July 12, 1938. W. NOBLE 2,123,197

LUBRICATOR

Filed Dec. 18, 1934 2 Sheets-Sheet 1

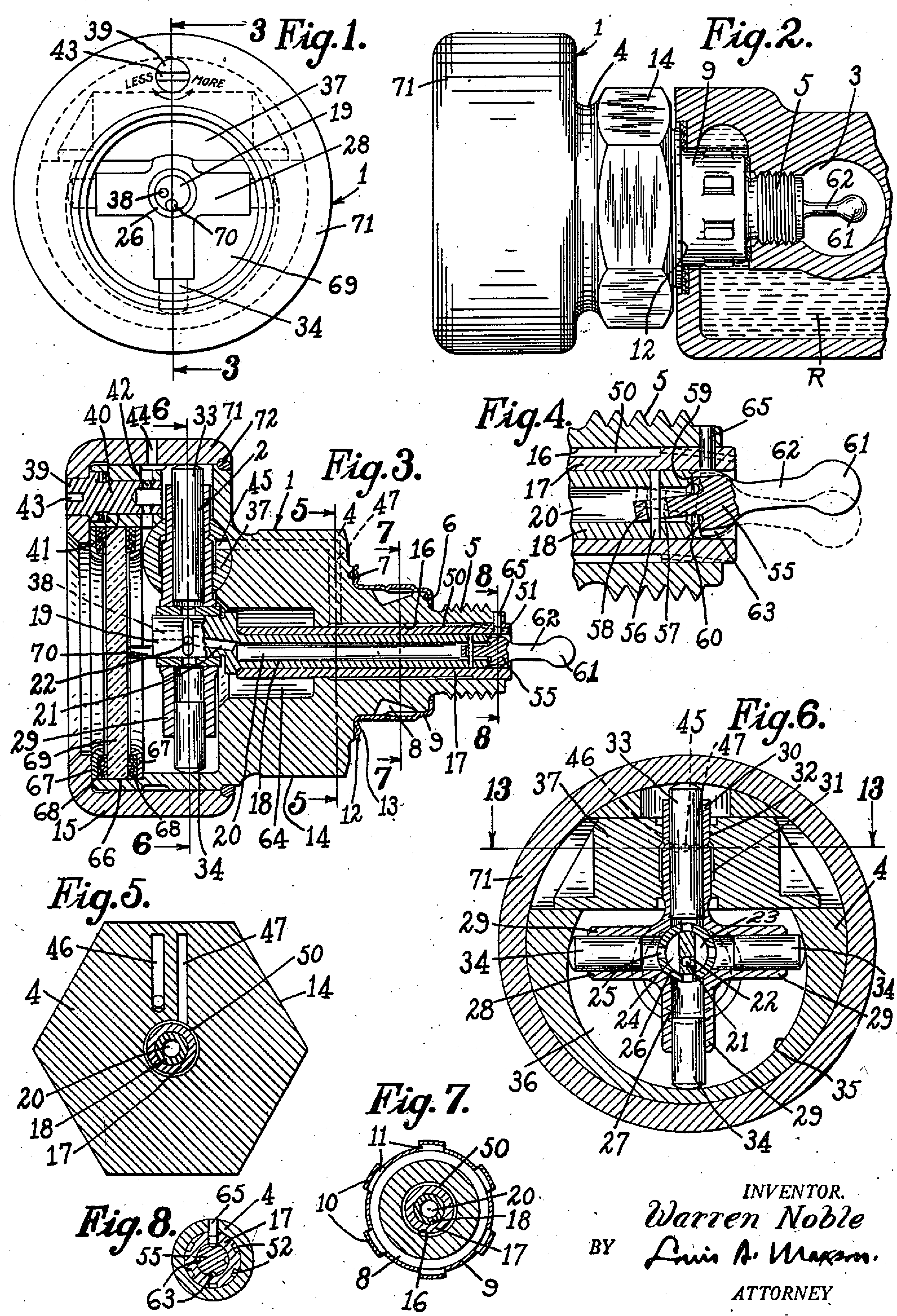

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Fig.9.

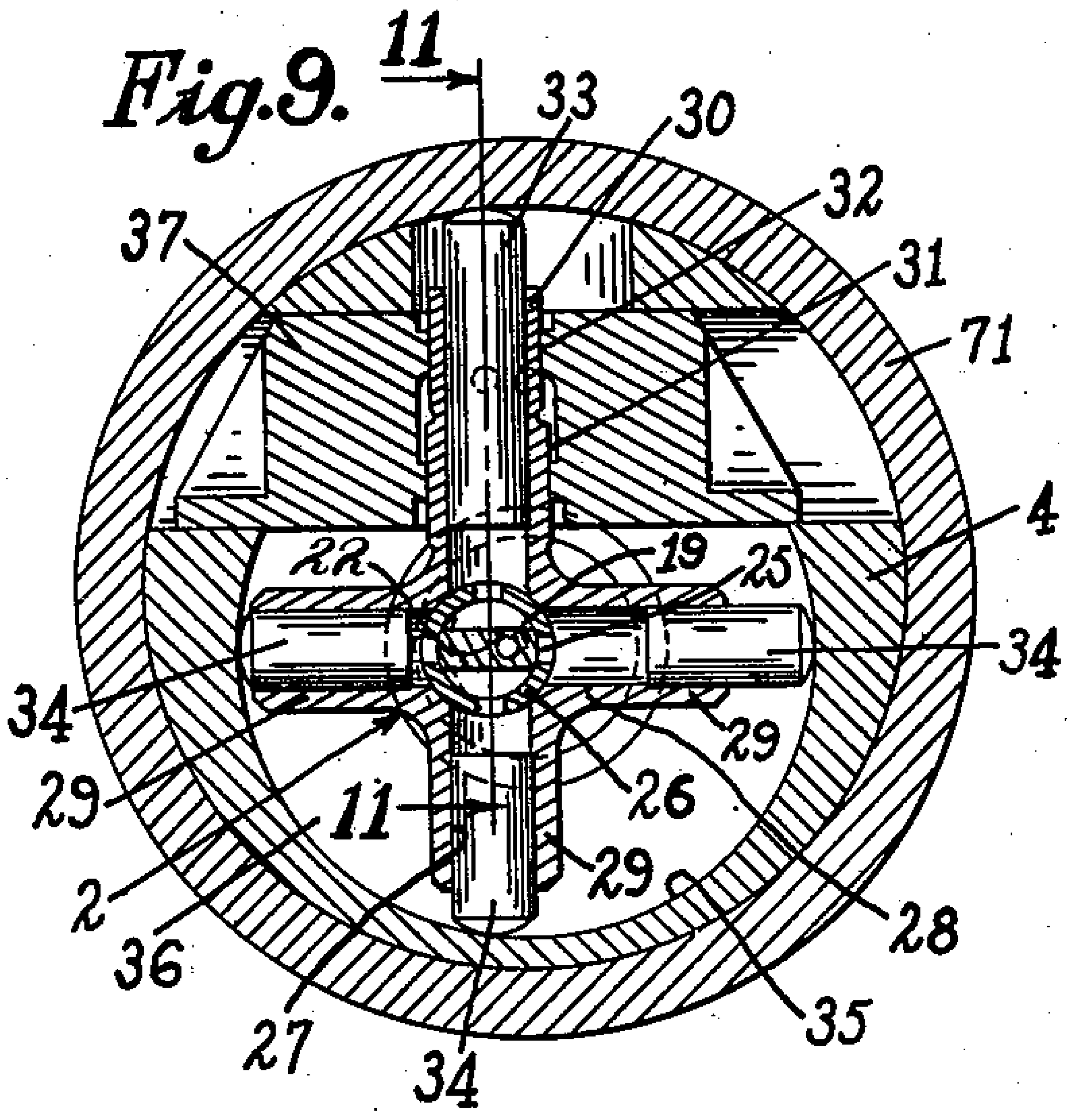


Fig.10.

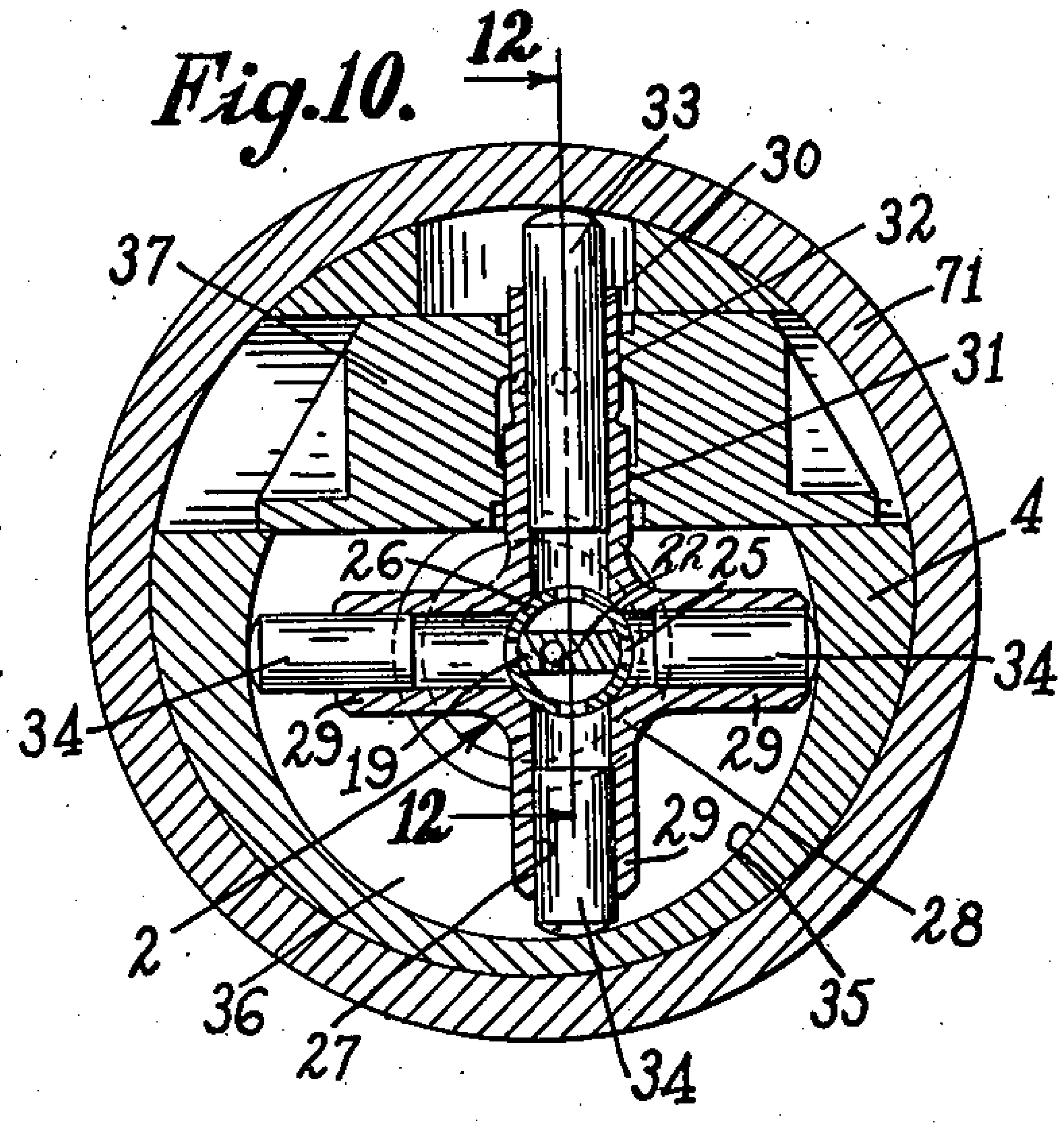


Fig.11.

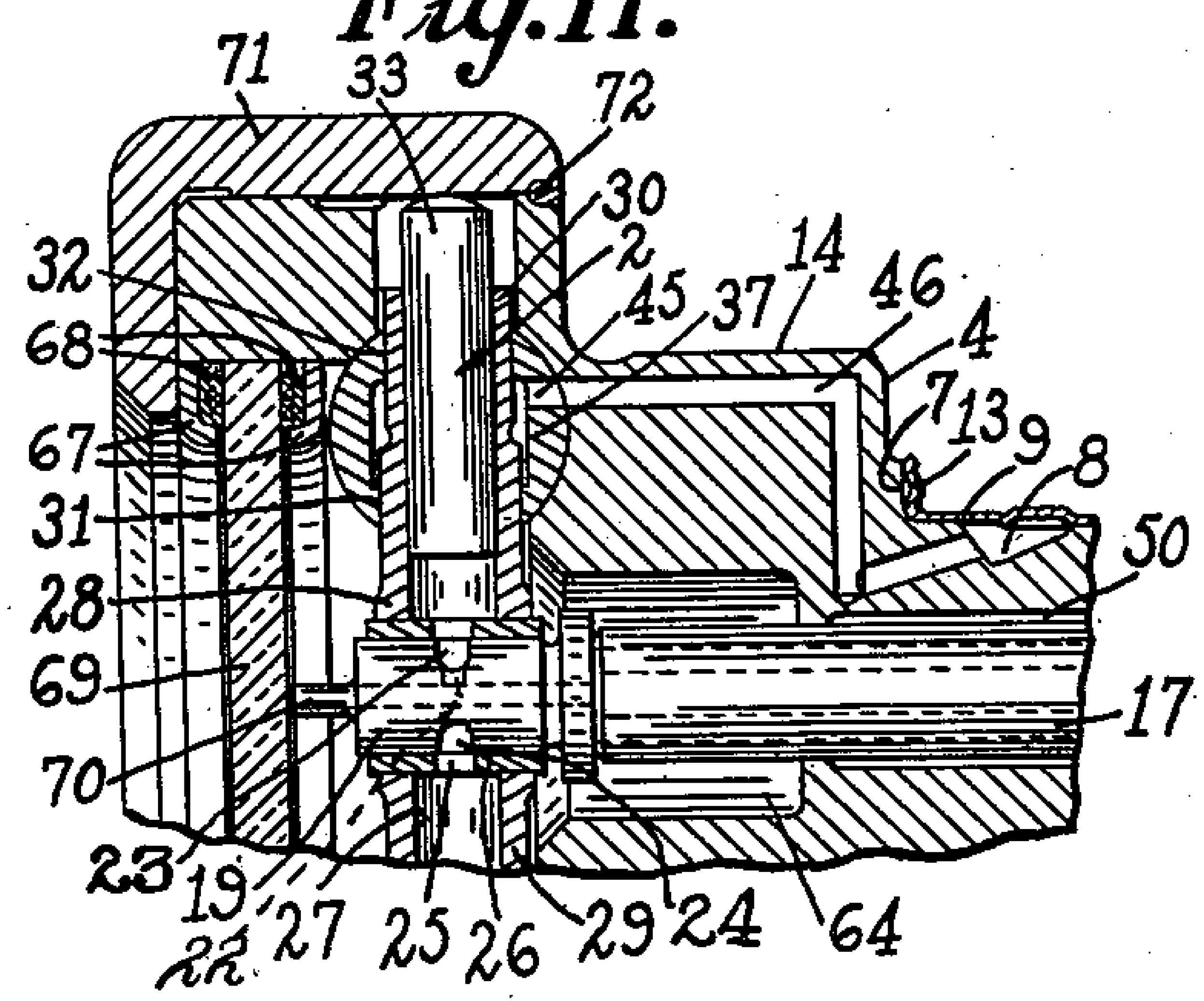


Fig.12.

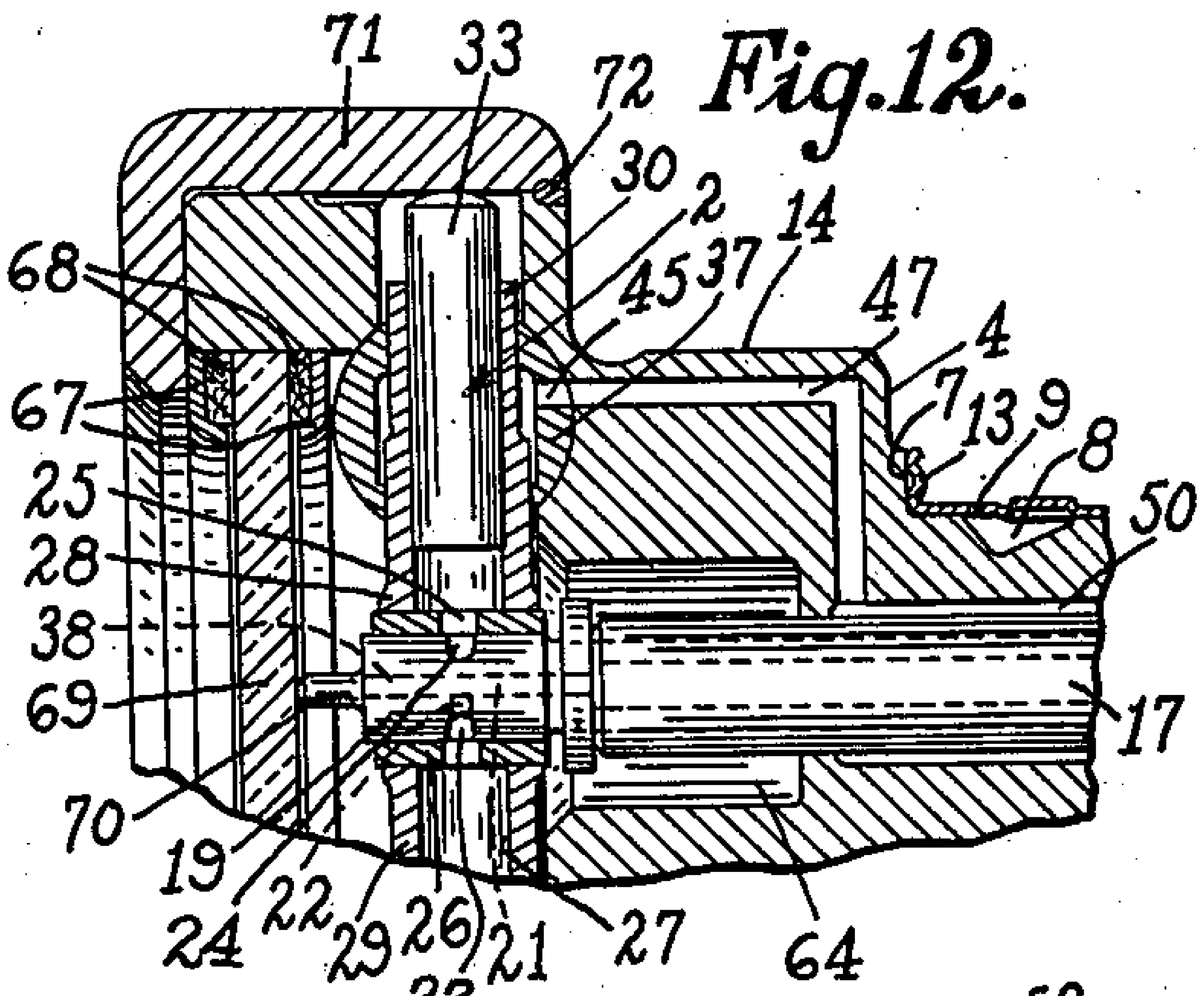


Fig.13.

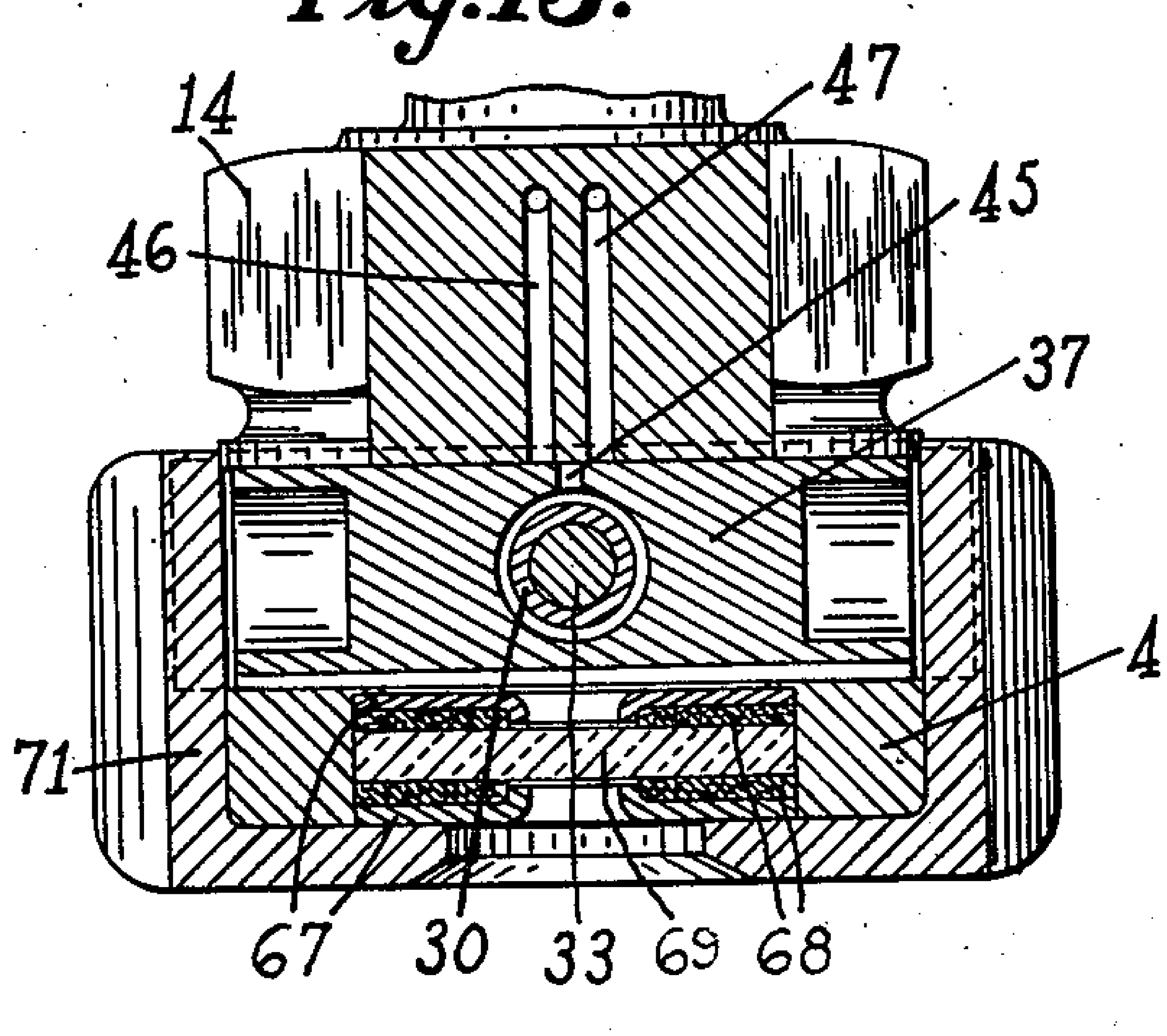


Fig.14.

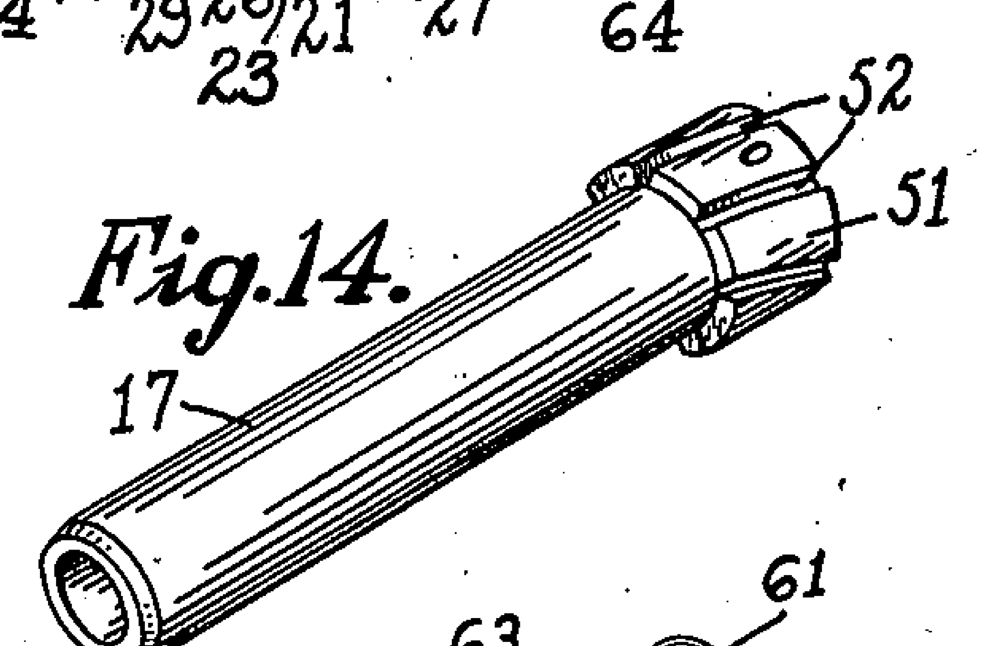
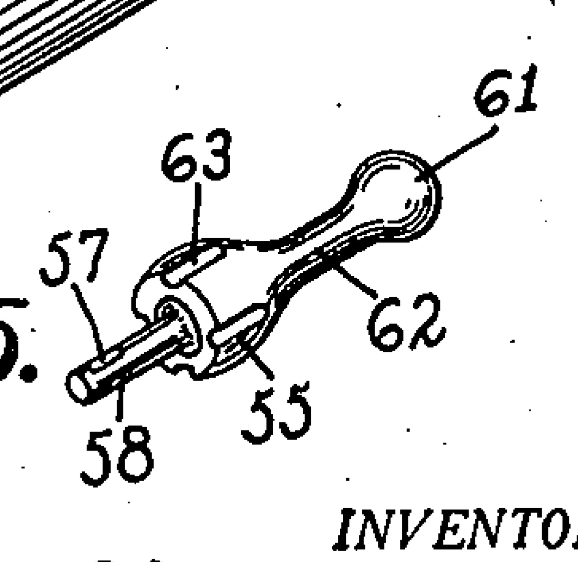


Fig.15.



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2,123,197

UNITED STATES PATENT OFFICE

2,123,197

LUBRICATOR

Warren Noble, Michigan City, Ind., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application December 18, 1934, Serial No. 758,076

25 Claims. (Cl. 184—55)

This invention relates to lubricators, and more particularly to improvements in a self-driven lubricator unit of general applicability.

In very many types of machinery, and especially those air-driven for mining and rock cutting, adequate and reliable lubrication, on which better performance, greater reliability and longer life are dependent, is still relatively unattained. In rock tools, especially, lubrication is particularly haphazard, usually depending upon slight pressure differences set by the flow of air in the portings of the machine. Quantitatively it varies with the prime air pressure, the character of the edges, forms and surfaces of the ports conceived, the manufacturing clearances between associated parts, and in general, is non-susceptible to close control. In some cases a new tool lubricates less perfectly than an old one; a worn tool will drain its oil reservoir without taking care of the must-be-lubricated surfaces. Diminishing performance, short life and high repair charges are inevitably invited. In other machines special conditions make it desirable to deliver a metered quantity of oil, starting and varying with the machine performance, and while the common form of ratchet-driven lubricator can sometimes be arranged to deliver oil suitably, it still suffers from many limitations that the improved self-driven lubricator unit of the present invention is designed to overcome.

An object of this invention is to provide an improved self-driven lubricator unit whereby the inadequacies mentioned above are, to a great extent, overcome. Another object of this invention is to provide an improved self-driven lubricator unit having embodied therein a self-contained motor driven pump whereby flow of lubricant to the various parts of the machine to be lubricated is insured. Yet another object is to provide an improved self-driven lubricator unit of an extremely compact design having embodied therein a miniature driving motor and pump mechanism whereby lubricant is positively pumped to the various parts of the machine to be lubricated. Still another object is to provide an improved self-driven lubricator having embodied therein a variable speed pump driving motor having improved speed control means whereby the amount of lubricant delivered is regulated by raising or lowering the back pressure of the exhaust motive fluid. A still further object is to provide an improved self-driven lubricator unit which consists of a tiny engine-driven pump complete with all necessary associated functions except tankage, that starts automatically with the flow in a pilot passage and stops automatically when the flow ceases, the unit being entirely self-contained and adapted for association with flow passages of machines of various characters. Yet another object is to provide an improved self-driven lubricator adapted, irrespective of its supported position, automatically to supply lubricant to the moving parts of the machine to be lubricated. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings,—

Fig. 1 is an end elevational view of the illustrative form of the improved lubricator unit.

Fig. 2 is a side elevational view of the lubricator unit shown in Fig. 1, in supported relation with a part of the machine to be lubricated.

Fig. 3 is a view in longitudinal section taken substantially on line 3—3 of Fig. 1.

Fig. 4 is an enlarged sectional view showing a portion of the lubricator control valve means.

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is a cross sectional view taken on line 6—6 of Fig. 3.

Fig. 7 is a cross sectional view taken on line 7—7 of Fig. 3.

Fig. 8 is a cross sectional view taken on line 8—8 of Fig. 3.

Figs. 9 and 10 are views similar to Fig. 6, showing the moving motor and pump parts in different positions.

Fig. 11 is a longitudinal sectional view taken on line 11—11 of Fig. 9.

Fig. 12 is a longitudinal sectional view taken on line 12—12 of Fig. 10.

Fig. 13 is a detail sectional view taken on line 13—13 of Fig. 6.

Fig. 14 is a perspective view of the valve bushing.

Fig. 15 is a perspective view of the control valve element.

In this illustrative embodiment of the invention, there is shown a self-contained, self-driven lubricator unit, generally designated 1, comparable in size to an automotive spark plug, which consists of a tiny engine-driven pump, whose engine is designated 2, complete in itself with all necessary associated functions, except tankage, that starts automatically with the flow in the pilot passage 3 and stops automatically when the flow ceases. The amount of oil delivered is regulated by varying the speed of the engine by raising or lowering the back pressure of the exhaust motive fluid.

As illustrated, the improved lubricator unit comprises a body 4, herein preferably made of a free-cutting, case hardened steel, threaded at 5 similarly to a metric, automotive spark plug, this size being chosen for ease of obtaining good taps and dies for manufacture of the thread, and on account of the world-wide distribution of copper asbestos gaskets for this size. Formed on the lubricator casing 4 is a gasket shoulder 6 and a larger step and shoulder 7, the shoulders 6 and 7 being spaced before and beyond a circumferential groove 8 communicable with a suitable lubricant reservoir R and, in this instance, circumscribed by a filter thimble 9. As clearly shown in Fig. 3, this thimble, which is preferably a brass shell, is formed with a double internal diameter to fit snugly the steps on the lubricator casing and enclose the circumferential groove 8. The zone circumscribing the groove 8 is divided into a series of louvre-like bars 10 slit from the shell, one set being raised outwardly from the smaller diameter of the shell in such a way as to leave narrow interstices 11 between the bars of the cage so formed. By making the difference in the diameter slightly more than twice the thickness of the stock from which the shell is drawn, it thus becomes possible to establish an oil filter unit with flow apertures of known dimensions. The outer flange 12 of the oil filter unit is corrugated at 13 to provide resiliency in order to compensate for slight differences in dimension of the lubricator casing as regards the shoulders 6 and 7 holding the filter thimble in place. The lubricator casing is formed of hexagonal shape at 14 for the reception of a wrench, beyond which is a circular head 15 in which the recesses for the working parts of the lubricator are housed.

In a bore 16 axially traversing the entire casing body lies a bushing 17 giving support to a crank shaft 18 of the pump driving motor 2, this crank shaft having an overhung crank pin 19. The crank shaft 18 is bored throughout its length at 20 to pass motive fluid, herein pressure air, and is also drilled obliquely at 21 to feed a right angle air distribution port 22 located midway of the crank pin length and communicating with a supply port 23. The supply port 23, and an exhaust port 24, are formed by milling narrow, round bottom grooves normal to the axis of the crank pin and of such a depth that the section of the shaft remaining between the two grooves is only very slightly in excess of the diameter of the radial holes 25 drilled through a bushing 26 surrounding the pin. The bushing 26 forms a bearing in which the crank pin may rotate and also provides the heads for motor cylinders 27 bored in a cruciform block 28, the bushing being fixed within the block in a suitable manner. As shown in Fig. 6, this cylinder block 28 has three similar arms or cylinder barrels 29 and a fourth arm or cylinder barrel 30 of somewhat greater length than the other three cylinder barrels; and this fourth longer barrel is accurately ground to two external diameters at 31 and 32 to form the piston of the oil pump. The difference in area between these two diameters represents the piston area available for oil pumping. In order that the impulses from all four of the driving cylinders shall be entirely similar, a longer piston 33 is reciprocably mounted in the barrel 30, while shorter pistons 34 are reciprocably mounted in the other three shorter cylinder barrels. The four pistons are shaped to engage slidingly the walls 35 of the chamber 36 in which the motor and pump are arranged so that when the cylinder block moves about an axis coincident with the crank shaft axis, relative reciprocation between the cylinder barrels and the pistons occurs. The longer piston 33 is fitted in the interior of the fourth, longer barrel 30, and the mating pump cylinder is made by boring transversely a sliding block 37. This block, circular in cross section, as shown in Fig. 11, is bored with two diameters necessary to fit closely the steps 31, 32 of the pump plunger leg 30 of the cylinder block 28; and its duty, apart from its function as a pump cylinder and valve slide, is the maintenance of the cruciform cylinder block 28 in constant relation to the crank shaft.

As the crank shaft 18 rotates, manifestly the cylinder block 28 moves therewith about an axis coincident with the crank shaft axis, so sliding the pump leg 30 in and out of the sliding block 37 and at the same time traversing this block from side to side. The sliding block 37 slides through a distance equal to the throw of the crank shaft, and the piston or plunger 30 that it contacts slides through an equal distance at right angles thereto. The combination of rotation and sliding thus set up enables the engine to function by reaction through its pressure urged pistons, upon the walls 35 of the casing chamber 36 in which the whole mechanism is contained. The rotation of the crank pin 19 within the surrounding bushing 26 that forms the inner heads of the cylinders of the pump barrels provides for properly timed intake and exhaust functions, rotation of the crank pin moving the supply and exhaust ports 23 and 24 in timed relation with respect to the ports 25 in the bushing. The motion of all the parts is a replica of the true harmonic of the crank pin movement as related to either horizontal or vertical planes, being modified only in that the pistons are permitted to abut and consequently slide upon walls 35 of the concavity of the containing chamber 36, a circumstance that modifies their motion with relation to the true harmonic without affecting the total stroke and without perceptible effect upon the action of the entrained air. The course of the working air, after entering the crank shaft bore 20, is first to the crank pin and to the timing port, thence to the cylinders (when the motor is running there are at all times two cylinders contributing to the torque) and then from the cylinders in which it has performed its work laterly to the exhaust space 36 surrounding the cylinder block via the exhaust port 24 obverse to the intake 23 in the crank pin and a drill hole 38 in the pin end; thence to an exhaust control valve 39 which consists of a plug 40 close-fitted in a hole 41 bored between the face of the main body and the clearance cylinder surrounding the pump leg of the cylinder block. This plug 40 has a cross hole 42 and a screw driver slot 43 wide enough to be turned by the edge of a small coin, if desired. When this plug 40 is rotated in one direction, it makes more free the passage from the casing to the outer air; contrawise, it reduces the freedom of communication with the aperture 44 available for exhaust, and by raising the pressure within the casing, cuts down the speed of the motor and so the number of pumping strokes of the oil pump piston.

The valving of the oil pump is performed by the sliding valve block 37 which has a hole 45 located in its transverse central plane communicating, as to the valve block, with the differential pump barrel 30, and as to the body, alternately with one or the other of two drilled passages 46 and 47 communicating respectively with the source of the incoming oil and the discharge passage for the oil leaving the pump. Communication with these passages is alternately set up by the reciprocation of the sliding block 37 as the crank shaft turns. Oil coming to the pump is drawn from the lubricant reservoir R through the groove 8 beneath the cage belt of the filter thimble 9. Discharge oil is delivered into a space 50 formed in the casing and surrounding the bushing 18, and the outer end of this bushing is enlarged at 51 to provide snug support in the casing bore and provided peripherally with a series of helical grooves 52. These grooves form the pump delivery nozzles and give into the pilot passage 3, from which the motive force is derived and into which the metered lubricating oil is to be discharged.

Arranged at the threaded end 5 of the lubricator casing and projecting in the pilot passage 3 is a flow sensitive valve 55. This valve, slightly smaller than the crank shaft diameter, is assembled with the crank shaft by means of a cross pin 56, which passes through an oversize hole 57 in the valve shank 58, though tight in the crank shaft itself. The end of the crank shaft 18 is formed as a flat valve seat 59 lapped true and highly finished. Opposed to it on the control valve is a similar face 60 in cooperation acting to seal the entrance of the crank shaft 18 against admittance of the surrounding pressure air. The outer end of this pilot valve, which in general coincides with the axis of the flow passage 3, is formed as a sphere at 61, the bar 62 between the sphere and the valve head 55 being relatively slender. With quiescent air in the passage 3, the form of the spherical valve head and bar is without influence and the valve 55 acts in conjunction with the end of the crank shaft merely as a check valve. When, however, air starts to flow in the conduit 3, the restriction of the passage created by the presence of the body of the pilot valve, together with the aerodynamic properties of the valve itself, cause a tilting action to take place, with the result that one side of the valve 55 is elevated in the manner indicated in full lines in Fig. 4, and air thus finds its way via the peripheral slots 63 on the valve body and the separated valve seats 59, 60 to the interior of the bore 20 of the chank shaft 18, and so to the pump driving motor.

The entire assembly is made without necessity for the use of screws, springs or other holding devices which might unlock, break or be endangered by vibration. The sliding block 37 is inserted in its bore, and then the cruciform cylinder block 28, assembled with its pistons, is introduced part way in the valve block 37, this being done with its cylinder block normal to its final position. The crank shaft bushing 17 is at this time lacking, although the crank shaft 18 has been completely assembled with the pilot valve 55. A recess 64 sufficiently deep to permit the crank pin to be dropped down entirely out of the way of the cylinder block as it is swung into its working plane, is formed in the lubricator casing. Into this recess the crank shaft is loosely set and once in this position the bushing 17 is slipped over the crank shaft 18 and brought into place, thus locating the shaft properly in all directions with respect to the rest of the mechanism. The cross pin 65, as shown in Fig. 4, is inserted within the alined openings in the casing and bushing 17 and staked into place for final retention. The lubricator casing is counter-bored at 66 to shoulder a pair of brass rings 67, 67 with their associated cork washers 68, 68 and a thick plane glass medallion 69 snared between them. The center extension 70 of the crank pin, actually an extension of the crank shaft, has its end made truly flat and its cross section slightly less than a complete circle. Highly polished, it is employed as a thrust bearing in direct contact with the glass plate 69, and the static thrust of the crank shaft is taken by the crank pin extension against the glass medallion. The glass medallion 69 thus closes the chambering within the lubricator casing and acts as an inspection port and supports this duty. The sub-assembly complete, an outer case ring 71, a carburized and hardened steel ring capable of withstanding great abuse, is pressed into place on the exterior of the casing 4 enclosing the pump chamber 36, and, when thus placed, locked and certified by means of a lead-wire seal 72. On the face of this steel ring are the necessary indicia relating to the supply of oil and the maker's style and number. Where the glass medallion 69 is considered undesirable or unnecessary, its place may be taken by a metallic plate or the chambering for the glass and the bezel bore in the case ring 71 entirely eliminated.

The general mode of operation of the improved lubricator unit will be clearly apparent from the description given. As shown in Fig. 2, the lubricator unit is suitably secured into place within a suitable threaded opening formed in the casing of the machine to be lubricated with the control portions 61, 62 of the control valve 55 projecting within the pilot passage 3 in the manner shown. When the air pressure in the passage 3 is quiescent, the entire lubricator unit is shut down and no flow of lubricant takes place. However, when the machine to be lubricated is started and a flow of pressure fluid occurs in the passage 3, the valve 55 is tilted by the action of the flowing fluid on the control portion 61, 62 of the valve, thereby permitting flow of pressure fluid past the valve through the passage 20 in the crank shaft 18, through the passage 21, port 22, port 23 and through the ports in the bushing 26 to the cylinders of the motor, the pressure fluid acting on the inner pressure areas of the motor cylinders to effect rotary motion of the cylinder block 28 within the chamber 36. This rotary motion of the cylinder block causes reciprocatory motion of the valving block 37, controlling its discharge of lubricant from the pump barrel through the discharge passage to the chamber 50 and thence through the helical grooves 52 on the bushing 17 to discharge into the air flow passage 3, the discharging lubricant being entrained by the flowing air to the various parts of the machine to be lubricated. It will thus be seen that the improved lubricator is entirely self-contained, is self-driven, and embodies its own motor driven pump so that the entire unit may be attached in various locations with respect to various machines to supply lubricant, irrespective of its attached position, to any passage through which pressure fluid flows. These and other uses and advantages of the improved lubricator will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a self-contained lubricator unit adapted for connection to a pressure fluid supply line, a casing having a chamber, a motor driven pump arranged in said chamber and having lubricnt intake and discharge passage means, said lubricant discharge passage means discharging into the supply line, a pressure fluid actuated driving motor in said chamber for driving said pump, and valve means for controlling the flow of motive fluid from the supply line to said motor, said pump constantly operating to effect its lubricant pumping function during fluid flow in said supply line.

2. In a self-contained lubricator unit adapted for connection to a pressure fluid supply line, a casing having a chamber, a motor driven pump arranged in said chamber and having lubricant intake and discharge means, a pressure fluid actuated driving motor in said chamber for driving said pump, valve means for controlling the flow of motive fluid from the supply line to said motor, and valve means for controlling the motor exhaust to vary the motor speed.

3. In a lubricator unit, a casing having a chamber and communicable with a passage in which motive fluid is adapted to flow, a fluid actuated motor in said chamber, a lubricant pump driven by said motor, passage means for supplying motive fluid from the flow passage to the intake of the motor, valve means controlled by the flow of fluid in the flow passage for controlling the flow of motive fluid to said motor, and lubricant intake and discharge passage means for said pump.

4. In a lubricator, a casing having a chamber and communicable with a passage in which motive fluid is adapted to flow, a fluid actuated motor in said chamber, a lubricant pump driven by said motor, passage means for supplying motive fluid from the flow passage to the intake of the motor, valve means controlled by the flow of fluid in the flow passage for controlling the flow of motive fluid to the intake passage means of said motor, lubricant intake and discharge passage means for said pump, and valve means for controlling the motor speed by varying the motor exhaust.

5. In a self-driven lubricator, a lubricator casing, a fluid actuated motor in said casing, a pump in said casing and driven by said motor, intake and discharge passage means for said pump, motive fluid intake and discharge passage means for said motor, and valve means for controlling the flow of motive fluid to said motor intake passage means automatically in accordance with the requirements of a machine to be lubricated, said motor operating constantly to effect actuation of said pump and said pump constantly operating to effect its lubricant pumping function to supply lubricant to the machine to be lubricated during operation of the latter.

6. In a self-driven lubricator, a lubricator casing, a fluid actuated motor in said casing, a pump driven by said motor, lubricant intake and discharge passage means for said pump, motive fluid intake and discharge passage means for said motor, valve means for controlling the flow of motive fluid to said motor intake passage means automatically in accordance with the requirements of a machine to be lubricated, and means for regulating the motor exhaust to vary the motor speed.

7. In a self-driven lubricator adapted for connection to a pressure fluid supply line, a casing, a pressure fluid actuated motor in said casing and comprising means providing a motor chamber containing a movable motor piston, a pump in said casing and driven by said motor, lubricant intake and discharge passage means for said pump, said lubricant discharge passage means discharging into the supply line, motive fluid intake passage means for said motor for connecting the piston chamber and the supply line, and discharge passage means for discharging fluid from the piston chamber of said motor, said motor operating constantly to actuate said pump to discharge lubricant into said supply line during fluid flow through said supply line.

8. In a self-driven lubricator, a casing, a fluid actuated motor in said casing comprising means providing a motor chamber containing a movable motor piston, a pump in said casing and driven by said motor, lubricant intake and discharge passage means for said pump, and motive fluid intake and discharge passage means alternately communicating with the motor chamber of said motor, the lubricant discharge passage means and the motive fluid intake passage means having terminals located in adjacency and adapted to communicate with a common passage through which motive fluid continuously flows during operation of a pressure fluid actuated machine to be lubricated.

9. In a self-driven lubricator, a casing, a fluid actuated motor in said casing, a pump in said casing and driven by said motor, lubricant intake and discharge passage means for said pump, motive fluid intake and discharge passage means for said motor, the lubricant discharge passage means and the motive fluid intake passage means having terminals located in adjacency and adapted to communicate with a common passage through which motive fluid is adapted to flow, and valve means controlled by the flow of pressure through said passage for regulating the flow of fluid to the motive fluid intake passage means.

10. In a self-driven lubricator, a casing, a fluid actuated motor in said casing, a pump in said casing and driven by said motor, the piston element of said pump constituting a cylinder element of said motor, lubricant intake and discharge passage means for said pump, and motive fluid intake and discharge passage means for said motor.

11. In a self-driven lubricator, a casing, a fluid actuated motor in said casing, a pump in said casing and driven by said motor, said motor comprising a cylinder block movable about an axis and having cylinders in which pistons are contained, said cylinders and pistons being relatively reciprocable and a cylinder of said motor constituting the piston element of said pump, lubricant intake and discharge passage means for said pump, and motive fluid intake and discharge means for said motor.

12. In a self-driven lubricator, a casing, a fluid actuated motor in said casing and having a tubular crank shaft, a pump driven by said motor, lubricant intake and discharge passage means for said pump, and motive fluid intake and discharge passage means for said motor, the motive fluid intake passage means including the passage in said tubular crank shaft.

13. In a self-driven lubricator, a casing, a fluid actuated motor in said casing and having

a tubular crank shaft, a pump driven by said motor, lubricant intake and discharge passage means for said pump, motive fluid intake and discharge passage means for said motor, the motive fluid intake means including the passage in said tubular crank shaft, and a valve seated on the end of said crank shaft for controlling the flow of motive fluid therethrough to said motor.

14. In a lubricator unit, a casing connectible with a lubricant reservoir and a pressure fluid conducting passage, a pressure fluid actuated motor in said casing, a pump in said casing and driven by said motor, lubricant intake and discharge passage means for said pump communicating respectively with said reservoir and said fluid conducting passage, motive fluid intake passage means for supplying fluid from said fluid conducting passage to said motor for actuating the latter, and motor exhaust passage means, said motor operating constantly to effect actuation of said pump and said pump constantly operating to effect its lubricant pumping function during flow of fluid in said fluid conducting passage and irrespective of the supported position of the lubricator unit.

15. In a lubricator unit, a casing connectible with a lubricant reservoir and a pressure fluid conducting passage, a pressure fluid actuated motor in said casing, a pump in said casing and driven by said motor, lubricant intake and discharge passage means for said pump communicating respectively with said reservoir and said fluid passage, motive fluid intake passage means for supplying fluid from said fluid passage to said motor for actuating the latter, motor exhaust passage means, and means for governing the flow of fluid to said motor controlled by fluid flow in said passage.

16. In a lubricator unit, a casing connectible with a lubricant reservoir and a pressure fluid conducting passage, a pressure fluid actuated motor in said casing, a pump in said casing and driven by said motor, lubricant intake and discharge passage means for said pump communicating respectively with said reservoir and said fluid passage, motive fluid intake passage means for supplying fluid from said fluid passage to said motor for actuating the latter, motor exhaust passage means, means for governing the flow of fluid to said motor controlled by fluid flow in said passage, and means for regulating the motor exhaust to vary the motor speed.

17. In a lubricator adapted for connection to a pressure fluid supply line, a lubricator casing, a motor driven pump in said casing and having lubricant intake and discharge passage means, a pressure fluid actuated motor in said casing for driving said pump, and valve controlled means for supplying pressure fluid from the supply line to said motor automatically upon flow of pressure fluid through the supply line, said pump constantly operating to effect its lubricant pumping function to discharge lubricant to the supply line during flow of pressure fluid from said supply line to said motor.

18. In a lubricator adapted for connection to a pressure fluid supply line, a lubricator casing, a motor driven pump in said casing and having lubricant intake and discharge passage means, a pressure fluid actuated motor in said casing for driving said pump, passage means in said casing for supplying pressure fluid from the supply line to said motor, and valve means regulated automatically by the flow of pressure fluid through the supply line for controlling the flow of pressure fluid in said pressure fluid supply passage means.

19. In a lubricator adapted for connection to a pressure fluid supply line, a lubricator casing, a motor driven pump in said casing and having lubricant intake and discharge passage means, a pressure fluid actuated motor in said casing for driving said pump, passage means in said casing for supplying pressure fluid from the supply line to said motor, and valve means regulated automatically by the flow of pressure fluid through the supply line for controlling the flow of pressure fluid in said pressure fluid supply passage means, said valve having an actuating portion projecting within the supply line and upon which the flowing pressure fluid in the supply line acts.

20. In a lubricating means, the combination with a conduit through which pressure fluid flows, of a lubricator unit connected to said conduit and embodying a motor driven lubricator pump actuated by the pressure fluid in the conduit and constantly operating to effect its lubricant pumping function to supply lubricant to the conduit whenever flow of pressure fluid through the latter occurs and irrespective of the supported position of the lubricator unit.

21. In a lubricator unit, a casing having a chamber and communicable with a passage in which motive fluid flows, a motor in said chamber and having a motive fluid intake, a lubricant pump driven by said motor and having lubricant intake and discharge passage means, and passage means for supplying motive fluid from the flow passage to the intake of the motor, said pump constantly operating to effect its lubricant pumping function to discharge lubricant to said motive fluid passage during flow of motive fluid to said motor intake passage means and regardless of the supported position of the lubricator unit.

22. In a lubricator unit, a casing having a chamber and communicable with a passage in which motive fluid flows, a fluid actuated motor in said chamber and having a motive fluid intake and exhaust, a lubricant pump driven by said motor and having lubricant intake and discharge passage means, passage means for supplying motive fluid from the flow passage to the intake of the motor, and valve means for controlling the motor speed by varying the motor exhaust.

23. In a self-driven lubricator, a casing, a fluid actuated motor in said casing comprising means providing a motor chamber containing a movable motor piston, a pump in said casing and driven by said motor, an element of said pump constituting an element of said motor, lubricant intake and discharge passage means for said pump, and motive fluid intake and discharge passage means alternately communicating with the piston chamber of said motor, said pump operating constantly to effect its lubricant pumping function to discharge lubricant during flow of motive fluid to said motor intake passage means.

24. In a self-driven lubricator, a casing, a fluid actuated motor in said casing comprising means providing a motor chamber containing a movable motor piston, a pump in said casing and driven by said motor, said motor including a motor element movable about an axis and constituting an element of said pump, lubricant intake and discharge passage means for said pump, and motive fluid intake and discharge means alternately communicating with the piston chamber of said motor.

25. In a self-driven lubricator, a lubricator

casing, a fluid actuated motor in said casing and comprising means providing a motor chamber containing a movable motor piston, a lubricant pump in said casing and driven by said motor, lubricant intake and discharge passage means for said pump, and motive fluid intake and discharge passage means alternately communicating with the piston chamber of said motor, the lubricant discharge passage means and the motive fluid intake passage means having terminals located in adjacency and communicable with a common passage through which motive fluid flows, and said pump constantly operating to effect its lubricant pumping function to discharge lubricant through said discharge passage means to said common passage during flow of motive fluid in said common passage.

WARREN NOBLE.