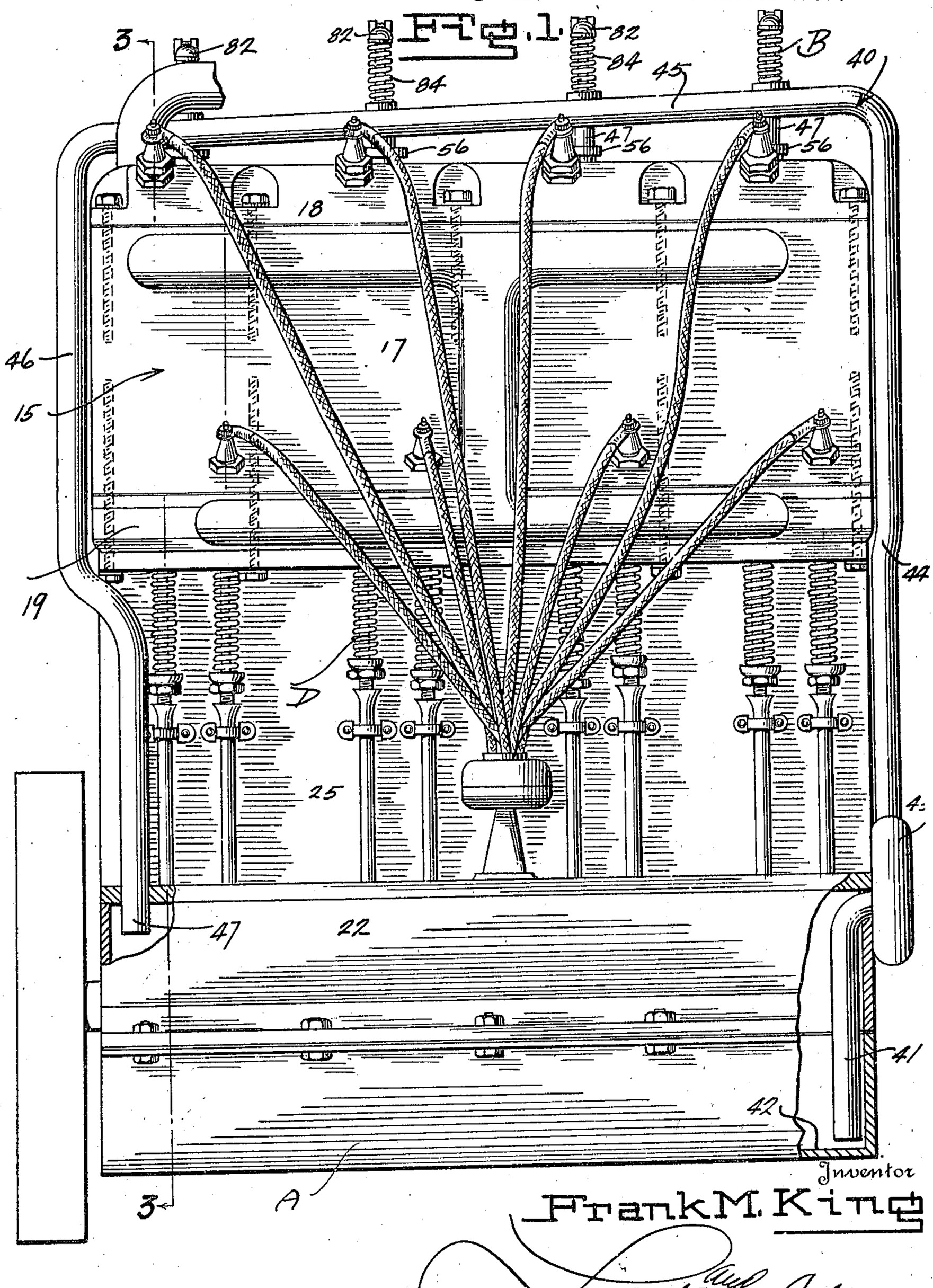
Nov. 18, 1924. 1,516,044

F. M. KING

LUBRICATING SYSTEM FOR INTERNAL COMBUSTION ENGINES

Filed Aug. 21, 1922 3 Sheets-Sheet 1

Fig. 1.



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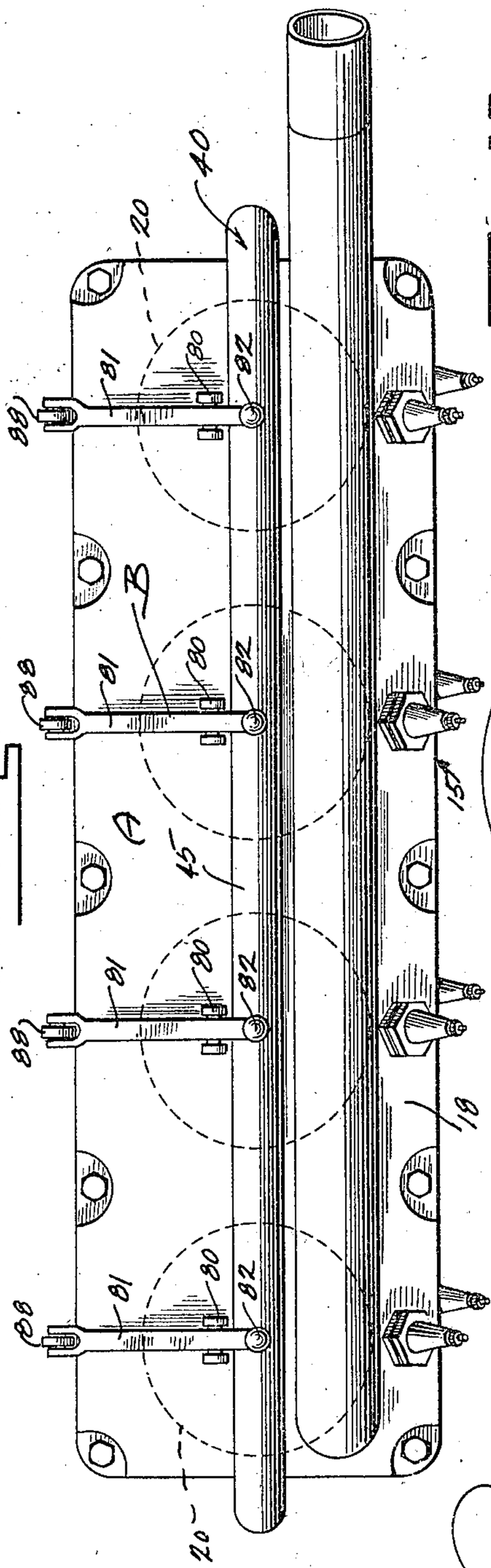

Fig. 2.

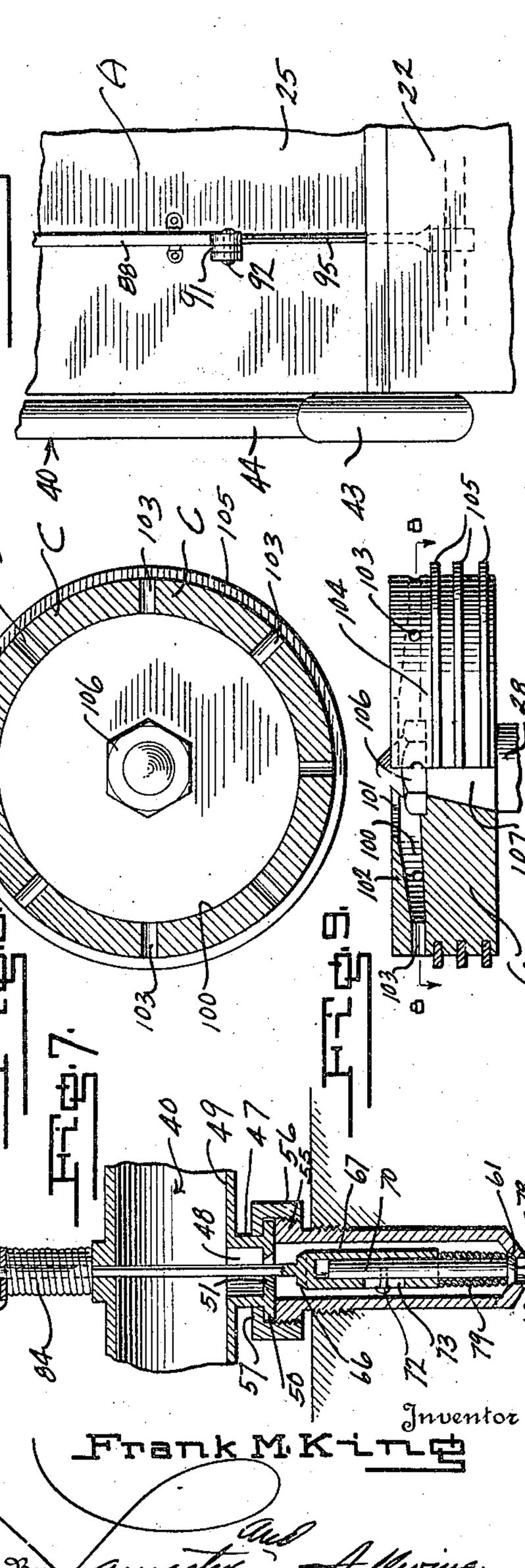

Fig. 10.

Fig. 8.

Fig. 5.

Fig. 7.

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Fig. 3.

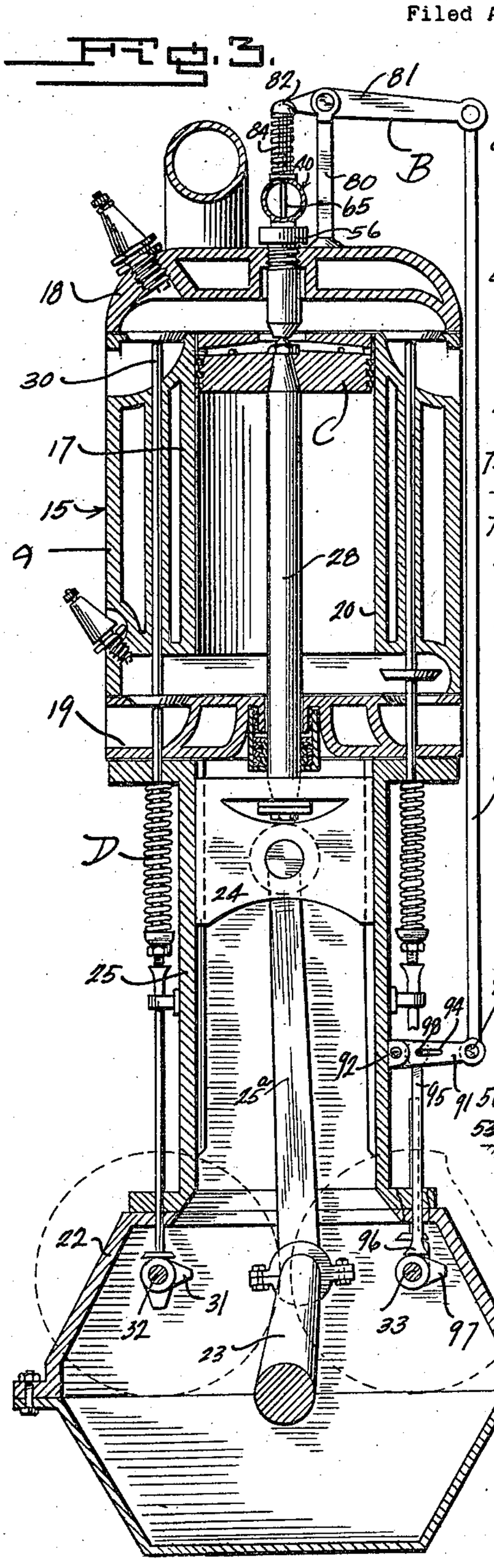

Fig. 4.

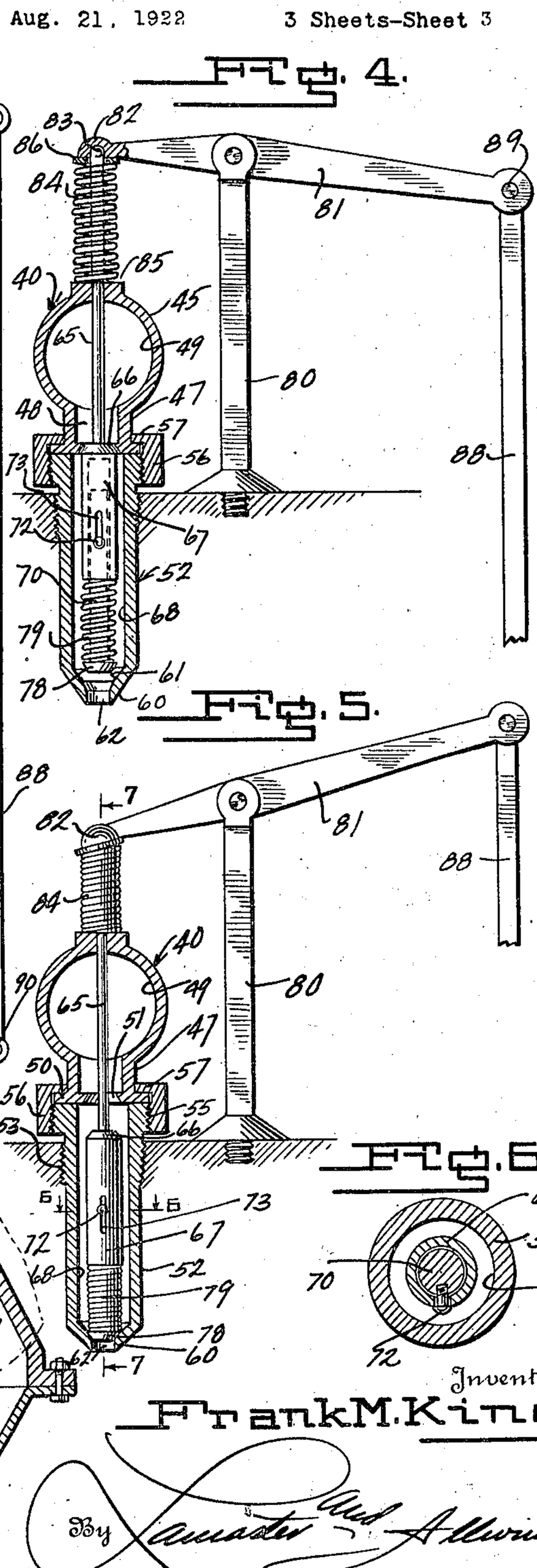

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

FRANK M. KING, OF BLUEFIELD, VIRGINIA.

LUBRICATING SYSTEM FOR INTERNAL-COMBUSTION ENGINES.

Application filed August 21, 1922. Serial No. 583,451.

To all whom it may concern:

Be it known that I, FRANK M. KING, a citizen of the United States, residing at Bluefield, in the county of Mercer and State of West Virginia, have invented certain new and useful Improvements in a Lubricating System for Internal-Combustion Engines, of which the following is a specification.

This invention relates to an improved lubricating system for an internal combustion engine.

The primary object of this invention is the provision of an improved lubricating arrangement for internal combustion engines of the four cycle type, being particularly well adapted for use in connection with the double acting type of internal combustion engine described and claimed in my copending application, Serial No. 583,452, filed Aug. 21, 1922.

An important object of this invention is the provision of an improved lubricator having communication with internal combustion engine chambers, whereby a lubricant may be supplied thereto, and including a novel type of valve arrangement for intermittently regulating flow of lubricant to the combustion chambers without permitting loss of compression.

A further object of the invention is the provision of an improved lubricating system for internal combustion engines embodying an improved automatically operated valve arrangement for supplying lubricant to the cylinders of an internal combustion engine.

In the drawings, wherein similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a side elevation of a double acting type of internal combustion engine embodying the improved lubricating system.

Figure 2 is a plan view of an internal combustion engine, showing details of the improved lubricating mechanism.

Figure 3 is a transverse cross sectional view, taken substantially on the line 3—3 of Figure 1.

Figure 4 is an enlarged fragmentary view, showing details of the improved lubricating mechanism.

Figure 5 is a view altogether similar to Figure 4, with the details thereof in a differently adjusted position.

Figure 6 is a transverse cross sectional view on the line 6—6 of Figure 5.

Figure 7 is a transverse cross sectional view on the line 7—7 of Figure 5.

Figure 8 is a transverse cross sectional view on the line 8—8 of Figure 9, showing an improved piston member.

Figure 9 is a side elevation, partly in section, showing an improved type of piston adapted for use in connection with the improved lubricating arrangement.

Figure 10 is a fragmentary side elevation, showing details of the improved lubricating arrangement.

In the drawings, wherein for the purpose of illustration is shown but the preferred embodiment of this invention, the letter A designates an internal combustion engine or similar device, having the improved lubricating mechanism B associated therewith.

Referring to the internal combustion engine A, the same is preferably of that type described and claimed in my copending application, Serial No. 583,452, filed Aug. 21, 1922. It comprises the housing arrangement 15 which includes a cylinder casing 17, provided with upper and lower cylinder heads 18 and 19 respectively. Since this type of engine A is of the double acting type, the novel type of piston member C is adapted for receiving combustion charges upon both sides thereof within each of the cylinder chambers 20. The housing 15 furthermore includes a crank case 22, in which the crank shaft 23 is rotatably mounted. Cross heads 24 are preferably slidably mounted in a cross head casing portion 25, which is disposed intermediate the crank case 22 and the lower cylinder head 19, said cross heads 24 being provided for each combustion chamber 20 and piston member C and being pivotally connected by a connecting rod 25^a to the throws of the crank shaft 23. The piston rods 28 are reciprocably disposed in the lower cylinder head casing 19 and connected to the pistons C and at their other ends to the cross heads 24 to complete the piston arrangement as embodied in the type of internal combustion engine above referred to.

A valve arrangement D is embodied in the improved internal combustion engine A including valve stems 30 operated by means of cams 31, the latter being disposed

upon cam shafts 32 and 33 provided in the crank case 22.

Referring to the improved lubricating mechanism B, the same preferably includes a U-shaped conduit arrangement 40 which includes a portion 41 extending into the chamber 42 of the crank case 22, said portion 41 being directly connected exteriorly of the internal combustion engine housing 15 to a pump 43 of any approved type, whereby lubricant may be pumped upwardly through a side portion 44 of the conduit 40 to an overhead conduit portion 45, which extends longitudinally of the cylinder head top and slopes gradually downward from the portion 44 to an opposite side conduit portion 46, which depends and communicates at an end 47 into the crank case chamber 42, whereby lubricant may return to the crank case, as will be hereinafter more fully set forth.

The overhead conduit portion 45 is preferably provided with a tubular offset portion 47 therein for each internal combustion engine cylinder 20, said tubular portions 47 having passageways 48 therein which communicate with the longitudinal passageway 49 in said conduit portion 45.

Each of these offset portions 47 is provided with an exteriorly extending annular shoulder 50, and a tapered valve seat 51 which converges from the lower surface of the offset 47 upwardly of the passageway 48. A tubular shaped cap member 52 is provided for each combustion chamber or cylinder 20, which is screw threaded as at 53 in the top of a cylinder head 18 to extend axially of its cylinder chamber 20; the upper ends of each of these caps or tubes 52 being annularly enlarged and screw threaded, as at 55, for detachably receiving a swivel nut 56 which may rest by an annular shoulder 57 upon the outwardly extending annular flange 50 of a conduit offset 47. The lower ends 60 of each of the tube members 52 are tapered and provide a downwardly converging valve seat 61 for use in connection with valve arrangements which will be more fully described hereinafter. The lower ends 60 are of course, provided with openings 62 which open into each of the cylinder chambers 20 directly above the pistons C.

Each of the tubular devices 52 is provided with a valve stem 65 which extends axially thereof outwardly through the passageway 48 of the conduit offset 47 and through the top of the conduit 40. A tapered valve head or member 66 is provided upon the lower end of each stem 65 for cooperation with the valve seat 51 disposed immediately at the top of each cap or valve tube 52. A sleeve portion 67 depends into the chamber 68 of each tube 52 from the valve member 66 which is open at its bottom and slidably receives a plunger pin 70 upwardly therein. This pin 70 of each valve tube 52 is reciprocably disposed upwardly in the passageway of the sleeve 65 and the limit of movement of the same is defined by a pin 72 which extends transversely through a slot 73 formed longitudinally of each sleeve 67; said pin 72, of course, engaging the plunger or pin 70 which slidably extends into the sleeve 67. A tapered valve member or head 78 is provided upon the extreme bottom of each of the pins or stems 70, and a spiral spring member 79, under an initial compression, is mounted circumferentially about the pin 70 intermediate the head 78 and the lower marginal edge of the sleeve 67, so that the pin 70 is normally maintained in its most outwardly extending position with respect to the sleeve 67. It is to be noted that when the valve head 66 is seated in the seat 51 provided therefor, that the valve head 78 is raised off of the seat 61 in the lower end of the tubular member 52, and vice versa.

A series of brackets 80 are provided upon the top of the upper cylinder heads 18; one being provided for each valve stem 65, which oscillatively receives a lever 81 upon the upper end thereof. An outer end 82 of each lever 81 is provided with a socket which pivotally receives a ball end 83 of a valve stem 65. A spiral spring 84 is provided for each valve stem 65 resting upon a seat 85 of the conduit 40 and engaging against a washer 86 disposed just below the ball socket 82, said springs 84 of the valve stems 65 being provided for normally maintaining the valve members 66 in their seats 51, whereby lubricant will be effectively retained in the upper portion 45 of the conduit 40. In order that the levers 41 may be operated to permit entrance of lubricant into the cylinder chambers 20, a link rod 88 is pivotally connected as at 89 to the other outer end of each of said levers 81, and which extends vertically downwardly along the side of the engine housing 15 for pivotal connection as at 90 to a lever 91. These levers 91 are pivoted at their ends remote from the connection 90 by pins 92 to the cross head casing portion 25 upon the outer surfaces thereof; each of said levers 91 having a slot 94 longitudinally therein. Cam stems 95 are reciprocably disposed through suitable bearing openings in the engine housing 15, having enlarged lower ends 96 for cooperation with cams 97 mounted upon the cam shaft 33, the upper ends of said cam stems 95 having pins 98 thereon, which are reciprocably connected in the slots 94 of the levers 91.

Referring to the improved type of piston C, the same is preferably of cast iron or analagous material, of cylindrical formation, and provided with a reservoir 100 having an outlet opening 101 axially thereof.

The reservoir 100 is relatively shallow, although the same is of much greater diameter than the diameter of the pasageway 101 so that an overhanging portion 102 is provided over the annular and greater part of the reservoir 100. Radial ducts 103 extend through the wall of the piston C and communicates the reservoir 100 with the exterior surface 104 of the piston C, just upwardly of the piston rings 105, which are provided in any manner in the piston C. A nut 106 may be employed for attachment of the piston rod 28 upon the upper reduced end 107 of said piston rod; said nut 106 being attached through the passageway or opening 101 of the reservoir 100.

In operation, it can readily be understood that as the cam shaft 33 rotates within the crank case 22, the cams 97 thereof will reciprocate the cam stems 95 upwardly through their bearings in the engine housing 15, so that the levers 91 are moved at the proper time for vertical movement of the link rods 88. Movement of the rods 88 upwardly, of course, oscillates the levers 81. Oscillation of a lever 81 so that the valve stem 65 will be depressed against action of the spring 84 will result in a supply of lubricant passing from the conduit 40 into the tube chamber 68 through the valve seat 51, since such upward movement of the link connection 88 will of course unseat the valve 66. A supply of lubricant 68 thus flows into the compartment 68 of each tubes 52 and at the proper time outlets through the openings 62 thereof to drop through the passageway 101 into the piston reservoir 100. From thence the lubricant flows through the radial ducts 103 for oiling or lubricating the walls of the cylinder chamber 20. Some of the lubricant of course flows onto the lower cylinder head 19 for oiling the sliding bearing of the piston rods 28 therein.

In connection with this operation of the device, it is to be noted that the levers 81 are not all operated at the same time, but according to the strokes of the pistons in the various cylinders of the internal combustion engine A. The cams 97 may be properly arranged so that the valve rods 65 are properly timed in their operation to cooperate with a certain stroke of the piston C. In order to prevent loss of compression or deteriorating effect upon the action of the valve 66, the above described valves 78 in their yieldable mounting have been provided, which at the proper time cooperate upon their respective valve seats 61 in order that the valve 78 may close the passageway 62 to prevent communication of a compressive charge with the conduit 40. In effecting this operation, it is to be noted that the spiral spring 79 of each valve member 78 is depressed so that the pins 70 slide upwardly within the passageways of the sleeves 67. Of course, when the valve members 78 are seated, the valve members 66 are unseated, and the lubricant is flowing into the chamber 68.

From the foregoing description of this invention it can be seen that an improved lubricating system has been provided, which may be used in connection with the lubrication of pistons and like members, the device being particularly well adapted for supplying an intermittent flow of lubricant to a moving part; and being automatic in operation, so that there is little liability of inadequate or over supply of lubricant to the moving parts.

Various changes in the shape, size and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of this invention or the scope of the claims.

I claim:

1. A lubricating mechanism comprising a supporting device, a lubricating conduit provided with a supply opening therein, a feed member attached to said lubricating conduit having communication with said supply opening and provided with an opening therein, a valve means for cooperation with the supply opening of said conduit, and valve means yieldably carried by said first mentioned valve means for cooperation with the opening of said feed member.

2. A lubricating system for internal combustion engines comprising a conduit, means for supplying lubricant to said conduit, feed tubes detachably carried by said internal combustion engine for each cylinder thereof in communication with said conduit, valve means normally closing communication between said conduit and said feed tubes, means for intermittently and automatically unseating said valve means to permit escape of lubricant into said feed tubes, and yieldable valve means cooperating with said feed tubes normally open when said first mentioned valve means is closed and closed when said first mentioned valve means is open.

3. A valve arrangement for lubricating systems comprising a casing having a pair of valve openings remotely positioned therein, a valve arrangement normally closing the upper of said openings, a valve arrangement for the other of said openings yieldably carried by said first mentioned valve arrangement, being normally open when said first mentioned valve means is closed, and vice versa.

4. A valve arrangement for lubricating systems comprising a supply conduit having an opening therein defining a valve seat, a tube carried by said conduit in communication with said valve seat and the opening defined by said valve seat, said tube having a valve seat defining an opening remotely positioned from said first mentioned valve

seat, valve means normally maintaining said first mentioned valve seat opening closed, a sleeve carried by said valve having a slot therein, a stem reciprocably carried by said sleeve including a pin extending through the slot of said sleeve to limit the amplitude of movement of said stem, a valve head carried by said pin for cooperation with the valve seat on said tube, spring means intermediate said last mentioned valve and said sleeve under initial compression to extend said valve toward the tube seat, said supply opening of the conduit being normally closed by said first mentioned valve, said second mentioned valve when the first mentioned valve is in closed position being opened, and means for automatic operation of said first mentioned valve to open the same and close the tube opening by compression of said spring.

5. In a device of the class described, the combination with an internal combustion engine embodying cylinder chambers and a cylinder head, of a lubricant supply conduit carried by said internal combustion engine including an upper portion extending over said cylinder head and inclined at an acute angle with respect to the horizontal, means for pumping lubricant from the crank case of said internal combustion engine through said conduit, said upper inclined portion of the conduit having a plurality of openings provided therein, feed tubes detachably carried by the cylinder head of said engine extending axially therethrough for each cylinder chamber, detachable nut means carried by said conduit communicating said feed tube with the openings in the upper inclined portion thereof, each feed tube having a valve seat arranged just upwardly thereof and provided at its lower end with a second valve seat, a valve member for said upper seat having an upwardly converging tapered surface for operation in said valve seat, valve stems for each of said valve members extending upwardly through said inclined portion of the conduit, brackets carried by said cylinder head, levers oscillatively carried by said brackets intermediate their ends and having an outer end of each of the same oscillatively connected to the extreme upper ends of said valve stems, spring means carried by said valve stems normally maintaining said internal combustion engine below said first mentioned levers, link rods connecting said first mentioned levers with said last mentioned levers, said last mentioned levers having slots therein, a cam shaft, and cam stems reciprocably carried by said engine cooperating with said cam shaft and in the slots of said last mentioned levers, whereby said first mentioned levers may be operated upon the brackets on top of said cylinder heads to intermittently unseat said valve members, a sleeve carried by each of said valve members depending interiorly of said feed tubes, said sleeves being open at their lower ends and provided with slots transversely therein extending longitudinally thereof, a plunger slidably carried in each of said sleeves having projections extending through the slots of said sleeves to limit the amplitude of motion of said plungers within said feed tubes, the lower ends of said plungers having tapered downwardly converging valve heads thereon, and springs carried by the plungers intermediate said downwardly converging valve heads and said sleeves to normally maintain said valve heads in their most extended position toward the valve seat provided in the ends of said feed tubes, said first mentioned valves when seated within the seats at the upper ends of said feed tubes having the lower valve heads maintained off of the seats in the lower ends of said tubes, and when said uppermost valves are opened, said springs within said tubes being maintained under compression to close the openings in said feed tubes.

6. In a lubricating system of the class described the combination with an internal combustion engine embodying a casing having a cylinder chamber therein, a piston slidable within the cylinder chamber having an oil reservoir therein opening on the top of said piston and said piston having ducts leading from the reservoir to the side walls of said cylinder chamber, operating means connected to said piston, said cylinder casing having a duct therein placed above and in alignment with the reservoir in said piston, and valve means operating in said duct for controlling admission of lubricant through the duct.

7. In a lubricating system of the class described the combination with an internal combustion engine embodying a casing having a cylinder chamber therein, a piston slidable within the cylinder chamber having an oil reservoir therein opening on the top of said piston and said piston having ducts leading from the reservoir to the side walls of said cylinder chamber, operating means connected to said piston, said cylinder casing having a duct therein placed above and in alignment with the reservoir in said piston, valve means operating in said duct for controlling admission of lubricant through the duct, and means connecting said valve means for operation by the engine operating mechanism.

8. In a lubricating system of the class described the combination of an engine casing having a cylinder therein, a piston slidable within the cylinder, operating means connected to the piston, a cam shaft, an oil conduit carried at the top of said casing, a tube having openings in the top and bottom thereof extending from the oil conduit to

communicate the same with the cylinder of the engine casing, a valve operating in the tube providing valve heads at the top and at the bottom thereof adapted to alternately seat in the top and bottom openings of said tube, a rocker arm, means connecting one end of the rocker arm to said valve, and means connecting the other end of said arm to said cam shaft, whereby upon operation of the cam shaft the rocker arm will be oscillated for reciprocating the valve within said tube for alternately opening and closing the openings at the top and bottoms of said tube to intermittently feed lubricant from the conduit into the cylinder chamber.

FRANK M. KING.