I. LARSEN.

LUBRICATING DEVICE.

APPLICATION FILED OCT. 7, 1910.

1,026,322.

Patented May 14, 1912.

5 SHEETS—SHEET 1.

Fig. 2.

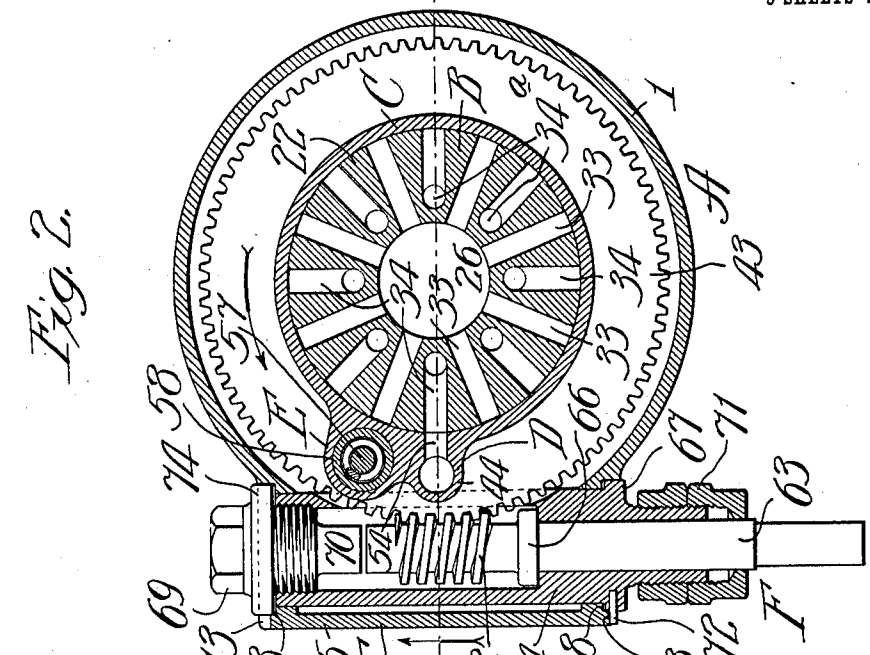
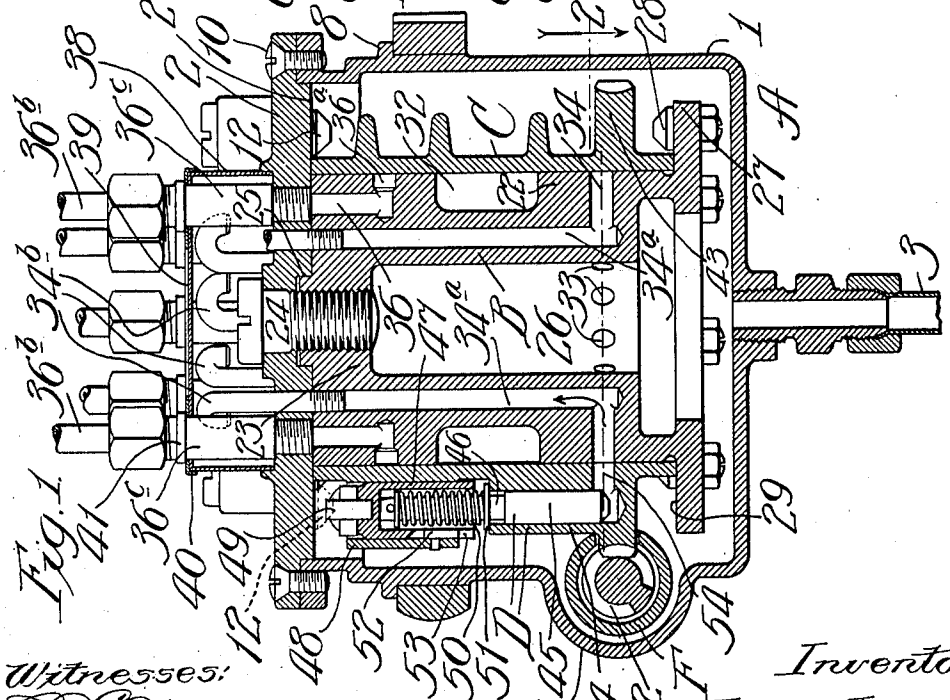


Fig. 1.



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5 SHEETS—SHEET 2.

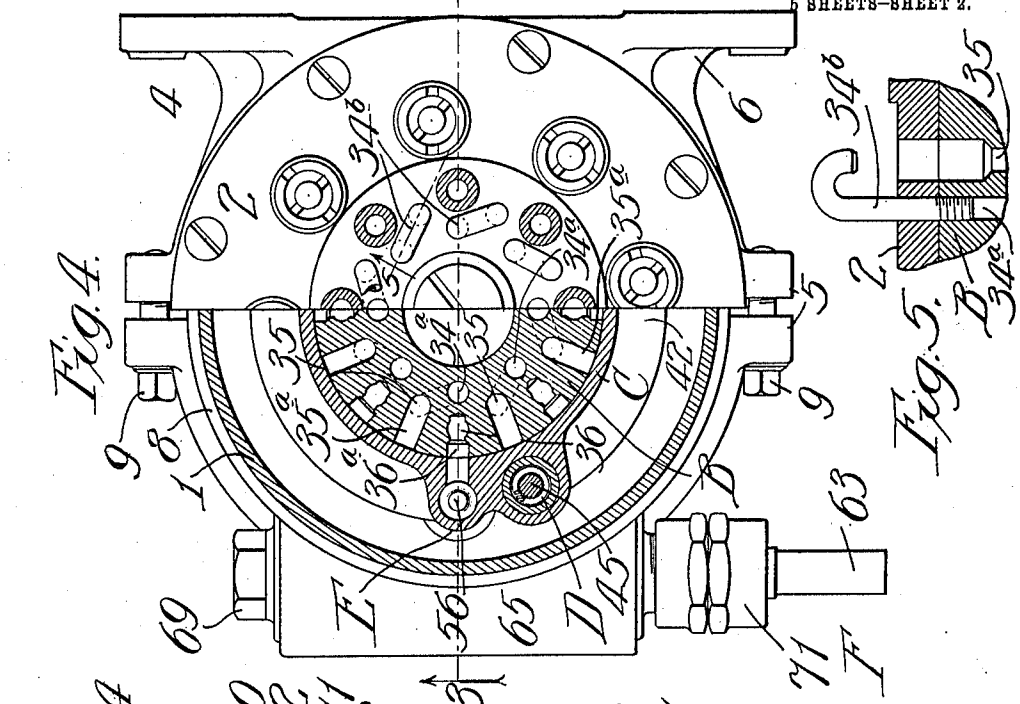

Fig. 4.

Fig. 5.

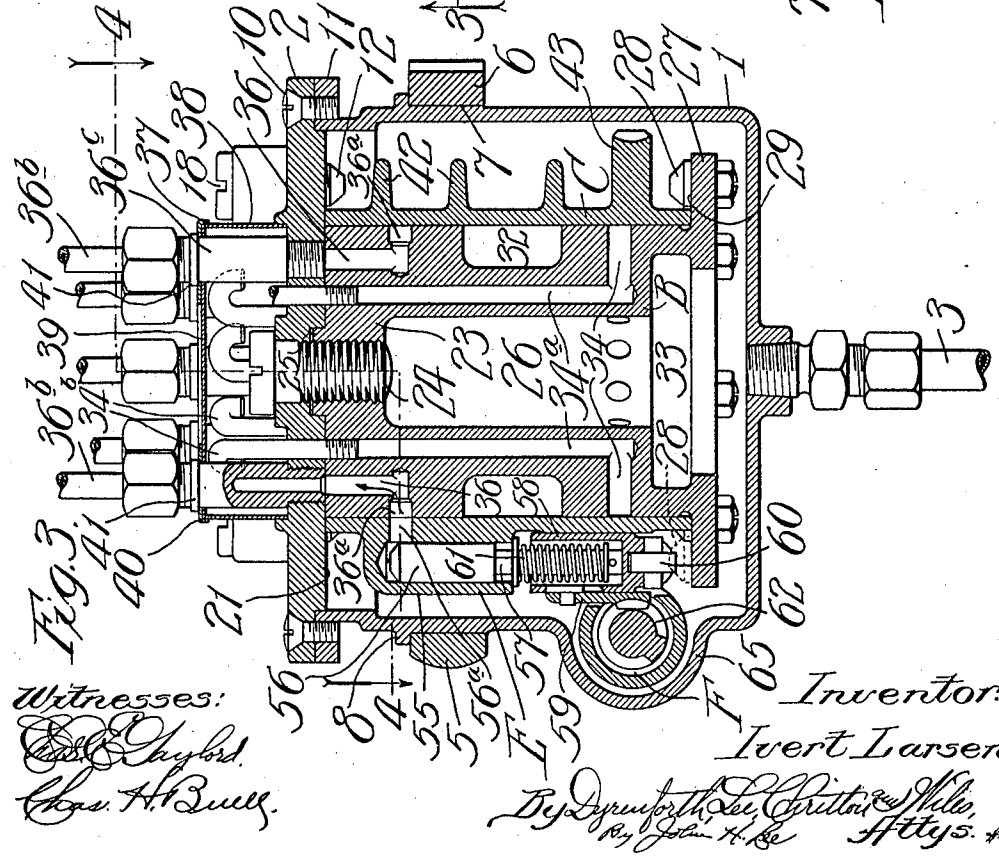

Fig. 3.

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5 SHEETS—SHEET 3.

Fig. 6.

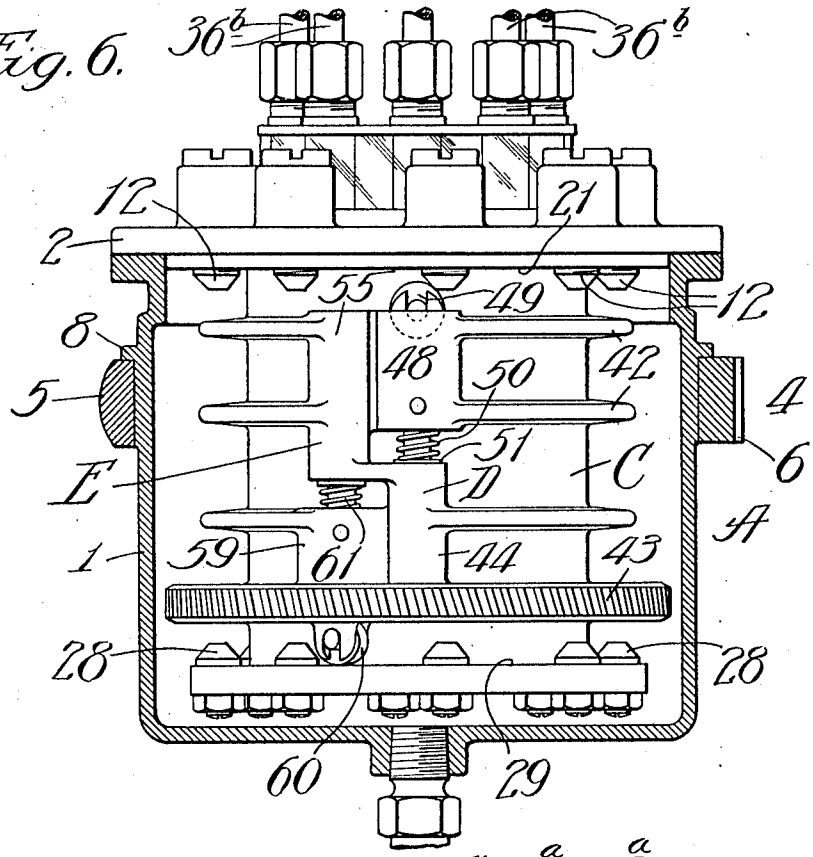
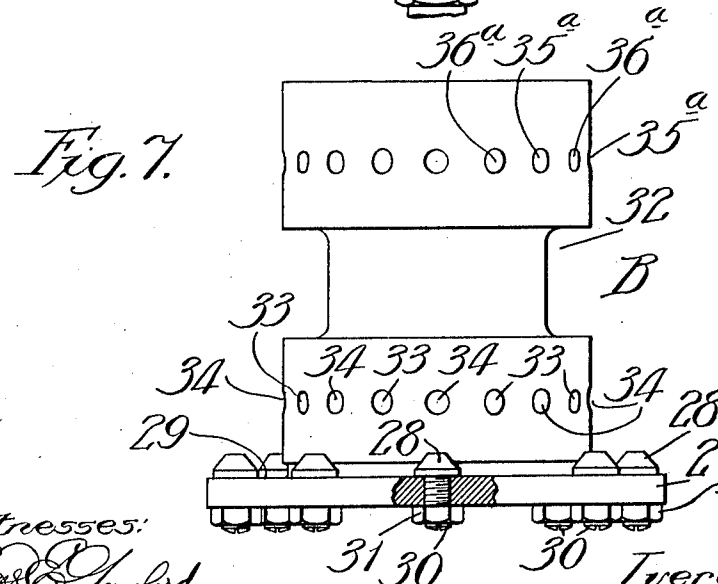


Fig. 7.



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6 SHEETS—SHEET 4.

Fig. 9.

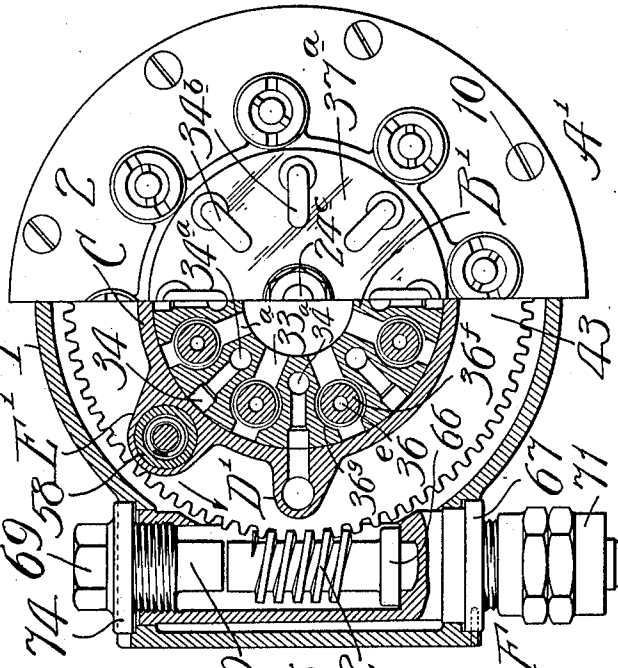
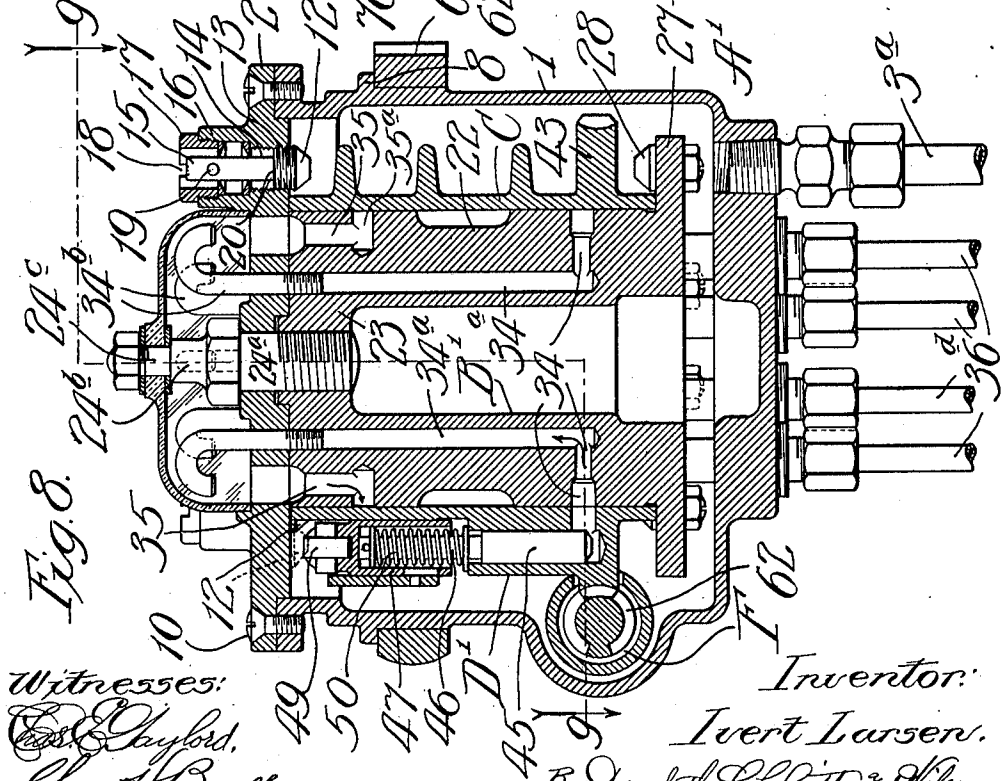


Fig. 8.



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5 SHEETS—SHEET 5.

Fig. 11.

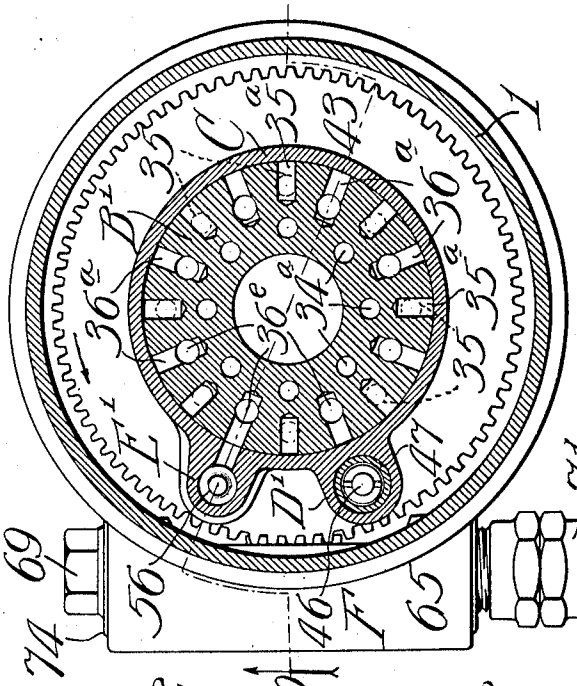
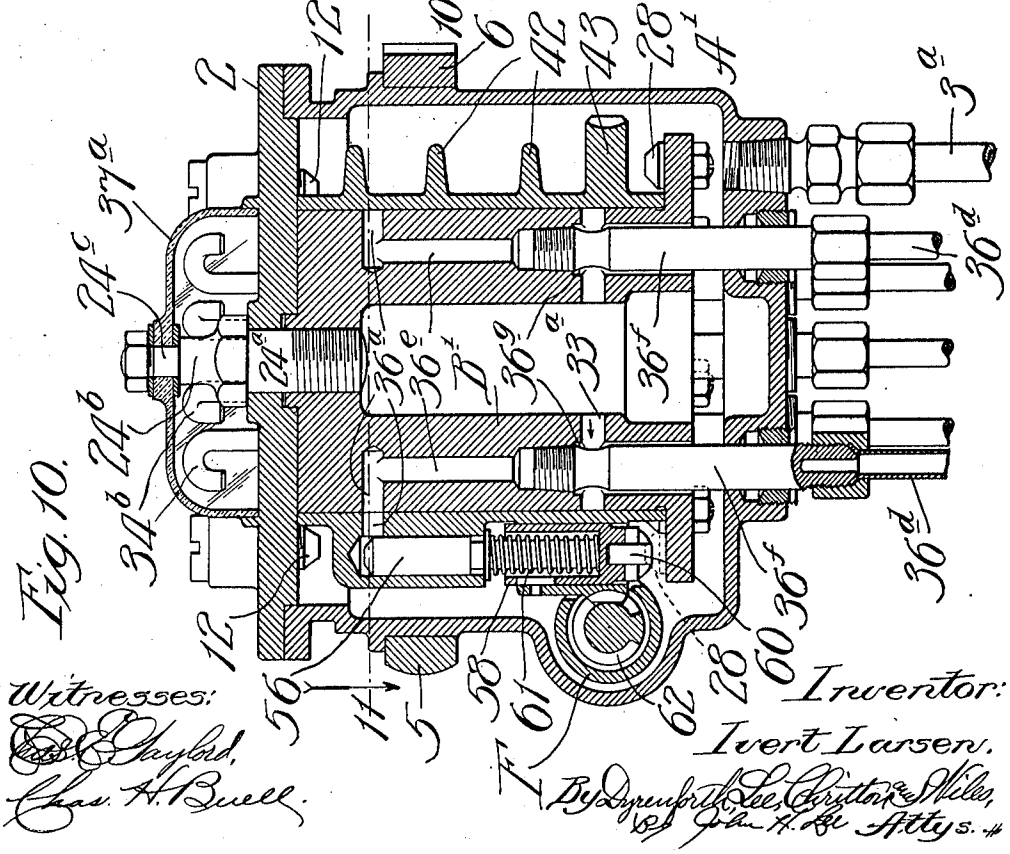


Fig. 10.



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UNITED STATES PATENT OFFICE.

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LUBRICATING DEVICE.

1,026,322. Specification of Letters Patent. Patented May 14, 1912.

Application filed October 7, 1910. Serial No. 585,832.

To all whom it may concern:

Be it known that I, IVERT LARSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Lubricating Devices, of which the following is a specification.

This invention relates particularly to lubricating devices employing a rotary pump-carrying member; and the primary object of the invention is to make provision, in this type of force-feed oiler, for a sight-feed, provision being made for the ready adjustment of the feeds to the various delivery-ducts or tubes.

A further object of the invention is to provide a durable device of this type, which is certain in its operation, and capable of supplying with accuracy the desired amount of oil to each member or part of any machine to which it may be applied, regardless of the consistency of the fluid lubricant employed.

In the preferred embodiment of the invention there are employed: a casing or oil chamber adapted to contain lubricant; a stationary cylindrical member mounted in said casing and provided with a series of inlet-ducts alternating with a series of outlet-ducts, which lead to the sight-feeds, and provided further with a series of return-ducts alternating with a series of final discharge-ducts, which communicate with tubes adapted to have connection with the various bearings or parts of a machine to be lubricated; a rotary pump-carrying cylindrical member equipped with a primary, or measuring, pump, and equipped, also, with a secondary, or delivery, pump; a series of adjustable annularly-arranged stationary cams preferably connected with the top of the casing and serving to actuate the measuring pump during its orbital movement; and a series of stationary annularly-arranged cams preferably carried by the lower portion of the inner stationary cylinder, and serving to actuate the secondary or delivery pump during its orbital movement. In the preferred arrangement, the casing is equipped with a worm which extends thereinto and meshes with a worm-wheel with which the rotary pump-carrying member is equipped at its lower portion, and the inner stationary cylinder and encompassing rotary cylinder are suspended from the removable top-plate of the casing, so as to be removable therewith. The casing may be made large enough to contain a large supply of oil, but preferably it is made small and supplied with oil from another reservoir, which may be located at a higher level than the casing, so that oil will gravitate therefrom to the casing.

The invention is illustrated in its preferred embodiment, in the accompanying drawings, in which—

Figure 1 represents a sectional view of an oiler constructed in accordance with this invention, the section being taken, as indicated, at line 1 of Fig. 2; Fig. 2, a horizontal section taken, as indicated, at line 2 of Fig. 1; Fig. 3, a section taken, as indicated, at line 3 of Fig. 4; Fig. 4, a section taken, as indicated, at line 4 of Fig. 3, this view showing the pump-carrying member advanced a step from the position shown in Fig. 2; Fig. 5, a broken sectional view, showing a detail of the sight-feed employed, the section being taken, as indicated, at line 5 of Fig. 4; Fig. 6, a view showing the casing in section and the pump-carrying member in elevation; Fig. 7, a view showing the inner stationary cylinder employed, detached from the top-plate of the casing; Fig. 8, a sectional view illustrating a modification under which the delivery pipes communicate with the oiler through the bottom-wall of the casing, instead of through the top-wall; Fig. 9, a view partly in section and partly in plan, the view being taken, as indicated, at line 9 of Fig. 8; Fig. 10, a section taken, as indicated, at line 10 of Fig. 11, illustrating the same modification; and Fig. 11, a section taken, as indicated, at line 11 of Fig. 10.

Referring to Figs. 1 to 7 inclusive, A represents a casing or oil chamber adapted to be attached to any suitable support, as at, for instance, the dash of an automobile; B, a stationary cylinder depending from the upper wall of the casing and provided with a series of primary or measuring-pump suction-ducts and a series of discharge-ducts alternating with said suction-ducts, and provided, also, with a series of secondary or delivery-pump suction-ducts, and a series of discharge-ducts alternating with said last named suction-ducts; C, a rotary pump-carrying cylinder surmounting the cylinder B; D, a primary or measuring-pump, carried by the cylinder C, and operating through a duct which is adapted to be brought successively into registration with

the corresponding suction and discharge-ducts which have their orifices opening at the lower portion of the exterior surface of the cylinder B; E, a delivery pump carried by the cylinder C and adapted to draw the measured charges of lubricant through the delivery-pump suction-ducts and discharge the same through the delivery-pump discharge-ducts and F, mechanism for rotating the member C.

The casing may be of any suitable construction and configuration. As shown, it comprises a hollow casting 1, of cylindrical form, provided with a removable top-plate or disk 2; and connected with the bottom-wall of the casing is a supply-pipe 3, through which oil may be supplied from a suitable reservoir (not shown). The casing is adapted to be connected to any suitable support, as to the dash of an automobile, by means of a bracket 4 comprising a two-part clamping-ring 5, and a base-portion, or attaching-portion, 6, carried by one part of said clamping-ring. The casing is provided exteriorly with a smooth cylindrical surface 7 about which the clamping-ring 5 is fitted, and the casing is provided externally with a flange 8 adapted to rest upon the clamping-ring. The portions of the clamping-ring are joined together by adjusting-screws 9.

The top-plate 2 is disconnectibly joined, by screws 10, to an external flange 11 with which the casing is provided at its upper-portion. Said plate 2 serves to carry a series of annularly-arranged adjustable-cams 12, which depend into the casing and serve to actuate the measuring-pump D, which has an upturned stem equipped with a roller adapted to coöperate with said cams. The detail of the cam adjustment is shown in Fig. 8, from which it will be seen that each cam has a truncated conical head affording a flat lower surface and a beveled or conical surface, said cam having a threaded shank 13 which screws in a threaded opening 14 with which the top-plate 2 is provided. From the threaded portion 13, a stem 15 of reduced cross-section extends upwardly through a packing-gland 16. The upper-portion of the packing-gland is internally threaded to receive a tubular-nut 17, which serves as a means for compressing the packing about the stem of the cam, thus applying sufficient friction to prevent vertical movement, said nut being provided with a slot 18 adapted to receive a screw-driver. The stem 15 is equipped with a transverse stud or pin 19 adapted to be engaged by a suitable implement inserted through the tubular-nut 17, so that the cam 12 may be thereby adjusted according to desire. The pin 19 serves as a stop, limiting the inward adjustment of the cam, and the upper-wall or shoulder 20 affords a stop adapted to contact with the lower surface of the packing ring, thus limiting the upward or outward adjustment. The series of cams 12 correspond in number with the measuring-pump outlet or discharge-ducts through the stationary cylinder B, and are so related to the orifices of said outlet-ducts as to cause the plunger of the pump D to be forced downwardly when the inlet-outlet duct of said pump is brought into registration with the orifices of said outlet ducts.

The removable plate 2 has a flat inner surface 21 affording a cam-surface under which the roller of the plunger of the pump D travels between the annularly-arranged cams 12.

The stationary cylinder B is preferably formed with a comparatively thick cylindrical wall 22, and a top 23, which is provided with a central perforation receiving a screw or bolt 24 which passes through the top-plate 2. The upper surface of the wall 23 is provided with a central boss 25 which enters a corresponding recess in the lower surface of the plate 2. The interior of the stationary cylinder B affords a chamber 26 which is open at its lower end, so as to communicate freely with the interior of the casing 1. Said cylinder B is provided at its lower end with an annular external flange 27 which projects beyond the rotary cylinder C and is equipped with a series of stationary, non-adjustable cams 28, which serve to actuate the plunger of the secondary or delivery-pump E, said plunger having a downwardly-extending stem equipped with a roller coacting with said cams and with the upper flat surface 29 of said flange 27. The delivery pump E is of ample capacity to deliver any charge of oil which it may receive from the measuring-pump, and it is unnecessary to make the cams 28 adjustable. As appears from Fig. 7, each cam 28 has a threaded stem 30 extending through the flange 27 and equipped with a nut 31. The stationary cylinder B may be externally recessed or cut-away, as indicated at 32, to lighten the member and lessen the amount of machining.

The stationary cylinder B is provided in its lower portion, above the flange 27, with a series of radial perforations 33 which extend from the bore 26 of the cylinder and have orifices opening at the external surface of the lower portion of the cylinder. These passages 33 constitute induction-ports. Alternating with the induction-ducts 33, and lying in the same horizontal plane, are radial measuring-pump discharge-ducts 34, which have orifices opening at the external surface of the cylinder B. The ducts 34 communicate at their inner ends with vertical-ducts 34^a which extend to the top of the cylindrical wall and communicate with sight-feed tubes 34^b which extend through

the top-plate 2. The tubes 34[b] have their upper ends laterally and downwardly curved and adapted to discharge into return-ducts 35, which have enlarged upper end-portions extending through the plate 2. The return-ducts 35 constitute intake- or induction-ducts for the secondary or delivery-pump, and have at their lower ends laterally-turned orifices 35[a] which open at the outer circumferential surface of the stationary cylinder B. Alternating with the ducts 35 are delivery-pump discharge-ducts 36, which have laterally-turned orifices 36[a] lying in the same horizontal plane as the orifices 35[a]. The ducts 36 communicate at their upper ends with delivery-tubes 36[b], which are connected with the top-plate 2, and which extend to the various bearings or parts to be oiled. The sight-feed-tubes 34[b] are located in a chamber 37 surmounting the top-plate 2, and having a transparent cylindrical-wall 38 and a transparent top-wall 39. The cylindrical-wall 38 may be composed of mica or glass, as may the top-wall 39, an annular metal-plate 40 being superposed and provided with perforations admitting the nipples, or tube-sections 36[c]. The tube-sections 36[c] have reduced lower ends screwed into the plate 2, and are provided with flanges 41 which rest upon the annular-plate 40. Said tube-sections are shouldered above their threaded ends to rest upon the upper surface of the plate 2.

The rotary cylinder C is ground or machined internally to fit accurately upon the enlarged parts of the stationary cylinder B, and the lower end of said cylinder C rests upon the external flange 27 of the internal cylinder. The cylinder C is shown as provided with external circumferential strengthening-ribs 42. Near its lower end the cylinder C is equipped with a worm-wheel 43, constituting a portion of the cylinder-rotating device F. The cylinder C is provided at one side with a longitudinal boss 44 in which is formed the bore or cylinder of the pump D. Said pump D comprises a piston 45 having an upwardly-extending stem 46 whose upper end is equipped with a tubular guide-member 47 which moves in a guide 48 and is equipped with a cam-roller 49. A spring 50, which rests at its lower end on a washer 51 supported by the upper end of the boss 44, serves to move the piston 45 upwardly, that is, to retract the piston. The guide 48 is equipped with a removable-spline 52 which is received in a slot 53 with which the sleeve 47 is provided. Thus the pump piston and its actuating sleeve are prevented from rotating in the guide 48, so that the roller 49 will be always disposed in proper relation to the cams 12. At the lower end of the cylinder of the pump D is an inlet-outlet duct 54 which has an orifice opening at the internal surface of the cylinder C and adapted to be brought into successive registration with the suction and discharge-ducts 33 and 34 of the cylinder B.

The pump-carrier, or cylinder, C, is equipped adjacent the guide 48 with a longitudinal-boss 55 in which is formed the bore or cylinder of the pump E. Said pump E comprises a piston 56 having a downwardly-extending stem 57 equipped with a sleeve 58 which moves in a guide 59 which lies adjacent the boss 44. The sleeve 58 is equipped with a cam-roller 60 which coacts with the cams 28 and the upper surface of the flange 27, and a spring 61 serves to depress or retract the plunger 56. The same details of construction for guiding the sleeve 58 and transmitting pressure from the boss 55 as are employed in connection with the pump D are employed in connection with the pump E. The piston 56 is preferably of somewhat greater diameter than the piston 45, or at any rate has a greater displacement than the piston 45, so that the delivery-pump E will serve, under all conditions, to deliver any oil which it may receive from the primary or measuring pump.

The mechanism F for rotating the pump-carrier C comprises, in addition to the worm-wheel 43, a worm 62 having a shaft 63 journaled in a sleeve 64 which is reversibly mounted in a boss 65 with which the casing is equipped at one side near its lower end. The sleeve 64 has an internal shoulder near one end against which presses a thrust collar 66 with which the shaft 63 is equipped. The boss 65 is open at both ends to permit reversal of the sleeve 64. Near one end, the sleeve 64 is provided with an external flange 67 which bears against a seat 68 at either end of the boss 65, depending upon which way the sleeve 64 is inserted. At the opposite end the sleeve is internally threaded to receive a cap-screw 69 which has a reduced extension 70 adapted to abut against the inner end of the shaft 63. The opposite end of the sleeve is equipped with a stuffing gland 71 through which the shaft extends. The flange 67 is equipped with a laterally-projecting stud 72 adapted to engage a slot 73 at either end of the boss 65, depending upon the way the sleeve is inserted. The cap-screw 69 is equipped with a flange 74 adapted to be inserted in the seat 68 at either end of the boss 65. It will be understood that the shaft may be reversed with relation to the casing to facilitate connection with the engine of an automobile, for instance, according to requirements.

The manner of operation may be stated briefly. Rotary motion is imparted to the cylinder C through the medium of the mechanism F, the shaft 63 being connected with any suitable source of power. As the cyl-

inder C rotates, it carries with it the pumps D and E. The duct 54 of the pump D is brought into successive registration with the alternating suction-ducts and discharge-ducts 33, 34, of the measuring-pump. The cams 12 are so arranged that the plunger 45 of the pump D will be moved in opposite directions at appropriate times to create, first suction, and then pressure, through the duct 54, thus causing the oil to be drawn into the bore of said pump when the duct 54 registers with a suction-duct 33, and to be discharged from the bore of said pump whenever the duct 54 registers with a duct 34. In the latter case, it is obvious that the oil will be forced through the duct 34^a and sight-tube 34^b, whence it will pass to the return-duct 35. At the appropriate instant, the delivery-pump E will have its inlet-outlet duct 56^a brought into registration with the orifices 35^a of the appropriate return-duct,—that is, delivery-pump suction-duct—and the measured charge of oil will be drawn into the cylinder of the delivery-pump, and an instant later, the duct 56^a will be brought into registration with an orifice 36^a of the delivery-duct 36, and the oil will be expelled by the plunger 56 through the delivery-tube 36^b, whence it will pass to the bearing or part to be lubricated. Inasmuch as the cams 12 which actuate the measuring-pump are adjustable, it will be understood that the desired amount of oil may be fed to any selected bearing or part; and inasmuch as the oil, in passing from the measuring-pump to the delivery-pump, passes through the sight-feeds, it is easy to observe the amount of oil being delivered to each delivery-tube.

In the modification shown in Figs. 8 to 11 inclusive, the construction is similar to the construction heretofore described, and the parts are similarly lettered, except where modified, as will now be explained. In this construction, the delivery-tubes, 36^d, instead of passing through the upper wall of the casing A′, pass through the lower wall thereof, the lower wall of the casing being, for this purpose, provided with suitable stuffing-glands through which the tubes pass. The orifices 36^a, in this instance, communicate with downwardly-extending ducts 36^e which communicate with tube-sections 36^f; and because of the limited size of the device, the tube-sections 36^f pass through enlargements 36^g in the measuring-pump suction-ducts 33^a, which correspond with the suction-ducts 33 of the first described construction. To facilitate the boring of the ducts, the measuring and delivery pumps D′, E′, respectively, are spaced slightly differently from the spacing employed in the first described construction, but the operation is the same as in the first described construction. Owing to the fact that the delivery-tubes do not pass through the sight-feed chamber 37^a, the construction at this point varies somewhat. The screw 24^a, which serves to connect the stationary-cylinder B′ to the casing and top-plate 2, is surmounted by a stud 24^b equipped with a threaded extension 24^c of reduced cross-section, which passes through a central perforation in an inverted glass bell which forms a chamber 37^a, said stud 24^c being equipped with a nut which secures the glass member in place. It will be understood that one advantage of the modified construction lies in the increased facility with which the sight-feeds may be viewed, owing to the absence of the delivery-tubes at this point; and the sightliness of the lubricating device is enhanced. In the modification, the supply-tube 3^a communicates through the lower wall of the casing near one side of the casing.

The foregoing detailed description has been given for clearness of understanding only, and no undue limitation should be understood therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art.

What I regard as new, and desire to secure by Letters Patent, is:—

1. In an oiling device, the combination of a pair of members adapted to rotate with relation to each other, one of said members having measuring-pump suction-ducts and discharge-ducts, and having also delivery-pump suction-ducts and discharge-ducts, and the other member equipped with a measuring-pump and a delivery-pump adapted to draw and discharge the lubricant through their respective ducts, and a sight-feed device through which the oil is delivered from the discharge-ducts of the measuring-pump to the suction-ducts of the delivery-pump.

2. In an oiling device, the combination of a member having a plurality of measuring-pump suction-ducts and a plurality of measuring-pump discharge-ducts opening at a given surface and in a given plane, and having also a plurality of delivery-pump suction-ducts and a plurality of delivery-pump discharge-ducts opening at a different plane, and a second member equipped with a measuring-pump and a delivery-pump having inlet-outlet ducts opening at planes corresponding with the orifices of the measuring-pump and delivery-pump suction and discharge-ducts mentioned respectively; and means for imparting relative rotation to said members, and a sight-feed device through which the lubricant is delivered from the measuring-pump discharge-ducts to the delivery-pump suction-ducts.

3. In an oiling device, the combination of a stationary cylinder provided with measuring-pump discharge-ducts, and provided, also, with delivery-pump suction and discharge-ducts, a sight-feed device through

which the oil is delivered from the measuring-pump discharge-ducts to the delivery-pump suction-ducts, a rotary member equipped with a measuring-pump and a delivery-pump, means for rotating said member, adjustable cams serving to actuate the measuring-pump, and cams serving to actuate the delivery-pump.

4. In an oiling device, the combination of a casing, a stationary cylinder projecting from one wall thereof and equipped with measuring-pump suction and discharge-ducts, and equipped, also, with delivery-pump suction and discharge-ducts, sight-feed tubes connected with the measuring-pump discharge-ducts and communicating with the delivery-pump suction-ducts, a rotary member equipped with a measuring-pump and a delivery pump having ducts adapted, respectively, to be brought into registration with the measuring-pump and delivery-pump suction and discharge-ducts, adjustable cams serving to actuate the measuring-pump, and cams serving to actuate the delivery pump.

5. In an oiling device, the combination of a casing equipped with a removable-plate, a stationary cylinder carried by said plate and equipped also with delivery-pump suction-ducts and discharge-ducts, sight-feed tubes connected with said plate through which oil is delivered from the measuring-pump discharge-ducts to the delivery-pump suction-ducts, a pump-carrying cylinder equipped with a measuring-pump and a delivery-pump having inlet-outlet ducts coacting with the corresponding ducts of said first named cylinder, means for rotating said pump-carrying cylinder, and cams actuating said pumps.

6. In an oiling device, the combination of a casing equipped with a removable-plate, a stationary-cylinder carried by said plate and provided with measuring-pump suction and discharge-ducts, and provided, also, with delivery-pump suction and discharge-ducts, sight-feed tubes through which the oil is fed from the measuring-pump discharge-ducts to the delivery-pump suction-ducts, a pump-carrying cylinder encircling said first named cylinder and equipped with a worm-wheel, and equipped, also, with measuring and delivery-pumps, a worm journaled in said casing and meshing with said wormwheel, an upper series of cams serving to actuate the measuring-pump, and a lower series of cams serving to actuate the delivery-pump.

7. In an oiling device, the combination of a casing equipped with a removable plate, a series of adjustable cams carried by said plate and equipped with measuring-pump suction and discharge-ducts, and equipped, also, with delivery-pump suction and discharge-ducts, sight-feed tubes communicating through said plate with the measuring-pump discharge-ducts and emptying into the delivery-pump suction-ducts, an upper series of cams, a lower series of cams, a rotary cylinder mounted on said first named cylinder and equipped with a measuring-pump and a delivery-pump, the measuring pump actuated by said first named series of cams and the delivery-pump actuated by said second named series of cams, and means for rotating the pump-carrying cylinder.

8. In an oiling device, the combination of a casing equipped with a removable plate, a stationary cylinder depending from said plate and equipped with measuring-pump suction and discharge-ducts, and equipped, also, with delivery-pump suction and discharge-ducts, a series of adjustable cams carried by said plate, and encircling the upper portion of said cylinder, a series of cams carried by the lower portion of said cylinder and supported at a distance from the outer surface of said cylinder, and a rotary pump-carrying cylinder surrounding said first named cylinder and equipped with a measuring-pump having an upwardly-extending actuating stem, and equipped, also, with a delivery-pump having a downwardly-extending actuating stem.

9. In an oiling device, the combination of a pair of members, means for imparting relative rotation to said members, measuring-pump suction and discharge-ducts, delivery-pump suction and discharge-ducts in one of said members, a pair of oppositely-arranged longitudinally-disposed pumps carried by the other of said members, one of said pumps having an actuating stem extending in one direction and the other of said pumps having an actuating stem extending in the opposite direction, a series of cams located near one end of the rotary member and serving to actuate one pump, and a series of cams located near the opposite end of said rotary member and serving to actuate the other pump.

10. In an oiling device, the combination of a casing having a removable-plate, a stationary-cylinder depending from said plate and equipped at its lower end with an outturned flange, cams carried by said flange, cams carried by said plate, measuring-pump and delivery-pump suction and discharge-ducts in said stationary-cylinder, sight-feed tubes communicating with the measuring-pump discharge-ducts through said plate and emptying into the delivery-pump suction-ducts, and a rotary-cylinder equipped with a measuring-pump having a stem extending in one direction, and equipped, also, with a delivery-pump having an actuating stem extending in the opposite direction.

11. In an oiling device, the combination of a casing provided exteriorly to its upper wall with a sight-feed chamber, a stationary-

cylinder extending inwardly from said wall and equipped with measuring-pump suction and discharge-ducts and with delivery-pump suction and discharge-ducts, the measuring-pump discharge-ducts communicating through sight-feed tubes in said sight-feed chamber with the delivery-pump suction-ducts, adjustable cams connected with said wall and extending into said casing, a rotary-pump carrying-cylinder equipped with a measuring-pump having an upwardly-extending actuating stem, and equipped, also, with a delivery-pump having a downwardly-extending actuating stem, stationary cams located near the lower ends of said cylinders and serving to actuate the delivery-pump, means for rotating the pump-carrying cylinder, and delivery-tubes communicating with the delivery-pump discharge-ducts.

12. In an oiling device, the combination of a casing having a top-wall equipped exteriorly with a sight-feed chamber, a stationary-cylinder in said casing provided with measuring-pump suction and discharge-ducts, and provided, also, with delivery-pump suction and discharge-ducts, means for conducting oil through said wall from the measuring-pump discharge-ducts into said sight-feed chamber and into the delivery-pump suction-ducts, a rotary-cylinder equipped with a measuring-pump and a delivery-pump, actuating cams for said pumps, means for rotating the pump-carrying cylinder, and delivery-tubes extending through said sight-feed chamber and communicating with the delivery-pump discharge-ducts.

13. In an oiling device, the combination of a casing provided with a removable-plate equipped with a sight-feed chamber, a stationary-cylinder in said casing provided with measuring-pump suction and discharge-ducts, and provided, also, with delivery-pump suction and discharge-ducts, means whereby oil may pass through said plate from the measuring-pump discharge-ducts into said sight-feed chamber and into the delivery-pump suction-ducts, a rotary-cylinder equipped with a measuring-pump and a delivery-pump, mechanism for actuating said pumps, and delivery-tubes extending through the lower portion of the casing and communicating with the delivery-pump discharge-ducts.

14. In an oiling device, the combination of a casing equipped with a removable plate, and equipped, also, with actuating means extending into the casing near the lower portion thereof, a stationary cylinder mounted on said plate and depending into the casing and removable with said plate, said cylinder provided with measuring-pump suction and discharge-ducts, and provided, also, with delivery-pump suction and discharge-ducts, a sight-feed device mounted on said plate through which the measuring-pump discharge-ducts communicate with the delivery-pump suction-ducts, a rotary cylinder mounted on said stationary cylinder and removable from the casing therewith, measuring and delivery-pumps mounted on said rotary-cylinder, and means for rotating the pump-carrying cylinder, said last named means freely disconnectible from said actuating means upon the removal of said plate.

IVERT LARSEN.

In the presence of—
J. G. ANDERSON,
R. A. SCHAEFER.