oil fitting, said dash plate being arranged at substantially right angles thereto, though preferably at an angle slightly greater than ninety degrees. The distributer 58 may be conveniently secured to the oil fitting 48 by means of a screw 67, as is shown in detail, Fig. 3, said screw being tapped into the oil fitting and provided with a shank upon which the said trough or stem is mounted and to which it is conveniently fastened by means of a set screw 68. The distributer is further provided with a wind shield 69 formed as an extension of one of the walls of the trough, said wind shield being arranged in a line with the currents of air as they enter through the air inlet ports 23, whereby the said wind shield will serve to prevent deflection of the injected stream of fuel through the orifice in the washer 60. The said wind shield is preferably cut away, as at 75, in proximity to the dash plate 59, or, in other words, does not extend quite as far as the said dash plate, while, upon the opposite side, the wall of the trough is preferably raised somewhat at this point, as shown at 74 in the drawings, the top level of the raised portion 74 and the level of the cut away portion 75 being about on the level of the center of the dash plate 59.

It will be noted that the distributer is of slightly smaller size in cross section than the opening in the wall of the cylinder to which the oil fitting 48 is fitted. The distributer may hence be withdrawn through the said opening, and it will be noticed that the entire oil fitting, together with the distributer, may be readily removed by merely disconnecting the union 54 and releasing the bolts or other securing devices which are employed for fastening the said oil fitting in position.

The operation of the engine is as follows: During a down stroke air will be slightly compressed in the crank casing 16, so that when, at the completion of the down stroke, the piston ports 29 come into register with the port 22 in the cylinder, such air, partially compressed, will rush through the passage 21 into the upper end of the cylinder to charge same. The spent gases will, in the meantime, have been partially discharged through the exhaust port 24, and the inrushing fresh air will complete the discharge by driving out the exhaust gases ahead of it. It will be noted that the head 25 of the piston 11 is provided with a deflector 61 which directs the incoming air up toward the top of the cylinder and prevents the same from flowing toward the discharge port 24. The upper end of the cylinder, being now charged with clean fresh air, the said air will be compressed by the piston during its up-stroke, and it may herein be noted that the head of the cylinder is provided with a dome or bulb

62 to which heat may be applied when initially starting up the engine, but which will be kept hot while the engine is running, the heat thereof being sufficient to ignite inflammable gases when brought in contact therewith. As the piston rises, and at somewhere about half stroke more or less, the pump begins to operate, being acted upon by the cam 44. This will inject fuel into the cylinder through the small discharge orifice in the oil fitting whence it will be directed toward the dash plate 59. The dash plate will have the effect of spraying the oil, the said spray being directed outwardly and upwardly, the trough acting to prevent the same from being directed downwardly toward the piston head. In the operation of the engine the distributer will become very hot, so that any oil which falls into the trough will be immediately vaporized, the vapor thus evolved rising with the spray and mingling in the most approved fashion with the air. In the further upward movement of the piston some of the mixed oil and air will be forced up in a compressed condition into the hot bulb 62. The result of this will be that, finally, just as the piston gets to the topmost portion of its stroke, the mixture will be ignited and power will be generated to force the piston downward. During the upward movement of the piston the air valve 34 will have been opened, and air will have been taken into the crank casing ready for a fresh charge, but, directly the piston reaches the highest point in its stroke, the air valve will have been so rotated as to have closed the crank casing, so that, in the downward stroke of the piston, air will be prevented from escaping from the crank casing and will therefore be compressed therein.

In actual practice I have found the distributer herein shown and described, in combination with the oil fitting having an ejector orifice, to be an exceedingly efficient device for distributing, atomizing and vaporizing the oil, so that it becomes intimately mingled with the air in the cylinder, whereby complete, perfect and rapid combustion takes place. This not only tends to greatly increase the efficiency of an engine of this character, but also prevents the cylinder from fouling.

To prevent the passage 55 from clogging up after the engine has stopped, I have provided a relief valve in the form of a screw 70 fitted to the oil fitting in a recess 71 connected with the said passage 55, said screw having a discharge groove 72, the said screw being provided with a hand piece 73 by which it can be conveniently manipulated. After the supply of fuel has been discontinued for the purpose of stopping the engine, the hand piece 73 may be turned, say a quarter of a turn, thereby opening the discharge groove 72 to the atmosphere. The compressed air in the main cylinder will then cause all oil contained in the passage 55 above the valve 53 to be discharged through the said groove, whereby, upon first starting up the engine, the said passage will always be clean and clear.

It may be noted that the present application is in part a divisional of a co-pending application Serial No. 345,204, filed Nov. 26th, 1906, and that certain features shown herein, but not claimed in this application, are claimed in said co-pending application.

What I claim is:

1. In an internal combustion engine, the combination with a cylinder and a fuel pump therefor, of a fitting secured to the upper end of the cylinder and connected with the discharge side of the said pump, said fitting provided with a detachable washer having a reduced hole forming a nozzle, and a dash plate arranged at a point opposite the said nozzle.

2. In an internal combustion engine, the combination with a cylinder and a fuel pump, of a removable fitting secured to the upper end of the cylinder and penetrating one of the side walls thereof, said fitting provided with a discharge opening therethrough, an extension arranged to project within the cylinder, and a dash plate supported by said extension within the cylinder opposite, and in a line with, the said discharge opening, the space between the discharge opening and the dash plate being open to the cylinder, whereby a stream of liquid fuel will be directed upon the said dash plate, and by it sprayed radially.

3. In an internal combustion engine, the combination with a cylinder and a fuel pump therefor, of a fitting secured to the upper end thereof and penetrating one wall, said fitting connected to the discharge side of the fuel pump and having a port or passage leading to within the cylinder, and provided with a check valve, a cap piece removably secured to the inner face thereof, a detachable washer with a reduced hole forming a nozzle, located between the said cap piece and the inner face of the said fitting, a stem extending from the fitting radially within the cylinder, and a dash plate supported by the said stem in a line with the said nozzle.

4. In an internal combustion engine, the combination with a cylinder and a fuel pump, of a fitting secured to the cylinder near the upper end and to which the discharge of the pump is connected, said fitting provided with a discharge opening therethrough and having an open trough-shaped extension beneath the said opening arranged to project within the cylinder, and a dash plate supported by said trough-shaped extension within the cylinder opposite to, and in a line with, the said discharge opening,

the said dash plate presenting a plane face toward the said opening, and at substantially right angles thereto.

5. In an internal combustion engine, the combination with a cylinder and a fuel pump therefor, of a fitting secured to the upper end of the cylinder and connected with the discharge side of the said pump, and having a discharge opening therethrough, said fitting provided with a dash plate arranged at a point opposite the said discharge opening, and presenting a plane face toward the said opening, at substantially right angles thereto, and with a lateral wind shield between the said discharge opening and the said dash plate.

6. In an internal combustion engine, the combination with a cylinder, of fuel injecting means including an oil fitting having a passage therethrough in communication with the cylinder, and a drain opening in communication with the said passage, a connection from the said passage to a source of liquid fuel supply, and means for controlling the said drain opening, whereby the said fitting may be drained through the said opening, by means of fluid under pressure in the engine, under the control of the last said means.

7. In an internal combustion engine, the combination with a cylinder and a fuel pump, of a fitting secured to the cylinder near the upper end and to which the discharge of the pump is connected, said fitting provided with a passage into the cylinder, and with a drain opening, and having a check valve, the said passage and drain opening being located between the check valve and the cylinder, and means for closing the drain opening.

8. In an internal combustion engine, the combination with a cylinder and a fuel pump, of a fitting secured to the cylinder near the upper end and to which the discharge of the pump is connected, said fitting containing a check valve and a horizontal port or passage leading therefrom to within the cylinder, the said passage having a drain opening, and a manually operated valve for closing the said drain opening.

9. In an internal combustion engine, the combination with a cylinder and a fuel pump, of a fitting secured to the cylinder near the upper end and to which the discharge of the pump is connected, said fitting provided with a discharge opening therethrough and having an open trough-shaped extension beneath the said opening arranged to project within the cylinder, and a dash plate supported by said trough-shaped extension within the cylinder opposite to, and in a line with, the said discharge opening, one of the walls of the trough-shaped portion being extended upward beyond the other, to form a lateral wind shield for the jet, between the discharge opening and the dash plate.

10. In an internal combustion engine, the combination with a cylinder and a fuel pump, of a fitting secured to the cylinder near the upper end and to which the discharge of the pump is connected, said fitting provided with a discharge opening therethrough and having a trough-shaped extension beneath the said opening arranged to project within the cylinder, and a dash plate supported by said trough-shaped extension within the cylinder opposite to, and in a line with, the said discharge opening, one of the walls of the trough-shaped portion being extended upward to form a lateral wind shield for the jet, between the discharge opening and the dash plate, the upper edge of the walls of the extension, in proximity to the dash plate, being substantially upon the level of the center of said dash plate.

11. In an internal combustion engine, the combination with a cylinder and a fuel pump therefor, of a fitting connected with the fuel pump and secured to the upper end of the cylinder and penetrating one of the side walls thereof, the said fitting having a nozzle for injecting a stream of liquid into the cylinder, and provided with a dash plate so supported thereby with respect to the nozzle within the cylinder that the liquid discharged by the nozzle will impinge against the dash plate and be radially sprayed thereby.

CHARLES H. SERGEANT.

Witnesses:
D. HOWARD HAYWOOD,
LEO FLATON.