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A. J. FRITH & J. D. MACPHERSON.

OIL PUMP FOR EXPLOSIVE ENGINES.

(No Model.) (Application filed Sept. 21, 1899.)

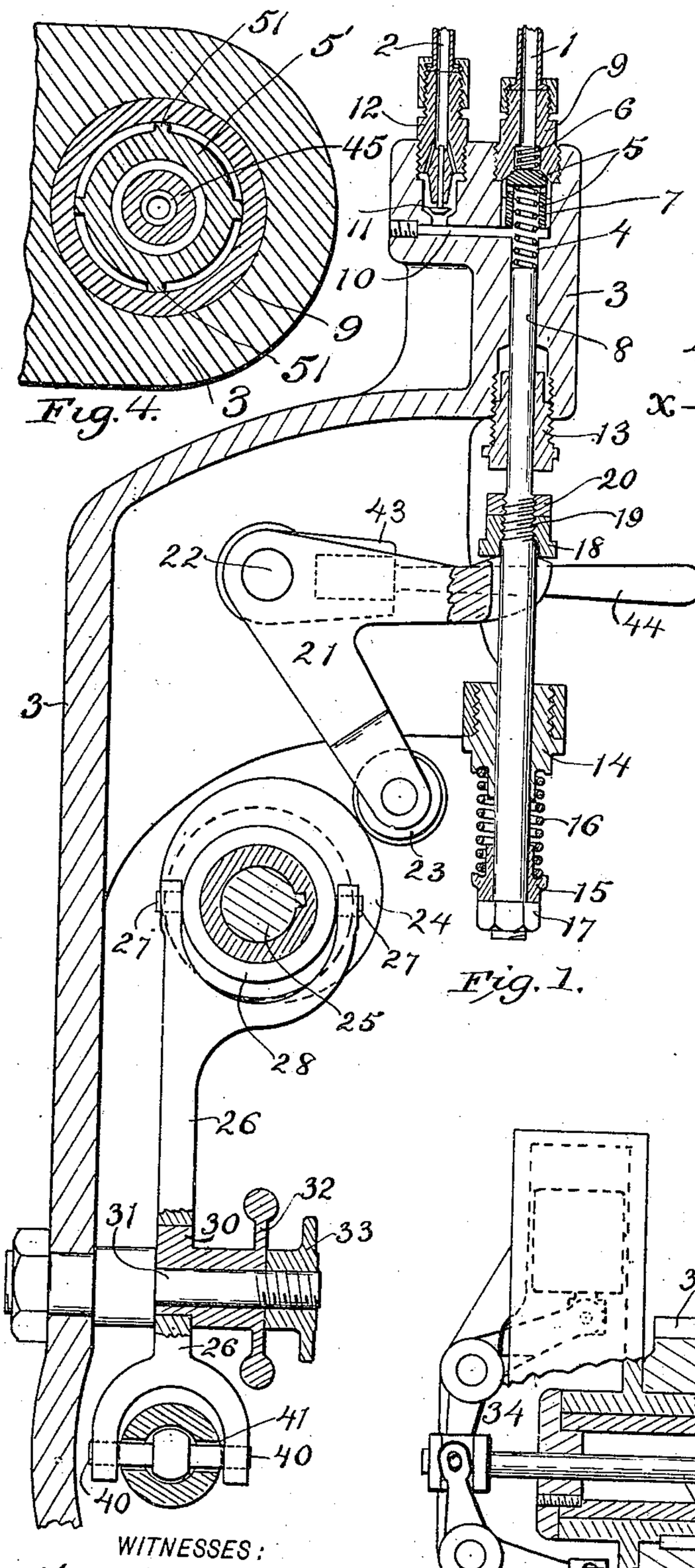


Fig. 4.

Fig. 1.

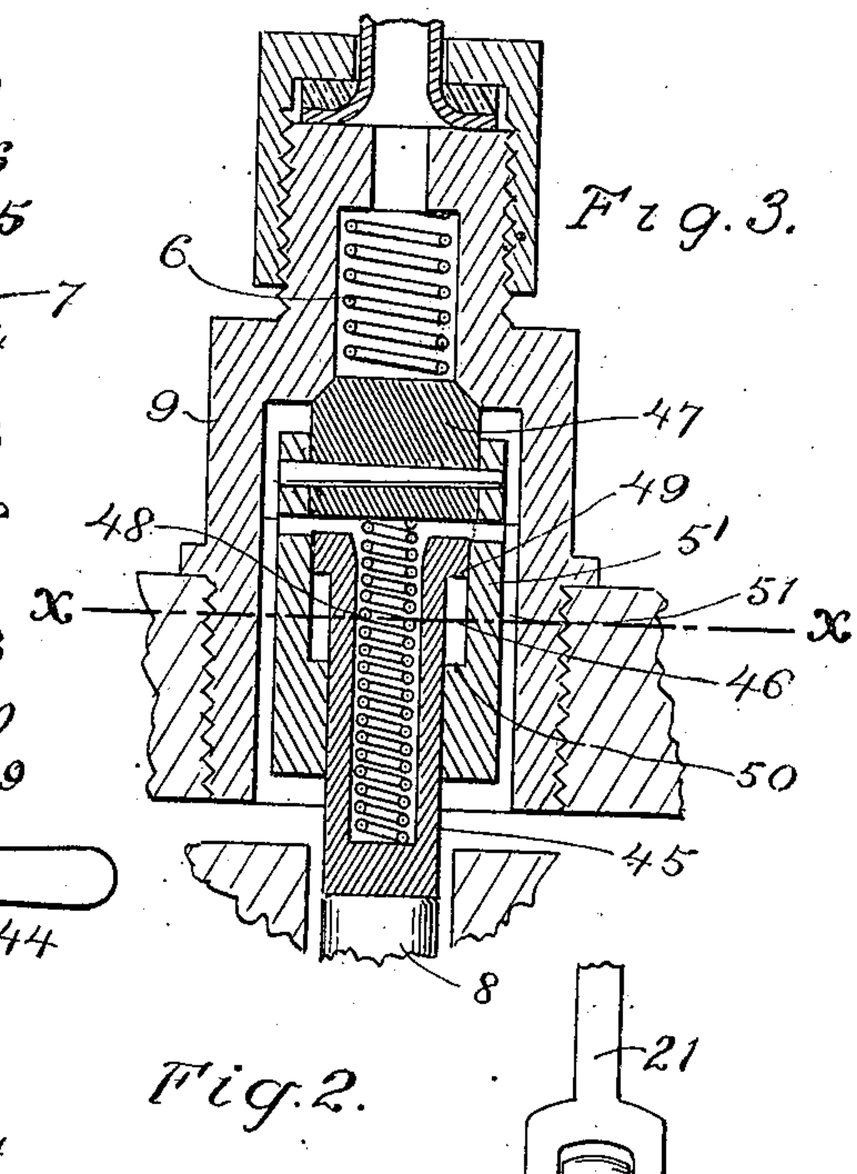
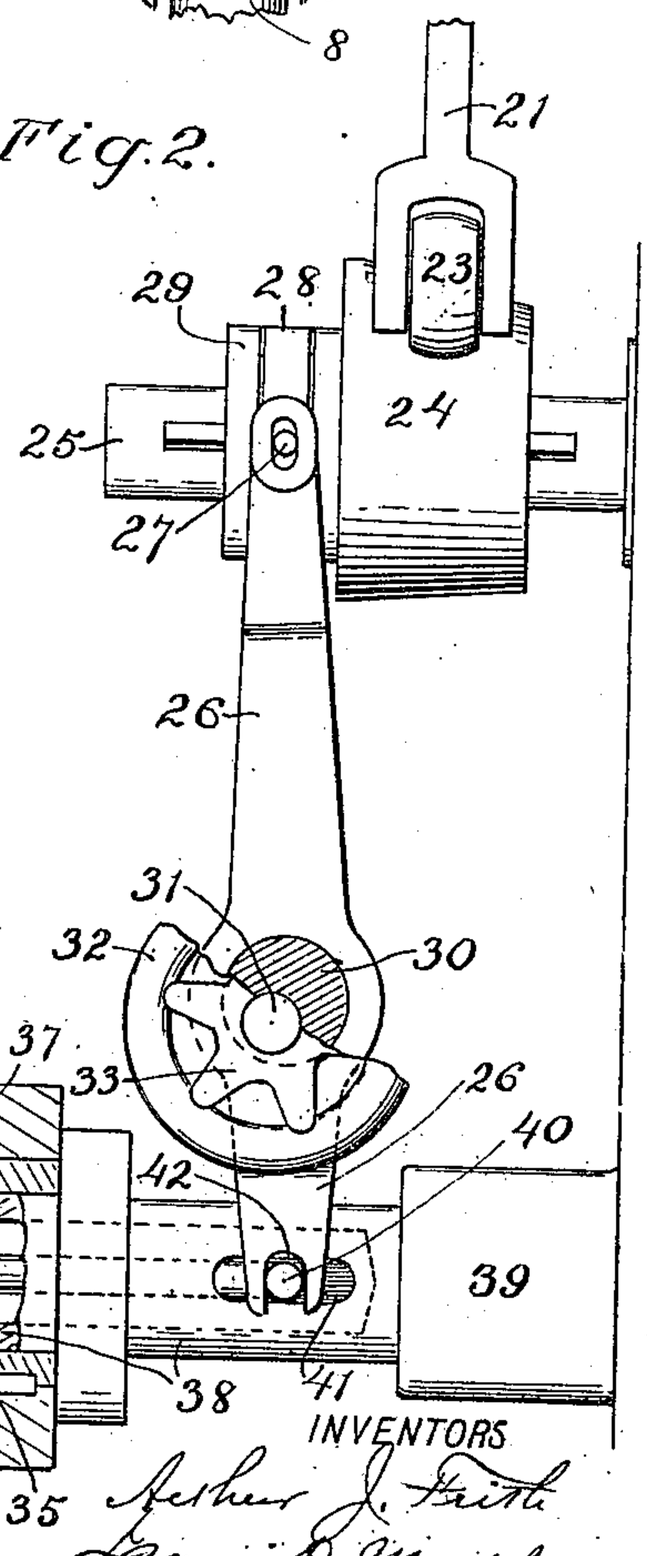


Fig. 3.

Fig. 2.



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OIL-PUMP FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 672,477, dated April 23, 1901.

Application filed September 21, 1899. Serial No. 731,226. (No model.)

To all whom it may concern:

Be it known that we, ARTHUR J. FRITH, residing in the borough of Manhattan, in the city, county, and State of New York, and JAMES D. MACPHERSON, residing at Passaic, in the county of Passaic and State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Oil-Pumps for Motors, of which the following is a specificaton.

This invention relates to improvements in oil-pumps for motors, particularly for internal-combustion motors; and the object of the invention is to provide a pump for this purpose which will be regulable either under the control of a speed-governor or of the operator and which will be at the same time simple and effective in operation.

The general principle of this pump is similar to that of a form of pump now applied to engines of this class wherein with a view to obtaining certainty in the delivery of small quantities of oil the pump draws in in the suction-stroke a much larger quantity of oil than is actually needed. In the return or driving stroke this oil at first is driven through a by-pass back into the reservoir, and at a certain point of the stroke this by-pass is closed and the remaining oil is forced through a check-valve to the fuel-valve of the engine. By varying the time of closure of the by-pass very slight variations in the quantity of oil delivered are easily accomplished. The operation of our invention is somewhat similar, but the connection back to the reservoir is closed at a determinate point of the stroke, the variation in feed being effected by varying the stroke of the pump-piston after such closure. To this end the suction-valve is held open by a spring until the piston reaches such determinate point of its stroke, when it acts through a spring to close the suction-valve, and thus cut off communication with the reservoir, the latter spring then yielding to enable the further movement of the piston. No by-pass is necessary with this arrangement, and the variation of the feed is effected simply and accurately by adjustment of the stroke of the piston by suitable means. All air-bubbles that are drawn in in the suction-stroke remain at the top of the fluid and are driven back through the suction-valve before the latter closes, so that when said valve does close only oil is forced into the engine.

Our invention includes other features of the pump operating and controlling mechanism, as hereinafter set forth.

In the accompanying drawings, Figure 1 is a vertical section of an oil-pump mechanism embodying our invention. Fig. 2 is a partly-sectional elevation of a portion of same at right angles to Fig. 1. Fig. 3 is a detail view in section of the preferred form of the suction-valve. Fig. 4 is a cross-section on the line *x x* in Fig. 3.

Only the parts which are directly concerned in the invention are shown in the drawings. Thus the engine to which the oil is supplied and the reservoir from which the supply is taken are not represented, the same being of any usual or suitable construction.

1 represents the pipe leading from the oil-reservoir, and 2 the pipe leading to the engine.

3 indicates the frame of the pump mechanism, to which the various parts hereinafter described are attached.

The pipe 1 is in communication with a cylinder-chamber 4, such communication being controlled by the suction-valve 5, which is normally held off its seat by a helical spring 6. A spring 7, below and engaging or connected with the valve 5, is engaged by piston 8, which works in the cylinder-space 4. The seat of valve 5 is formed in a bushing 9, which screws into frame 3, the oil-supply pipe 1 leading to the axial channel or bore of this bushing.

Leading laterally from the cylinder-space 4 is a channel 10, connecting with the oil-delivery pipe 2 through a check-valve 11, which only opens when the piston 8, having closed the valve 5 through the spring 7, interposed between it and said valve, puts the oil in the cylinder-space under pressure. This valve 11 is formed in a detachable screw bushing or nipple 12, to which pipe 2 is connected. The piston 8 is prolonged in the form of a rod, which is guided in bearings 13 14 in the

frame, and at its lower end is provided an adjustable collar 15, between which and the bearing 14 a spring 16 is arranged to cause the piston to be drawn away from valve 5. The adjustment of collar 15 is effected by a nut 17, screwing on the lower end of rod 8. A screw collar or nut 18, working on a screw-threaded portion 19 of piston-rod 8 and provided with a lock-nut 20, is engaged by an arm of a bell-crank or bent lever 21, which is pivoted to the frame 3 at 22, and whose other arm carries a roller 23, engaging with a cone-cam 24, mounted on a shaft 25, which is connected to the engine, so as to be driven thereby. The cam 24 is splined or otherwise connected to shaft 25, so that it is capable of longitudinal movement thereon while rotating therewith, and said cone is tapered or made of varying diameter longitudinally, so that by shifting it longitudinally on its shaft the stroke of piston 8 may be varied. To effect such longitudinal movement of the cam, it may be connected with manual or automatic controlling devices, or both. Thus we have shown an adjusting-lever 26 engaging by a fork at its upper end pins 27, projecting from a ring or collar 28, fitting in a groove in an extension or hub 29 of the cam, the hub turning freely within such ring, but moved longitudinally thereby. The lever 26 is pivoted on a center 30, and to enable manual variation or adjustment thereof this center is itself adjustable, being in the form of a sleeve with an eccentric bore fitting on a fixed pin-support 31, which is fast in the main frame 3. A hand-wheel 32 on this sleeve enables it to be shifted as desired, and a lock-nut 33, screwing on the end of pin 31 and provided with a suitable handhold, as shown, enables the center to be locked in any desired position.

The lower end of lever 26 is connected to an automatic shifting means—that is, to a suitable governor. The governor is here indicated at 34 and controls a rod 35, which extends axially through the governor-actuating gear 36 and the governor-hub 37 and through the fixed sleeve-support 38, which is formed as an extension of a fixed stud 39. Pins 40 on rod 35 extend out through slots 41 in the fixed sleeve 37 and engage with slots 42 in a fork at the lower end of lever 26. It will be understood that suitable mechanical driving connections with the engine will be provided for driving the shaft 25 and the governor-operating gear at the proper speed.

In Fig. 2 the roller 23 is shown as bearing about midway of the length of the cam, and this may be assumed to be the normal position, corresponding to average load on the engine, with the governor running at normal speed. Under these conditions each revolution of shaft 25 will cause one stroke of the lever 21 and piston 8. The return stroke of the piston is effected by spring 16, and in each such return stroke a quantity of oil considerably in excess of the momentary requirements of the engine is drawn in through suction-valve 5, this valve being opened by spring 6 as soon as piston 8 eases up on spring 7. On the next upstroke or driving stroke the piston 8, striking spring 7, first compresses same until it overcomes the spring 6 and closes the valve, and then continuing to ascend it puts the oil in the cylinder-space 4 under pressure and, opening the check-valve 11, drives the oil or a certain portion of same into the fuel-valve devices of the engine, the spring 7 yielding to permit such further movement of the piston.

In Fig. 1 the parts are shown in the position where the valve 5 is closed, valve 11 is open, and piston 8 is driving the oil into the engine, as described.

In Fig. 3 is shown the preferred construction of the suction-valve, the body 5′ of the valve having a plunger 45, which slides in a cylindrical bore 46 in such valve-body and at its lower end projects beyond the valve-body to engage with the piston 8. The upper end of the bore 46 is closed by a stopper or plug 47, which is keyed thereto and constitutes the valve proper, and a spring 48 is interposed between this part and the plunger 45, the latter being made hollow to receive the spring. A shoulder 49 on plunger 45 engages with a shoulder 50 on the valve-body 5′ to limit the movement of the spring and predetermine exactly the effective stroke of the pump. As the spring is inclosed, it is not possible for it to get out of line or catch in the moving parts of the pump. Ribs 51, either on the valve-body or on the valve casing or bushing 9, guide the valve in its vertical movement.

The above-described construction insures smooth running of the valve.

The action of the governor on variation of speed is to move the cam 24 longitudinally on shaft 25, and thus vary the effective throw of the cam. Until normal speed is reached the pump will feed the full quantity of oil. Above this normal speed the oil is cut down in proportion to increase of speed. Hand regulation changes the quantity of oil taken at normal speed. Thus if the speed exceeds the normal the governor may be assumed to draw the cam to the left in Fig. 2, thus bringing a smaller or less-eccentric part of the cam into operation and lifting the piston to a less extent. As the point where the valve 5 is closed remains the same as before, it will be evident that the stroke of the piston after such closure of the communication with the reservoir will be diminished, and the quantity of the oil fed to the engine will be decreased correspondingly. It is desirable, however, in some cases, and particular in marine work, to provide means for adjusting or varying the amount of oil introduced under a given condition of speed, so as to adapt the engine to a particular class of work. This adjustment is provided for by the adjustable center 30, which may be turned or shifted laterally by its handle 32 and locked by nut 33, so as to cause the position of the cam 24 under any given condition of the gov-

ornor to be shifted to cause a smaller throw or a greater throw, as may be desired, the power or capacity of the motor at a given speed being correspondingly varied.

As it may sometimes be required to operate the oil-pump by hand, a socket 43 is formed on the lever 21 and is provided with a socket-hole to receive a handle 44, whereby the pump can be operated without disturbing its adjustment relatively to the engine.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. In an oil-pump mechanism, the combination with the pump-cylinder, a communication therefrom to a source of oil-supply, and a suction-valve in such communication, of a piston working in said cylinder, means for operating said piston, a delivery connection from said cylinder including a check-valve, a spring for holding the aforesaid suction-valve open and means operated by the piston for closing the said suction-valve before the piston finishes its stroke.

2. In an oil-pump mechanism, the combination of the pump-cylinder, a communication therefrom to a source of oil-supply and a suction-valve in such communication, a piston working in said cylinder, means for operating said piston, a delivery connection from said cylinder including a check-valve, a spring for holding the aforesaid suction-valve open and a spring interposed between the said suction-valve and the piston and operated by the latter to close the valve before the piston reaches the end of its stroke.

3. In an oil-pump mechanism, the combination with the pump-cylinder, of an oil-supply connection communicating therewith, a suction-valve in such connection, a delivery connection from said cylinder including a check-valve, a piston working in said cylinder, a spring between said piston and the suction-valve, and operating means for said piston.

4. In an oil-pump mechanism, the combination with the pump-cylinder, of an oil-supply connection communicating therewith, a suction-valve in such connection, a delivery connection from said cylinder including a check-valve, a piston working in said cylinder, a spring between the piston and the suction-valve, and operating means for said piston comprising a spring for moving it away from the suction-valve and cam mechanism for moving it toward said valve.

5. In an oil-pump mechanism, the combination with the pump-cylinder, of an oil-supply connection therewith, a suction-valve in such connection, a delivery connection from said cylinder including a check-valve, a piston working in said cylinder, a spring between said piston and the suction-valve, and operating means for said piston comprising a part adjustable on said piston, piston-actuating means engaging with such adjustable part and a cam for operating such piston-actuating means.

6. In an oil-pump mechanism, the combination with the pump-cylinder, of an oil-supply connection communicating therewith, a suction-valve in such connection, a delivery connection from said cylinder including a check-valve, a piston working in said cylinder, a spring between said piston and the suction-valve, operating to close the said valve, means for operating the suction-valve when released from the pressure of such spring, and operating means for said piston.

7. In an oil-pump mechanism, the combination with the pump-cylinder, of an oil-supply connection communicating therewith, a suction-valve in such connection, a delivery connection from said cylinder including a check-valve, a piston working in said cylinder, a spring between the piston and the suction-valve, said valve being adapted to be closed by the operation of said piston acting through said spring, and operating means for said piston comprising a spring for moving it away from the suction-valve and cam mechanism for moving it toward said valve.

8. In an oil-pump mechanism, the combination with the pump-cylinder, of an oil-supply connection therewith, a suction-valve in such connection, a delivery connection from said cylinder including a check-valve, a piston working in said cylinder, a spring between said piston and the suction-valve, said valve being closed by said piston acting through said spring, and operating means for said piston comprising a part adjustable on said piston, piston-actuating means engaging with such adjustable part and a cam for operating such piston-actuating means.

9. In an oil-pump mechanism, the combination with the pump cylinder and piston, suction and check valves controlling the oil supply and delivery connections of said cylinder, means controlled by said piston to engage and close the suction-valve at a determinate point of its stroke, and an operating-shaft, of controlling means adjustable relatively to such shaft, but rotating therewith, means engaging with said controlling means to cause operation of said piston, and a governor responsive to the speed of the engine and controlling the position of said controlling means on its shaft.

10. In an oil-pump mechanism, the combination with the pump-piston and its operating-shaft, of a cone-cam mounted on said shaft to move rotatively therewith but capable of longitudinal movement thereon, means engaging with said cam to operate the pump-piston, a lever connected to said cam, a governor connected to and controlling said lever, and means for adjusting the center of said lever.

11. In an oil-pump mechanism, the combination with the pump-piston and its operating-shaft, of a cone-cam mounted on said

shaft to move rotatively therewith, but capable of longitudinal movement thereon, means engaging with said cam to operate the pump-piston, a lever connected with said cam, a governor connected to and controlling said lever, and means for adjusting the center of said lever, comprising an eccentrically-pivoted center for said lever, and means for rotating such center and for locking the same in position.

12. In an oil-pump, the combination with the pump cylinder and piston, of a suction-valve controlling the oil-supply and provided with means for pressing it away from its seat, a plunger working in the valve-body, and adapted to engage with the piston and with the valve-body, and a spring for holding the plunger toward the piston.

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