

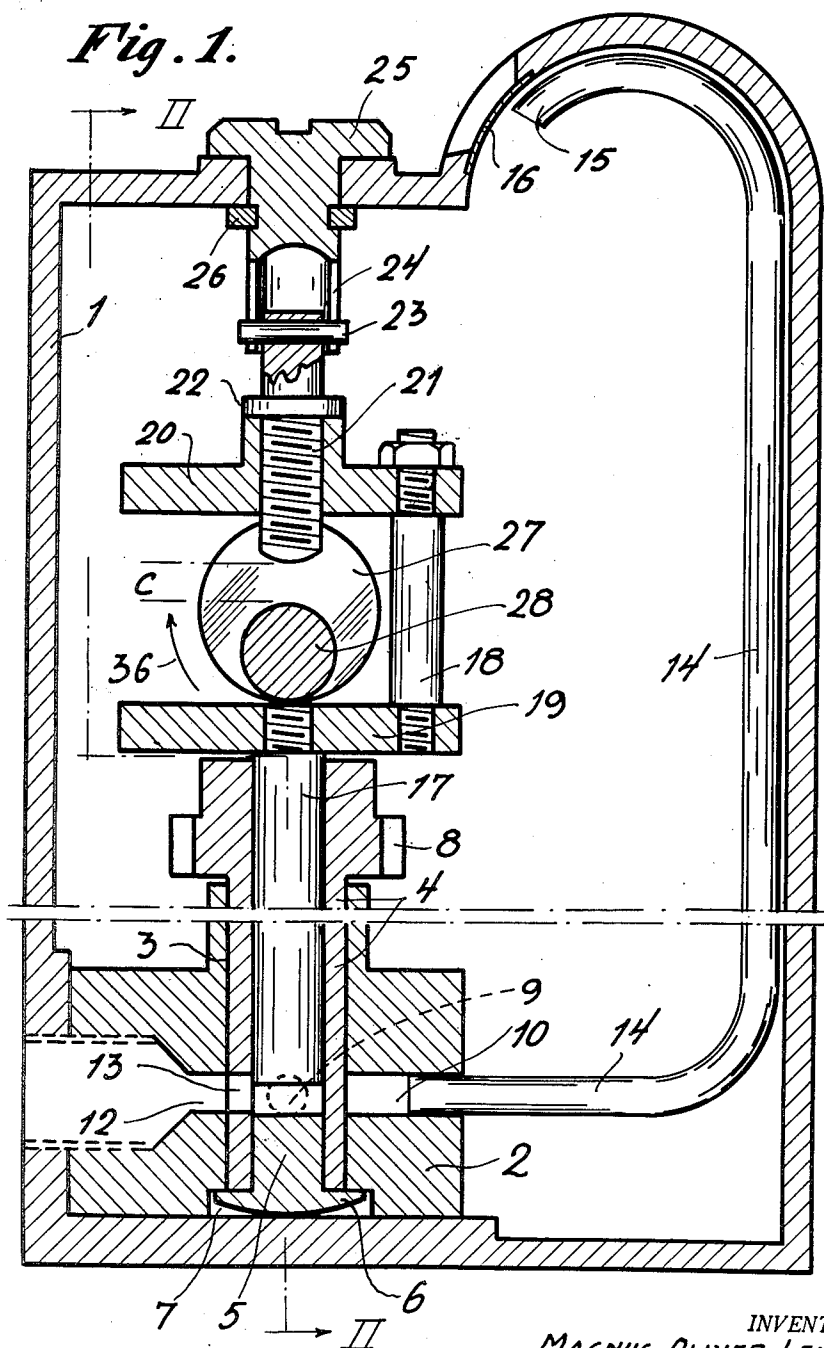
Nov. 25, 1952

M. O. LENDING
PRESSURE LUBRICATOR

2,619,192

Filed Dec. 20, 1949

3 Sheets-Sheet 1



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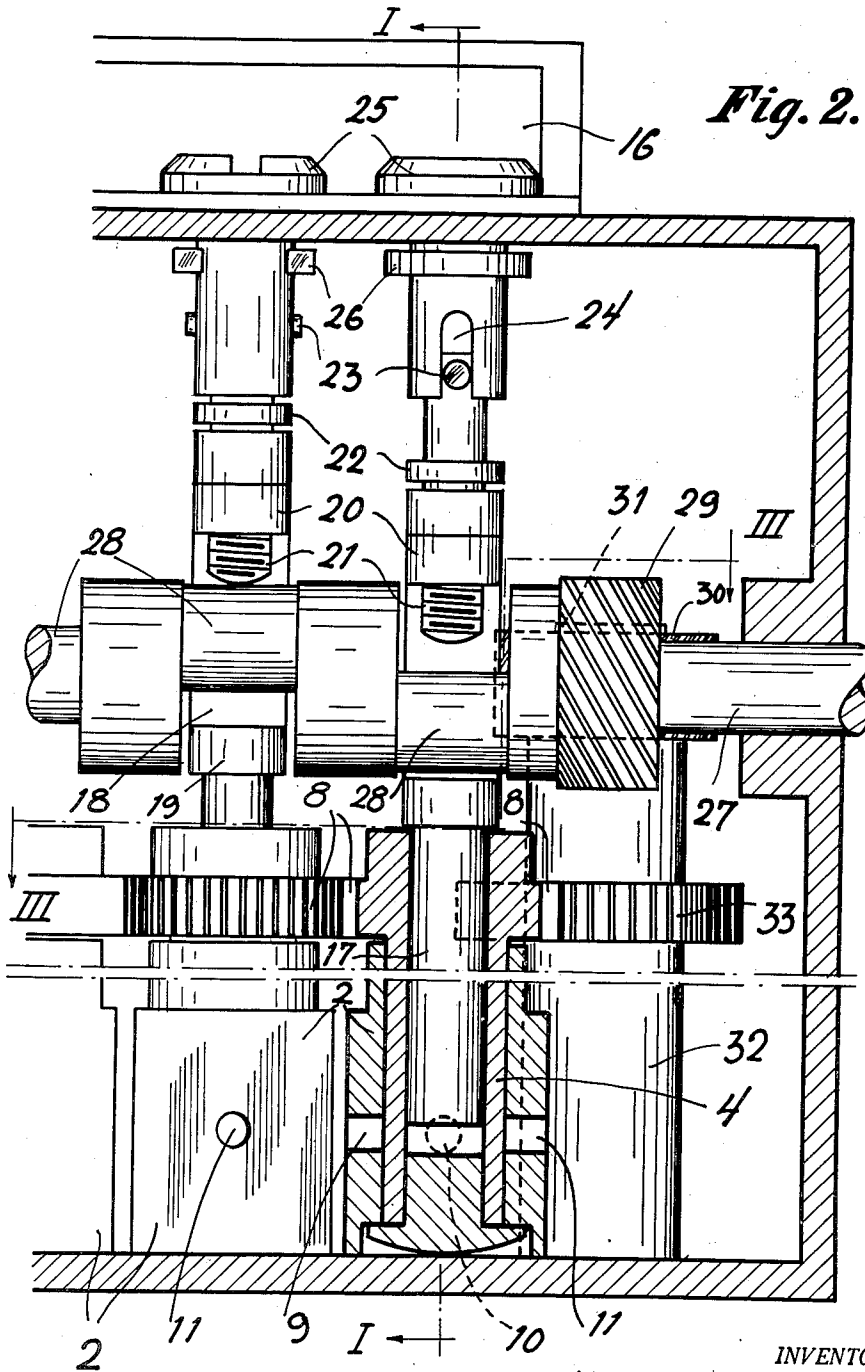
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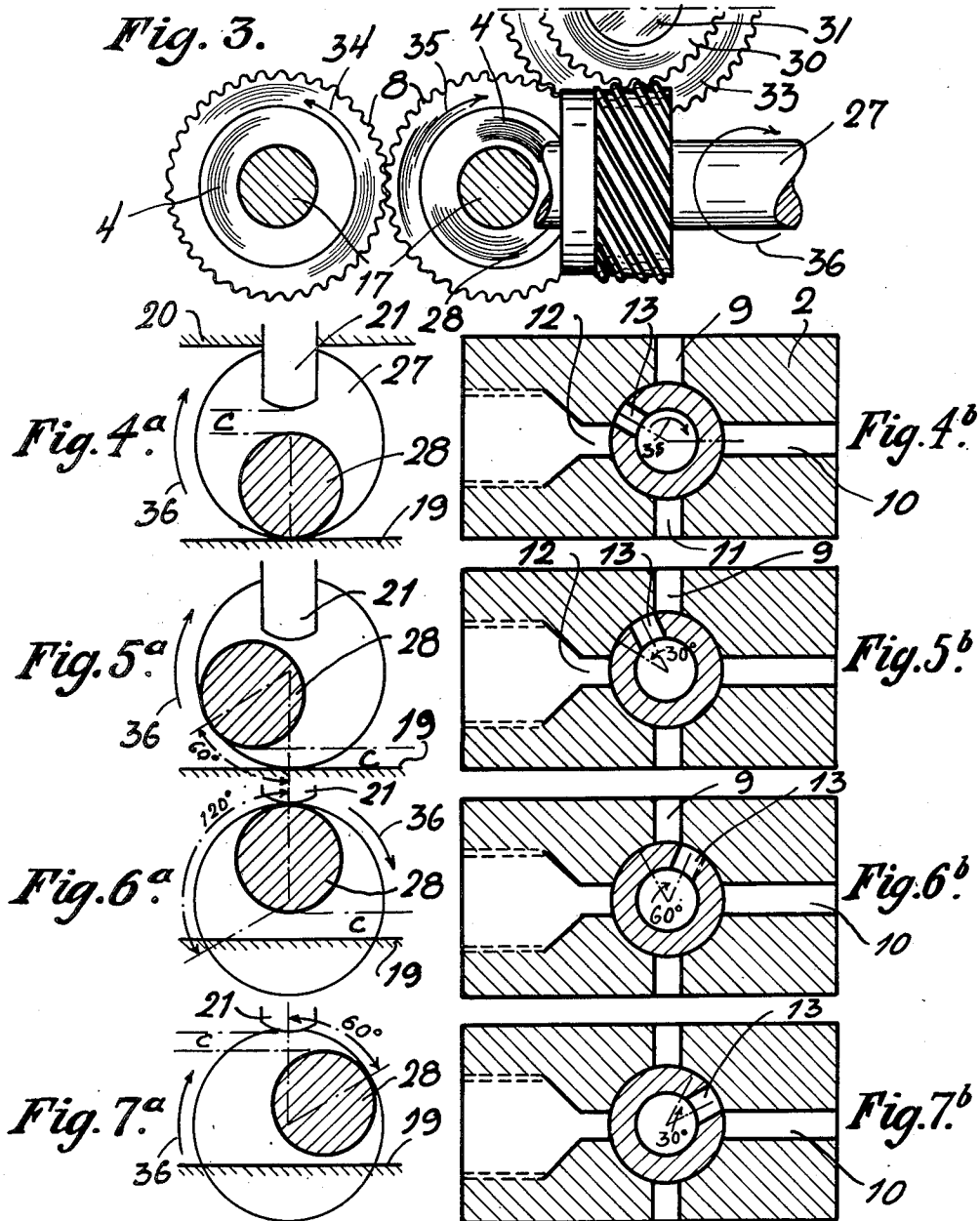
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PRESSURE LUBRICATOR

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5 Claims. (Cl. 184—35)

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The present invention relates to a pressure lubricator comprising a pump of the type in which a plunger is reciprocated in a cylinder rotating in a stationary housing. The lubricant is sucked into said cylinder from a reservoir and is thereafter discharged through a delivery tube, where it is visible, and returned to the reservoir, from which the lubricant again is sucked into the cylinder and finally delivered to the point or points of lubrication.

The chief object of the present invention is to obtain an improved lubricator of this type, in which the amount of lubricant supplied to the delivery tube can be readily proportioned according to the need of the particular point or points of lubrication. A further object of the invention is to provide a lubricator without valves, which consists of a few parts and which is of a compact construction.

The present invention is characterized by the provision in the wall of the cylinder of a port which, during the rotation of the cylinder, is brought into communication successively with a suction or charge port from the reservoir, a discharge port supplying the lubricant to a visual control (from which the lubricant is arranged to be returned to the reservoir), a second suction or charge port from such reservoir, and finally a delivery or discharge port feeding the lubricant to the lubrication point or points, with the plunger being reciprocated only when the cylinder port is aligned or in communication with one of the suction or discharge ports.

The lubricant will thus first be drawn into the cylinder during a suction stroke of the plunger, whereafter the lubricant during the successive discharge stroke of the plunger is discharged through the visual control back to the reservoir. During the next successive suction stroke of the plunger, the same amount of lubricant as in the preceding suction stroke is again sucked into the cylinder and during the next discharge stroke finally delivered to the point or points of lubrication. The improvement by this arrangement is primarily that it will thus be possible to obtain a visual control, which distinctly shows that amount of lubricant which is delivered from the lubricator to the point or points of lubrication, so that this amount may be readily adjusted to the particular needs of this point.

The invention also includes the further feature that the cylinder is rotatably accommodated in a housing which has four ports and which is enclosed within the reservoir, a pair of opposite ports communicating with the lubricant in such

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reservoir and the remaining ports communicating with the visual control and a delivery tube respectively. It is also a novel feature of this invention that the rotary movement of the cylinder and the reciprocating movement of the plunger is effected from a main rotary shaft, the rotary movement of the latter being transmitted to the cylinder via toothed wheels and to the plunger via a crank on this shaft by means of a lost motion device so that the plunger is moved only when the cylinder port is at least partially registered with one of the housing ports.

These arrangements provide a very compact construction and further that the outer movable parts of the lubricator are effectively lubricated by the lubricant dripping from the visual control.

Further features of the invention will herein-after be disclosed.

One example of embodiment of the invention is illustrated in the annexed drawing, wherein:

Fig. 1 is a vertical cross section through the lubricator along the line I—I of Fig. 2.

Fig. 2 is a vertical longitudinal section along the line II—II of Fig. 1.

Fig. 3 is a horizontal, fragmentary sectional view taken along the line III—III of Fig. 2.

Figs. 4a and 4b are diagrammatic illustrations showing the positions of the crankshaft and rotating cylinder, respectively, at a particular instant during the operating cycle of the device in Figs. 1 to 3.

Figs. 5a and 5b are diagrammatic illustrations similar to Figs. 4a and 4b, respectively, but showing the positions of the parts at a later instant during the operating cycle.

Figs. 6a and 6b are diagrammatic illustrations similar to Figs. 5a and 5b, respectively, but showing the positions of the parts at a still later instant during the operating cycle.

Figs. 7a and 7b are diagrammatic illustrations similar to Figs. 6a and 6b, but showing the positions of the parts at a still later instant during the operating cycle.

In the example shown in the drawings two pumps are shown in detail, but it will be understood that this number may vary according to the number of points of lubrication, and that any number of pumps may be arranged in succession.

A third pump is partially indicated at the left hand side of Fig. 2 in accord with this principle.

Each pump consists of a housing 2, the housings being arranged, spaced from one another, on the bottom of the main reservoir 1 for the lubricant. Each housing 2 has a central vertical bore

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3 in which a cylinder 4 is accommodated. Into the lower part of same is plugged a bottom 5 having a flanged head 6, which is received in a recess 7 in the lower part of the housing. The head 6 is locked between the housing 2 and the bottom of the reservoir 1, thus to prevent an axial displacement of the cylinder in either direction.

The upper part of the cylinder, above the housing, is formed with a spur gear 8 which continuously engages the corresponding gear 9 of the adjacent pump, such that the cylinders of adjacent pumps rotate in opposite directions, as indicated by the arrows 34 and 35 on Fig. 3, when one of these cylinders is driven by means as will later be explained.

The lower part of the pump housing 2 has four ports 9, 10, 11 and 12, all arranged at the same level but rotationally offset at an angle of 90°, each to the next. The cylinder 4 has a single radial port 13 at the same level as the ports 9-12 and leading into the interior of the cylinder just above the bottom 5. In the example shown, the diametrically opposite ports 9 and 11 (the suction or charge ports) of each pump communicate with the interior of the reservoir, as the pump housings are arranged in spaced relationship (see Fig. 2).

Extending from the port 10 (the control port) is a tube 14 (Fig. 1) which leads up to the upper part of the reservoir and bent into a neck 15 behind a window 16 in the top cover of the reservoir. This tube is the visual control of the degree of lubrication. The fourth port 12 (delivering or discharge port) leads through a suitable tube (not shown) to the point of lubrication. The reservoir is filled with lubricant to a level well above the ports 9-12.

In the cylinder 4 is a plunger 17, to the upper part of which is attached a fork 18 having two spaced horizontal prongs 19 and 20. The plunger is keyed or secured to the lower prong 19, and through the upper prong 20 is screwed an adjusting screw 21 coaxial with the plunger. Above the prong 20 the adjusting screw 21 has a flange 22 which abuts the prong and thus forms a stop for the downward adjustment of the screw, so that it can only project below the prong 20 into the opening between the prongs to a limited distance.

Extending diametrically through the screw, above the flange 22, there is a key or pin 23 which is received in a longitudinal slot 24 in a head 25. The latter is rotatably arranged in the top cover of the reservoir 1 and secured against axial displacement by a key or locking ring 26. When the head is turned by a suitable instrument, for example a screwdriver, the adjusting screw 21 will be screwed to a greater or lesser distance into the opening between the prongs 19 and 20.

The plungers 17 as well as the cylinders 4 of the different pumps are driven from a main horizontal crank shaft 27, which has bearings in the side wall of the reservoir and which may be driven by any suitable and known mechanism from the exterior of the reservoir. The shaft 27 has one crank 28 for the plunger of each pump, and such cranks are displaced at an angle to each other peripherally around the shaft, so that the plungers always occupy related positions, as will later be described more fully.

The crank shaft 27 is provided with a toothed wheel 29, preferably a worm, which continuously engages another toothed wheel 30, preferably a worm gear, keyed to a vertical shaft 31 which

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is supported in a vertical column 32 on the bottom of the reservoir. The worm gear 30, has attached thereto a toothed wheel or pinion 33 which continuously engages the spur gear 8 of the first cylinder in the row of pumps. When the shaft is driven in the direction indicated by the arrow 36 (Figs. 1, 3, 4a, 5a, 6a and 7a) the cranks reciprocate the plungers 17, and at the same time the crankshaft transmits, via the gearing 29, 30, 33 and 8, a drive which rotates the cylinders in the directions indicated by the arrows 34 and 35 on Fig. 3.

It should be noted that the ratio between the wheels 29, 30, 33 and 8 is such that, when the crank shaft rotates through two complete revolutions, the cylinders 4 of the pumps complete a single revolution.

The following is a more detailed description of the working of the lubricator.

When during the rotation of a cylinder 4, its port 13 communicates with the suction port 9 of the housing, the plunger 17 will be performing its suction or charge stroke and will draw lubricant by suction from the reservoir into the cylinder. The arrangement is such that when the plunger has passed its upper dead centre, the cylinder has rotated an amount such that its port 13 communicates with the control port 10 of the housing, so that when the plunger subsequently moves downwards in its cylinder the lubricant is discharged through the tube 14, from the upper end of which it drips back into the reservoir. By suitable adjustment of the head 25, the screw 21 is adjusted to decrease or increase the stroke of the plunger, so that the pump in question is adjusted for exactly that amount of lubricant which is needed for the particular point of lubrication which this pump serves.

The cylinder will thereafter revolve a distance so that its port 13 communicates with the suction port 11 of the housing, whereafter the plunger completes its second suction or charge stroke and lubricant is drawn into the cylinder by suction. The amount of lubricant in this position of the cylinder corresponds exactly to the amount of lubricant sucked into and discharged from the cylinder during the preceding strokes. Thereafter the cylinder is further rotated, so that its port 13 communicates with the discharge port 12 of the housing, whereafter the plunger completes its second discharge stroke and delivers the lubricant through a tube (not shown) to the particular point of lubrication.

It will be understood from the foregoing, that the suction and discharge strokes of the plunger are effected only in those periods when the port 13 communicates with the ports 9-12 of the housing 2, and that the plunger is not reciprocated during those periods the port 13 is revolved from one to another of the ports 9-12, whereas the cylinder is continuously driven by the gears 29, 30, 33 and 8.

This will be explained further with reference to Figs. 4a and 4b, 5a and 5b, 6a and 6b, and 7a and 7b.

It will be seen from the drawings, that the cranks have a certain amount of clearance in the fork 18 between the lower prong 19 and upper prong 20, which clearance may be adjusted by the adjusting screw 21, leaving a net clearance indicated by the letter c. In Figs. 4a, 5a, 6a and 7a the crank 28 is shown in four different positions and the cylinder 4 is shown in its corresponding positions in the related Figs. 4b, 5b, 6b and 7b.

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Starting with the Figs. 4a and 4b the crank is in its lowermost position (see also Fig. 1 and the right-hand pump Fig. 2). The discharge stroke of the plunger is just finished and the lubricant has been delivered to the point of lubrication. The crank and the cylinder revolve in the directions indicated by the arrows 36 and 35, respectively. When the central axis of the port 13 of the cylinder has revolved a distance corresponding to 30° from the position shown in Fig. 4b to the position shown in Fig. 5b, the crank has turned 60° (ratio 1:2) as in Fig. 5a. During this movement of the crank it is out of contact with both the screw 21 and the prong 19 so that the plunger has not been reciprocated, but the cylinder is continuously revolving. The crank is now in such a position that it will engage the lower end of the adjusting screw 21 and raise the plunger as soon as the port 13 communicates with the suction port 9 of the housing.

The ports 9 and 13 communicate over an arc of approximately 60°, the distance between the positions of port 13 in Figs. 5b and 6b, during which movement the crank turns 120° and steadily raises the plunger to its top dead centre (as shown in Fig. 6a) to complete the suction stroke. From this position on to the next position, shown in Fig. 7a, the crank does not engage either the screw 21 or the prong 19 and the cylinder is turned 30° to the position of Fig. 7b (the crank turns 60°). Thereafter the crank engages the lower prong 19 of the fork and the discharge stroke through the control port 10 is effected until the crank has reached its lower dead point shown upon Fig. 4a.

A half cycle of the cylinder and a full cycle of the crank has thereby been completed.

To adjust the amount of lubricant supplied to and discharged from the pumps, the screw 21 of each individual pump is adjusted as described in the foregoing. If the clearance *c* between the crank and the adjusting screw is large the stroke of the plunger will be small and vice versa. Thus the pumps may be individually adjusted, even if they are simultaneously driven. If the screw is screwed to its extreme upper position the crank cannot engage the screw (the vertical clearance between the prongs being larger than the eccentricity of the crank) and consequently the crank cannot raise the plunger. Thus one or more pumps may be uncoupled from the system simply by adjusting the screw 21 as explained.

What I claim is:

1. In a lubricating pump including a lubricant reservoir, a stationary pump housing located in said reservoir, a pump cylinder rotatable in said housing and a pump piston axially reciprocable in said pump cylinder; the combination of four equally spaced radial ports formed in said housing and opening into the interior of the latter, a single radial port extending through said pump cylinder for successive registration with said housing ports as said pump cylinder rotates, first conduit means extending from one of said housing ports for communicating the lubricant to a point of use, second conduit means extending from the housing port diametrically opposed to said one housing port and opening into said lubricant reservoir, a transparent section in the wall of said reservoir adjacent the open end of said second conduit means to permit observation of the discharge of lubricant from the latter, the remaining housing ports opening into said reservoir, and means for reciprocating said pump piston and rotating said pump cylinder so that the latter completes one revolution during the inter-

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val required for two complete stroking cycles of said pump piston with the latter effecting a pumping stroke during the registration of said cylinder port with said one housing port from which said first conduit means extends and during the registration of said cylinder port with said diametrically opposed port from which said second conduit means extends, the last mentioned means including a rotated crankshaft, gear means transmitting the rotation of said crankshaft to said pump cylinder, and lost motion connecting means between the crank throw of said crankshaft and said pump piston so that the latter is moved only during the successive communication of said cylinder port with said housing ports.

2. In a lubricating pump; the combination as set forth in claim 1, wherein said lost motion connecting means includes a laterally disposed U-shaped frame loosely receiving said crankthrow and having one leg secured to said piston pump, and an adjusting member extending through the other leg of said frame for varying the clearance of said crankthrow within said frame so that the length of stroke of said pump piston may be adjusted.

3. A lubricating pump assembly comprising a lubricant reservoir, a plurality of pump housings disposed in said reservoir in side-by-side spaced apart relationship, a pump cylinder rotatable in each of said housings, a plurality of ports formed in each of said housings and opening into the interior thereof, a single radial port formed in each of said pump cylinders for successive registration with the ports of the related housing as the cylinder is rotated, at least one of said housing ports of each housing constituting an inlet port and opening into said reservoir, conduit means extending from one of the other housing ports of each housing for communicating the pumped lubricant to a point of use, a pump piston axially reciprocable within each of said pump cylinders above the port formed in the latter, a rotated crankshaft within said reservoir and having a crankthrow thereon for each of said pump pistons, lost motion connecting means between each of said crankthrows and the related pump piston, a gear on each of said pump cylinders meshing with the gear on the pump cylinder in the next adjacent housing, and gear means transmitting the rotation of said crankshaft to the gear on the pump cylinder in the end one of said housings.

4. A lubricating pump assembly as set forth in claim 3; wherein each of said housings is provided with four equally spaced radial ports, and said gear means is arranged to effect the rotation of each of said pump cylinders through a single revolution during the interval required for two complete stroking cycles of the related pump piston, a pumping stroke of each piston occurring during registration of the related pump cylinder port with said housing port from which said conduit means extend and with the housing port diametrically opposed thereto; and including second conduit means extending from each of said diametrically opposed ports and opening within said reservoir, and a transparent wall section in said reservoir adjacent the open end of said second conduit means to permit viewing of the discharge of lubricant from said second conduit means, the remaining two housing ports of each housing communicating the interior of the housing with said reservoir and constituting diametrically opposed inlet ports.

5. A lubricating pump assembly as set forth

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in claim 4; wherein said lost motion connecting means includes a U-shaped frame loosely receiving the related crankthrow of said crankshaft and disposed with the legs thereof extending laterally relative to the direction of reciprocation of the related pump piston, one leg of said frame being secured to the related pump piston, and an abutment member extending adjustably through the other leg of said frame for varying the clearance of said crankthrow within the frame so that the length of the stroke of the related pump piston may be adjusted.

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