R. J. GIBBON.

STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 17, 1908.

950,206.

Patented Feb. 22, 1910.

3 SHEETS—SHEET 1.

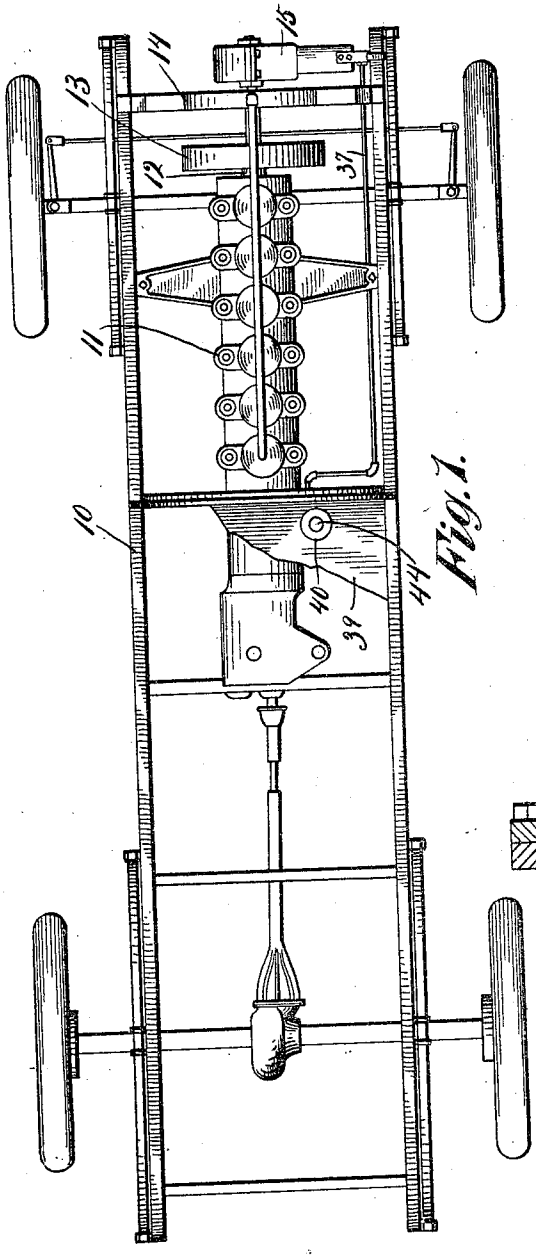

Fig. 1.

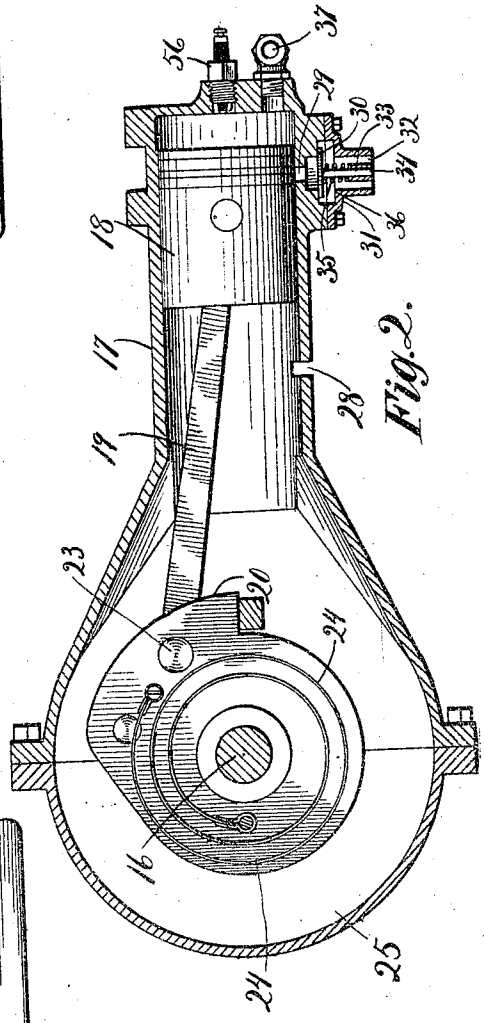

Fig. 2.

Witnesses:
W. H. Cotton
E. M. Klatcher

Inventor.
Robert J. Gibbon
By Louis K. Gleason
Atty.

R. J. GIBBON.

STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 17, 1908.

950,206.

Patented Feb. 22, 1910.

3 SHEETS—SHEET 2.

Fig. 5.

Fig. 3.

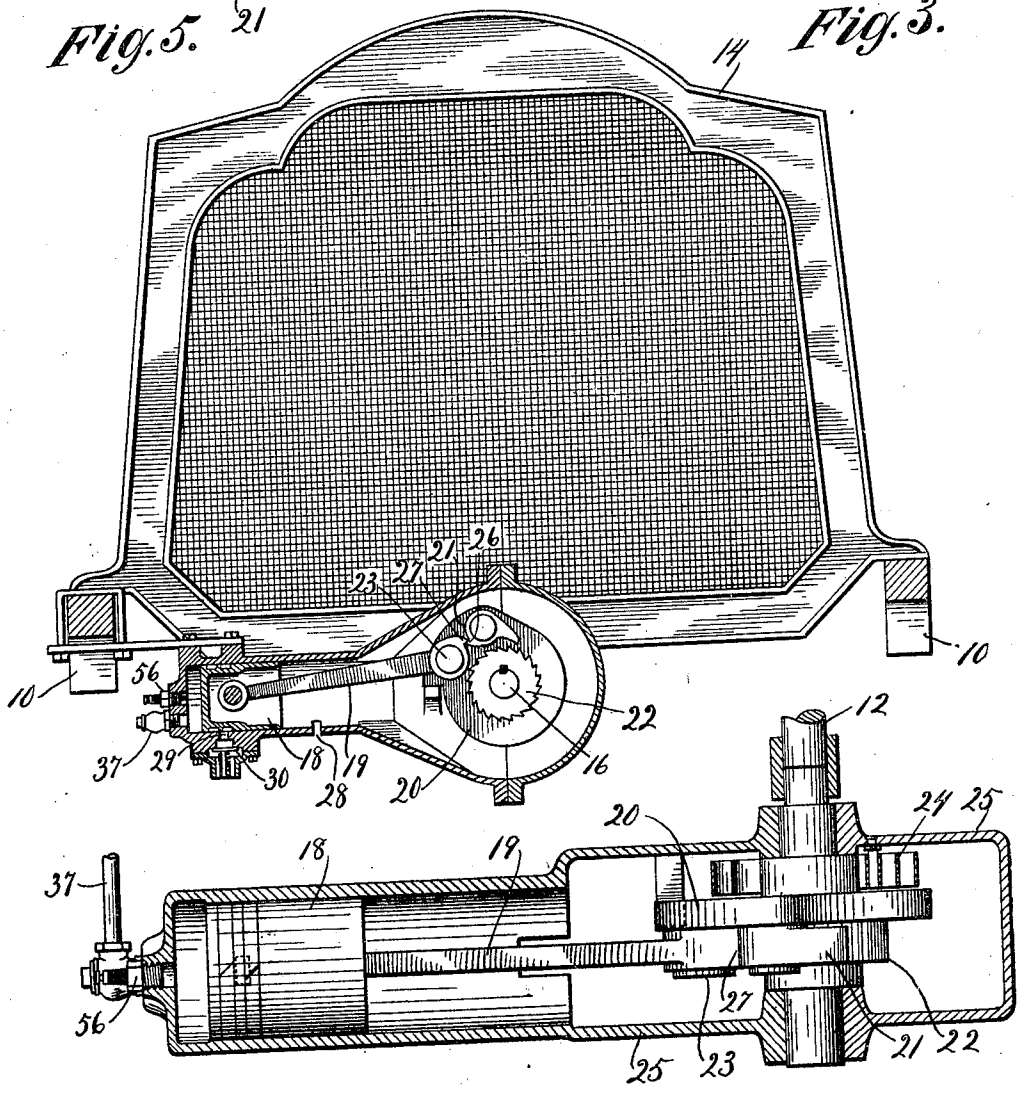

Fig. 4.

Witnesses:
W. H. Cotton
E. M. Klatcher

Inventor:
Robert J. Gibbon
By Louis R. Gleeson
Atty.

R. J. GIBBON.

STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 17, 1908.

950,206.

Patented Feb. 22, 1910.

3 SHEETS—SHEET 3.

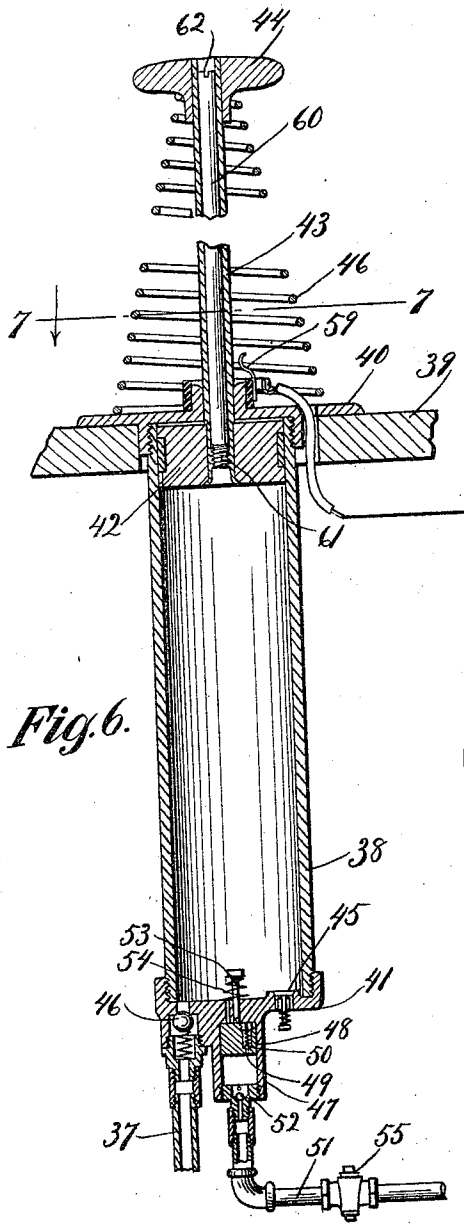

Fig. 6.

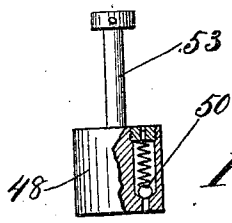

Fig. 8.

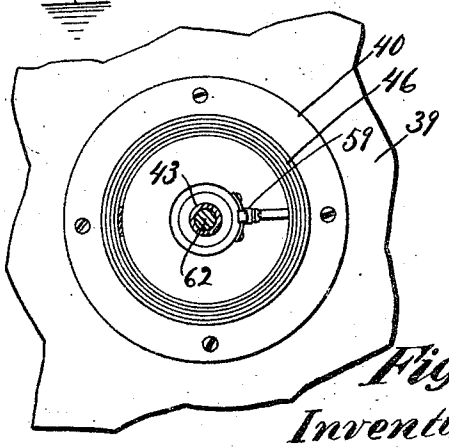

Fig. 7.

Witnesses:
W. H. Cotton
E. M. Klatcher

Inventor.
Robert J. Gibbon
By Louis A. Gibson
Atty.

UNITED STATES PATENT OFFICE.

ROBERT J. GIBBON, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO INTERNATIONAL DEVICE COMPANY, A CORPORATION OF SOUTH DAKOTA.

STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

950,206. Specification of Letters Patent. Patented Feb. 22, 1910.

Application filed April 17, 1908. Serial No. 427,607.

To all whom it may concern:

Be it known that I, ROBERT J. GIBBON, a citizen of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Starting Devices for Internal-Combustion Engines, of which the following is a specification and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to a power device for starting engines of the character named, and it is particularly applicable to such engines when used in connection with automobiles.

The object of the invention is to avoid the necessity for the use of manual power in turning the engine over to bring about the conditions necessary to the ignition of an explosive charge therein, and it consists in a structure such as is hereinafter described and illustrated in the accompanying drawings, in which—

Figure 1 is a plan view, conventionally shown, of the chassis of a six-cylinder automobile with the auxiliary motor applied thereto; Fig. 2 is a longitudinal sectional view of the auxiliary motor showing the engine shaft or an extension thereof in cross-section; Fig. 3 is a cross-section, partly in elevation of the automobile, showing a longitudinal sectional view of the auxiliary motor; Fig. 4 is a longitudinal sectional view of the auxiliary motor on a plane parallel with the engine shaft; Fig. 5 is a detail of a pawl used in connection with the auxiliary motor; Fig. 6 is a detail longitudinal sectional view of a charging pump used in connection with the auxiliary motor, and showing conventionally an electric igniting device therefor; Fig. 7 is a detail section on the line 7—7 of Fig. 6; and Fig. 8 is a detail of a part of the pump shown in Figs. 6 and 7.

The chassis of an automobile is represented at 10 and its engines, six in number and arranged to act upon a single crank shaft, are represented at 11, the crank shaft is shown at 12 and the balance wheel for the engine at 13.

At 14 is shown the usual radiator used in connection with the water cooling system of such an engine.

The auxiliary motor, designated generally by 15, is mounted upon an automobile, preferably forward of the radiator 14, its shaft 16 being the forward end of the engine shaft or an extension thereof. It is here shown as arranged horizontally though neither its arrangement nor location is essential. The auxiliary motor comprises a cylinder 17 within which reciprocates a trunk piston 18 connected by means of a pitman 19 with an oscillating crank disk 20 loosely mounted on the shaft 16, and cooperating through the medium of a spring pawl 21 with a ratchet wheel 22 fixed upon the shaft section 16. The stroke of the motor piston is of less length than the radial distance of the wrist pin 23 by means of which the pitman 19 is connected with the disk 20, from the center of the shaft 16 and consequently this wrist pin does not pass the axial line of the cylinder. The receding or "in" stroke of the piston is accomplished by means of a spring 24 helically coiled about the shaft 16 and having one end attached to a wall of the crank casing 25 and its other end to the disk 20. The pawl 21 is provided with a heel 26 which comes into engagement with a lug 27 formed on the hub of the pitman 19, at the end of the "in" stroke of the piston, thereby lifting the nose of the pawl out of engagement with the ratchet wheel 22 to permit the engine shaft to turn backward without injury to the auxiliary motor should premature ignition of the engine charge occur.

The motor cylinder 17 is provided with an exhaust vent 28 so located as to be uncovered by the piston at the end of its "out" stroke, thus relieving the pressure within the cylinder. There is also provided a supplemental exhaust port 29 near the inner end of the cylinder 17, but so located as to be covered by the piston when in its normal position. The port 29 is also covered by an outwardly opening puppet valve 30 housed within a casing 31 having an external opening port 32, and providing a sliding bearing 33 for the stem 34 of the valve, the valve being held to its seat to close port 29 by means of the spring 35. The casing 31 provides an outer seat at 36 for the valve 30. When an explosive charge is fired in the cylinder 17 and starts the piston 18 on its "out" stroke, the valve 30 is forced to the seat 36, closing the port 32 and preventing the escape therethrough of the expanding charge. As soon as the pressure within the

cylinder is relieved by the opening of the port 28, the spring 35 forces the valve 30 away from the seat 36 and permits the passage of the remainder of the burned charge as the piston makes its "in" stroke, the valve again occupying its inner seat as soon as the piston has passed port 29.

The explosive charge is introduced into the cylinder 17 through the pipe 37 leading from a pump, whose barrel is indicated at 38. This pump comprises the barrel 38, shown as being suspended from the floor 39 of the automobile by means of a flanged head 40, the outer end of the barrel being closed by a head 41. Within the barrel reciprocates pump plunger 42, controlled by means of a stem 43 carrying at its outer end a knob 44 or similar device to which pressure may be applied either by the hand or foot of the operator. A helical spring 46 reacts between the knob 44 and the plate 40 to retract the plunger. A spring closed inwardly opening intake valve 45 is located in the head 41 for the admission of air as the plunger recedes, and an outlet valve 46 permits the contents of the pump barrel to enter the pipe 37 leading to the auxiliary motor. The pump is provided with a carbureting device comprising a barrel 47 depending from the head 41 and within which there reciprocates a piston 48 provided with a port 49 opening to the barrel 38 and controlled by a spring seated valve 50. The pipe 51 leads from a source of hydro-carbon, such as gasolene, not shown, to the outer end of the barrel 47, its connection therewith being controlled by an inwardly opening valve 52; a plunger 53 is slidably mounted in the head 41, its lower end bearing upon the piston 48, and its upper end being in the path of the plunger 42, the length of the plunger being such that when it is in its normal position, it will be engaged by the plunger 42 near the end of the "out" stroke of the latter, and will force the piston 48 to the bottom of the barrel 47, thus driving the contents of this barrel through the port 49 into the barrel 38. By this operation the liquid hydro-carbon introduced into the pump barrel remains and is taken up by the air entering during the "out" stroke of the pump plunger, thereby carbureting the next succeeding charge. A helical spring 54 reacts between the head of the plunger 53 and a suitable seat formed in the head 41, and raises the plunger 53 upon the recession of the plunger 42. The suction action of the "in" stroke of the plunger 42 not only drives the air past the valve 45, but also raises the piston 48 and refills the barrel 47 with hydro-carbon for use in carbureting the next charge received into the barrel 38 of the pump. A manually controlled valve 55 is preferably located in the pipe 51 to cut off the connection between the gasolene tank and the pump, as for purposes of repair.

An igniting device for the auxiliary motor is shown, comprising an ordinary jump spark plug 56 located in the head of the cylinder 17, a battery 57, a spark coil 58, and a circuit closing device comprising a spring contact piece 59 mounted upon the pump head 40, and arranged to engage an appurtenance of the movable member of the pump, such as the knob 44, as the plunger 42 reaches the end of its "out" stroke.

The operation of the device is as follows: The piston 18 of the auxiliary motor always comes to rest at the inner end of the cylinder 17, leaving the pawl 21 out of engagement with the ratchet wheel 22. When it is desired to start the engine, the plunger 42 of the charging pump is forced down, preferably with a rapid stroke, driving the carbureted air within the pump barrel 38 to the cylinder 17, and igniting the charge within that cylinder by closing the electric circuit at 59. The piston 18 is forced downwardly, the pawl 21 engaging the ratchet wheel 22 at the commencement of the stroke, and thereby turning the shaft 16 and setting the engine in motion, whereupon the explosive charge therein is ignited by the usual means. The piston 18 of the auxiliary motor is immediately returned to its normal position upon the opening of the exhaust port 28 by the action of the spring 24. Should a single operation of the auxiliary motor not be sufficient to start the engine, it may be repeated as many times as may be necessary.

The richness of the charge delivered to the auxiliary motor may be varied by varying the stroke of the plunger in the carbureter. As a means for accomplishing this variation there is shown a central core 60 for the pump piston, which extends through the piston and serves as the abutment for engaging the plunger 53. This core is in the form of a rod having a threaded engagement with the piston, as shown at 61, and its outer end is slotted, shown at 62, for engagement by a screw driver. By adjusting this rod longitudinally the point in the stroke of the pump piston at which the plunger 53 is engaged is varied and the stroke of the carbureter correspondingly changed. While the exhaust valve 30 of the auxiliary motor is shown as having a double seat, its inner seat is not essential in view of the fact that the port 29 is covered by the piston at the time the charge is introduced into the cylinder.

I claim as my invention:—

1. A single stroke internal combustion motor comprising, in combination, a cylinder, a reciprocable piston therein, an exhaust port in the side wall of the cylinder adjacent each end thereof, the outer port being uncovered by the "out" stroke of the

piston, the inner port being covered by the piston at the end of its "in" stroke, and a valve for the last named port, openable only during the "in" stroke of the piston.

2. In combination, a single impulse internal combustion motor, a charging pump for the motor, means actuated by the pump plunger for carbureting the charge, and means controllable by the pump for firing the charge.

3. In combination, an internal combustion motor, a charging pump for the motor, means actuated by the pump plunger for carbureting the charge, and means controllable by the pump for firing the charge.

4. In combination, an internal combustion motor and a charging pump therefor comprising a barrel having an air induction port and a delivery port communicating with the motor, and a plunger reciprocable within the barrel, and a carbureter comprising a barrel having an induction port and a piston reciprocable in the barrel and having a duct leading to the pump barrel and an automatic valve therein opening toward the pump, and a stem for the piston projecting into the path of the pump plunger.

5. In combination, an internal combustion motor and a charging pump therefor comprising a barrel having an air induction port and a delivery port communicating with the motor and a plunger reciprocable within the barrel, and a carbureter comprising a barrel having induction and delivery ports, automatic valves for such ports and being openable inwardly and outwardly respectively, a piston in the barrel, and a stem for the piston projecting into the path of the pump plunger.

6. A charging and firing device for internal combustion motors comprising, in combination, a reciprocating pump having a plunger, a carbureter delivering to the pump barrel and actuated by the pump plunger, and an electric igniting system having a circuit closer actuated by an appurtenance of the plunger.

7. A single impulse internal combustion motor comprising, in combination, a cylinder, a piston reciprocable therein, an exhaust port so located as to be uncovered by the piston at the end of the outstroke, an exhaust port adjacent the inner end of the cylinder and so located as to be covered by the piston when at the end of its instroke, a valve movable outward to close the last-named port, and a spring holding the valve away from its seat.

ROBERT J. GIBBON.

Witnesses:
LOUIS K. GILLSON,
E. M. KLATCHER.