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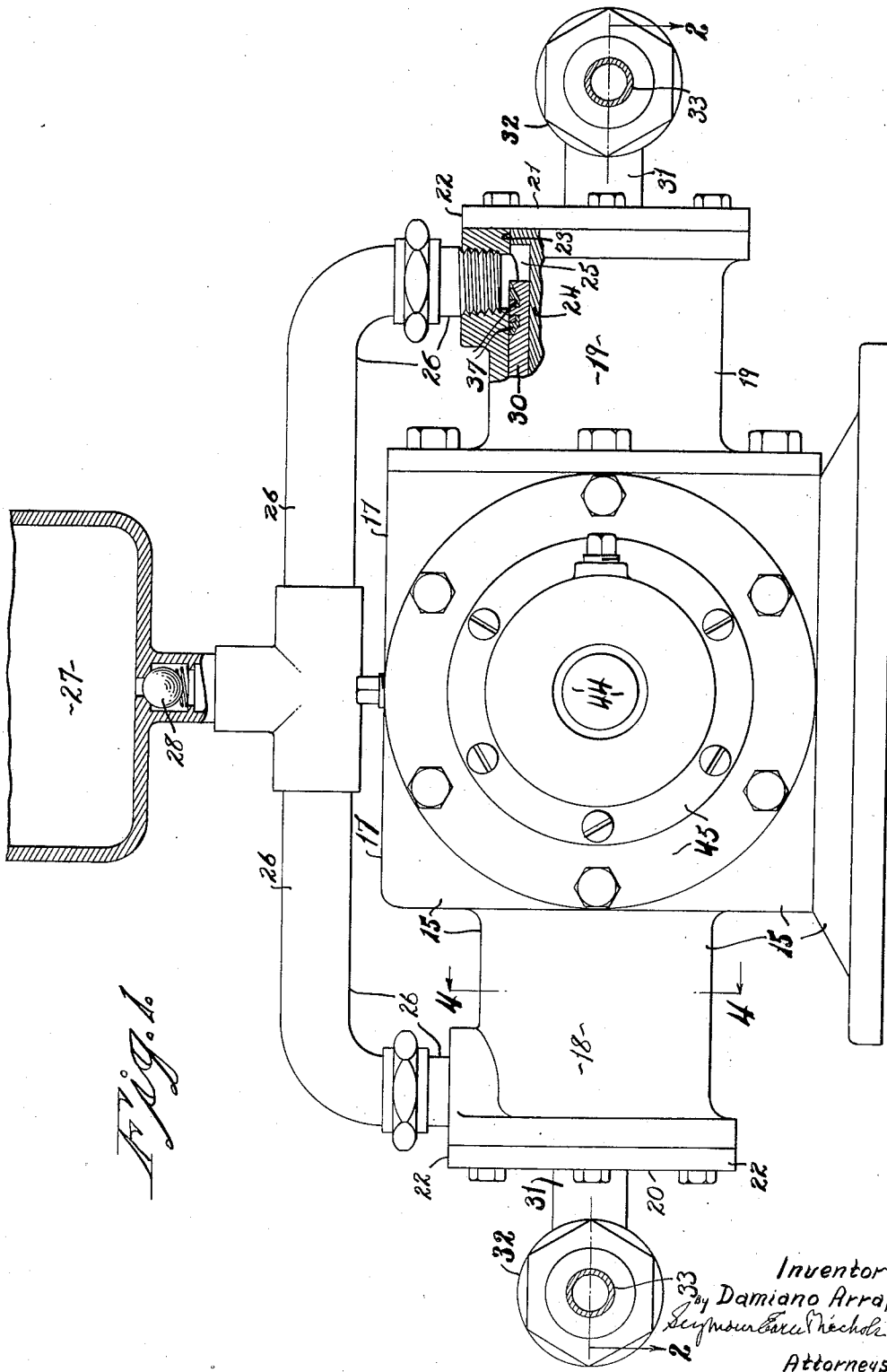
D. ARRAS

2,354,980

RECIPROCATING PUMP

Filed Feb. 1, 1944

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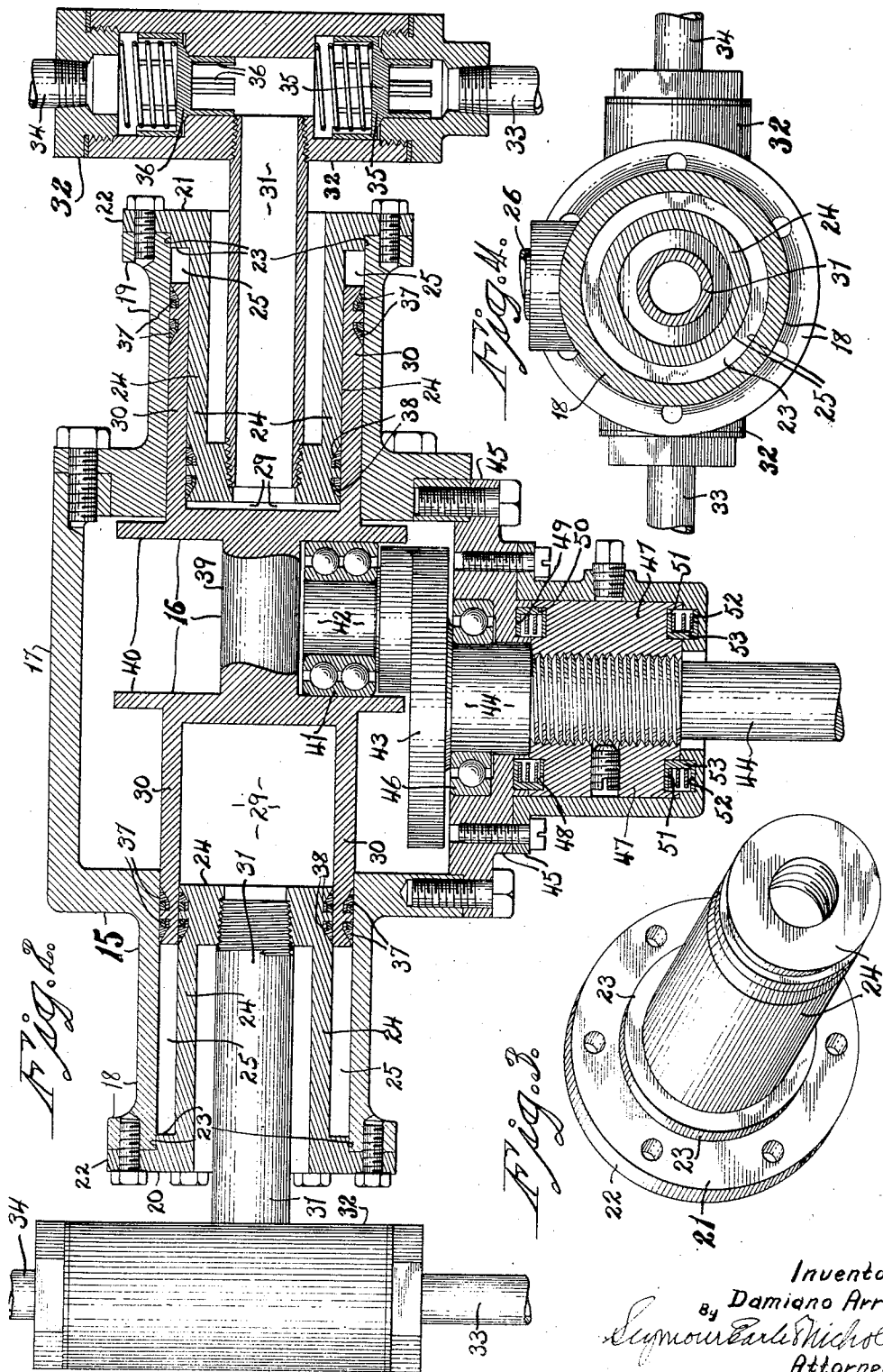
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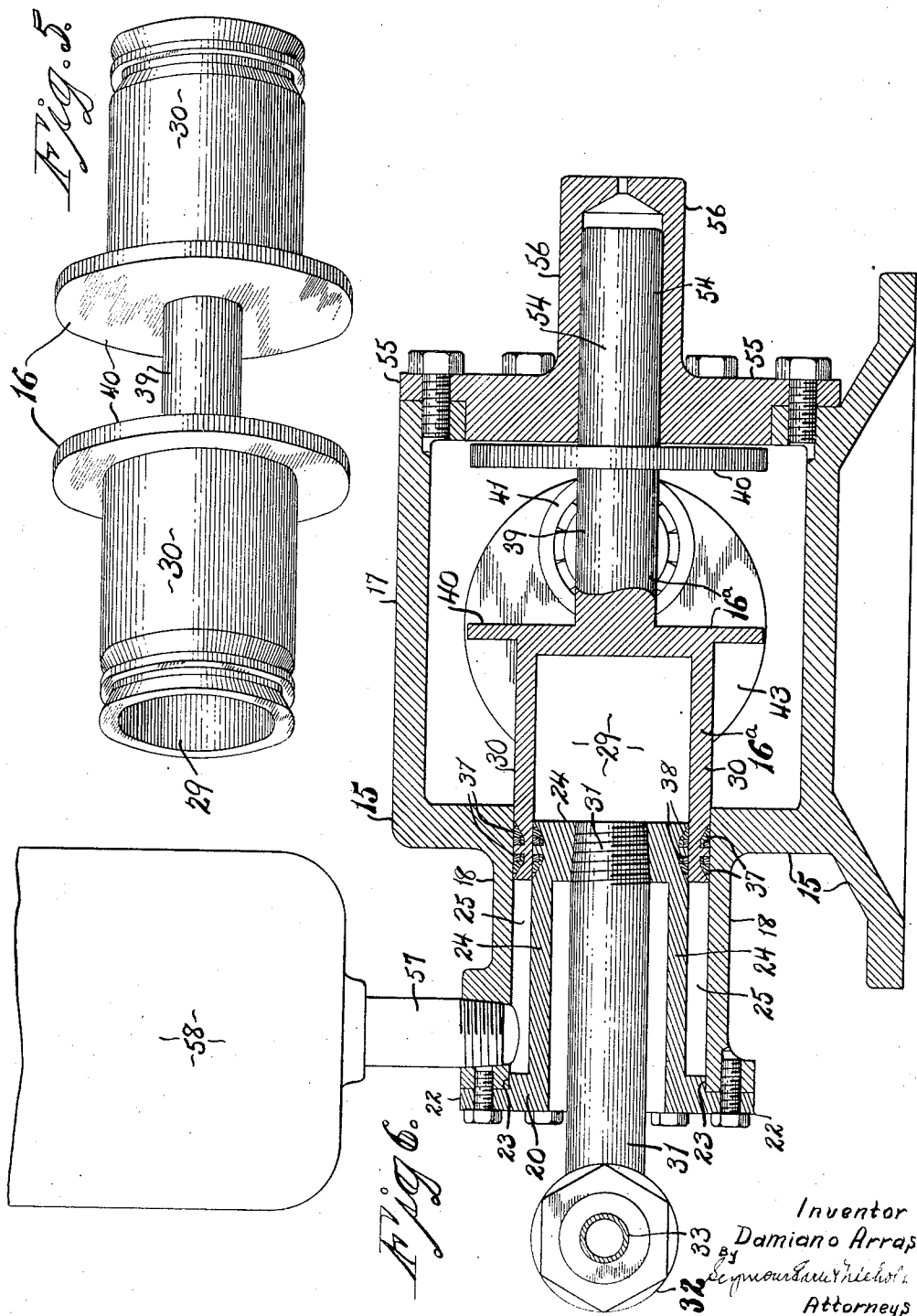
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UNITED STATES PATENT OFFICE

2,354,980

RECIPROCATING PUMP

Damiano Arras, Chester, Conn.

Application February 1, 1944, Serial No. 520,599

5 Claims. (Cl. 103—4)

The present invention relates to improvements in pumps, and more particularly to improvements in reciprocating pumps suitable for pumping a variety of fluids, either liquid or gaseous. The present application constitutes a continuation-in-part of my now abandoned but co-pending application Ser. No. 493,271, filed July 2, 1943.

One of the objects of the present invention is to provide a superior reciprocating pump having simple, reliable and effective means for guarding against the intermixture of the fluid being pumped and the lubricating medium.

Another object of the present invention is to provide a reciprocating pump with a superior construction and arrangement of parts whereby the adequate lubrication of the pistons is assured under all operating conditions.

Another object of the present invention is to provide a superior reciprocating pump designed and adapted to simultaneously pump a plurality of different fluids without appreciably intermixing the same.

Still another object of the present invention is to provide a superior double-acting reciprocating pump wherein the lubricating medium may be utilized as a seal to guard against the escape of the fluid being pumped past the relatively-reciprocating surfaces.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a view in side elevation of one form of double-acting reciprocating pump constructed in accordance with the present invention;

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of one of the head-members;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a perspective view of the double-ended reciprocating plunger-unit; and

Fig. 6 is a view in vertical central-longitudinal section of a modified form of reciprocating pump embodying the present invention.

The structure of Figs. 1 to 5 inclusive

The particular double-acting reciprocating pump illustrated in the figures now under discussion, includes in the main, an outer pump-unit or casing-unit generally designated by the reference character 15 and a double-ended reciprocating inner pump-unit or plunger-unit, generally designated by the reference character 16.

The casing-unit 15 above referred to, includes

a main casing-member 17 formed at its left end with an integral tubular neck 18, and having a neck-member 19 removably coupled to its opposite end in a fluid-tight manner. Securely bolted or otherwise secured in a fluid-tight manner to the outer end of the integral neck 18 is a head-member 20, while similarly secured to the outer end of the removable neck-member 19 is a corresponding head-member 21.

The head-members 20 and 21 above referred to are arranged in axial alignment though in opposition, and each thereof is provided at its outer end with a flange 22. The flange 22 of the head-member 20 is seated against the adjacent outer face of the integral neck 18 while the similar flange of the head-member 21 is seated against the adjacent outer face of the removable neck-member 19. Inwardly of its flange 22, each of the said head-members 20 and 21 is formed with an integral collar 23 and with an integral cup-shaped piston 24 which latter, for purposes of convenience of description, may be referred to as an "inner" piston. The integral collar 23 of a given head-member 20 or 21 serves to concentrically space its integral inner piston 24 from the interior surfaces of the neck 18 of the main casing-member 17 or of the neck-member 19, as the case may be. The spacing just referred to serves to provide two ring-like outer piston-chambers 25—25 respectively surrounding the inner pistons 24—24, as is especially well shown in Fig. 2.

The two ring-like outer piston-chambers 25—25 respectively located at the opposite ends of the pump-structure are, in the instance shown, interconnected by means of piping 26—26. Into an intermediate portion of the said piping is connected a reservoir or container 27. Interposed between the interior of the container 27 and the piping 26 is a spring-pressed check-valve 28 serving to permit the down-flow of fluid from the said container but preventing the movement of fluid in the reverse direction.

The inner pistons 24—24 respectively extend with a sliding fit, into one of two piston-chambers 29—29 which may be aptly referred to as "inner" piston-chambers. The said piston-chambers 29—29 are respectively formed in the opposite ends of the plunger-unit 16 before referred to. Each of the said inner piston-chambers is formed within one of two ring-like pistons 30—30 which, for convenience of description, may be aptly referred to as "outer" pistons. The said outer pistons 30—30 project in opposite direction respectively from the plunger-unit 16 and have their exteriors and interiors proportioned to slidably fit the adjacent one of the outer ring-like piston-chambers 25—25, as is especially well shown in Fig. 2.

Threaded into the end-wall at the inner end of a given one of the inner pistons 24 is the

inner end of one of two corresponding pipes 31—31 each of which is connected at its outer end to the intermediate portion of one of two corresponding valve-housings generally designated by the reference character 32—32.

As thus constructed and arranged, each of the inner piston-chambers 29 is connected to the interior of one of the two valve-housings 32—32 above referred to.

Each of the corresponding valve-housings 32—32 above referred to, has an inlet-pipe 33 connected to one of its ends and an outlet-pipe 34 connected to its opposite end. Mounted within the given valve-housing 32 adjacent the inlet-pipe 33 thereof, is an inwardly-opening spring-pressed inlet check-valve 35 constructed and arranged to admit fluid into the interior of the valve-housing 32 for movement into the inner piston-chamber 29, but serving to prevent the flow of fluid in the reverse direction. Also mounted in the interior of a given valve-housing 32 adjacent the outlet-pipe 34 thereof, is an outwardly-opening spring-pressed outlet check-valve 36 constructed and arranged to permit the egress of fluid from the interior of the said valve-housing, but serving to prevent the re-entry of such fluid therein.

In the particular construction shown, the ring-like outer pistons 30—30 are each provided in their outer peripheries with two (more or less) duplex piston-rings 37—37. Similarly, the inner ends of the respective inner pistons 24—24 are each provided with two (more or less) duplex piston-rings 38—38.

The ring-like outer pistons 30—30 respectively located at the opposite ends of the plunger-unit 16 are integrally connected by a relatively-slender tie-bar 39 resulting in the formation of an annular groove 40 in the central portion of the said plunger-unit. Closely fitting between the respective opposite side-walls of the groove 40 just referred to, is a ball-bearing driving-eccentric 41 mounted upon an eccentric pin or stud 42. The said eccentric pin 42 extends inwardly from a disk-like drive-head 43 formed upon the inner end of a drive-shaft 44 extending radially outwardly into a position accessible for the connection of a motor or the like to its outer end.

The drive-shaft 44 above referred to and the parts carried thereby, are mounted for rotation in a two-part bearing-housing 45 having its flanged inner end bolted or otherwise secured in a fluid-tight manner to one side of the main casing-member 17, as is shown in Figs. 1 and 2.

Interposed between the inner portion of the drive-shaft 44 and the adjacent portions of the bearing-housing 45, is a ball-bearing unit 46. Rigidly mounted upon the drive-shaft 44, in a position outwardly with respect to the ball-bearing unit 46, is a bearing-sleeve 47.

Formed in the inner face of the bearing-sleeve 47 is an annular groove 48 complementing a similar annular groove 49 formed in the adjacent portion of the bearing-housing 45. Jointly fitting into the grooves 48 and 49 just referred to, is a packing-ring 50 formed of leather, felt or other suitable material and serving to guard against the egress of lubricant from within the casing-unit 15.

Formed in the outer face of the bearing-sleeve 47 on the drive-shaft 44 is an annular outwardly-opening groove 51 complementing a similar but inwardly-facing groove 52 formed in the adjacent outer wall of the bearing-housing 45. Jointly interfitting into the grooves 51 and 52 just referred to is a packing-ring 53 serving to guard against

the egress of lubricant outwardly through the outer portion of the said bearing-housing 45.

From the foregoing it will be seen that as the drive-shaft 44 is turned, the plunger-unit 16 will be reciprocated. This reciprocation of the plunger-unit 16 will cause fluid to be alternately drawn into and expelled from each of the inner piston-chambers 29. As the plunger-unit 16 reciprocates, lubricating oil or the like in one ring-like outer piston-chamber 25, will be transferred back and forth to the other outer piston-chamber 25 through the piping 26. Should the oil in the piping 26 and the piston-chambers 25—25 become lessened for any reason, the volume will be made up automatically by oil flowing down from the container 27 past the check-valve 28. In this manner, the various piston-surfaces will be assured of adequate lubrication, and the lubricating oil or the like will serve as a seal to prevent escape of the fluid being pumped from the inner piston-chambers 29—29.

Should conditions make it advisable, the inter-connecting tubing 26 and associated parts may be omitted, and a relatively-small amount of lubricant placed in each of the outer ring-like piston-chambers 25—25. Under these latter conditions, the movement of the ring-like outer piston-chambers 30—30 will serve to distribute such lubricant and minimize wear.

If desired, and as will be obvious to those skilled in the art, one or more of the ring-like outer piston-chambers 25—25 may be utilized for pumping fluid to an extraneous receptacle, independently of the fluid being pumped from the inner piston-chambers 29—29.

The structure of Fig. 6

In Fig. 6 is illustrated a single-ended pump-structure, the main parts of which correspond in substance to the parts of the structure previously described, and where pertinent the parts shown in Fig. 6 bear like reference characters.

As will be noted by reference to Fig. 6, the plunger-unit 16a has only one ring-like piston 30 and has a guide-stem 54 at its opposite end. The right end of the main casing-member 17 is closed by an end-plate 55, rather than having a neck-member such as 19 attached thereto. The end-plate 55 is formed with an integral bearing-sleeve 56 in which the guide-stem 54 of the plunger-unit 16a slides.

The ring-like outer piston-chamber 25 may be connected in any manner desired to provide for the pumping of a fluid independently of the fluid pumped from the inner piston-chamber 29. In the instance shown, the outer piston-chamber 25 is connected by means of a pipe 57 to a container 58, so as to provide for the interchange of lubricant between the said container and the said outer piston-chamber 25. As will be obvious to those skilled in the art, should it be desired to utilize the outer piston-chamber 25 for the pressure-pumping of a fluid to any desired point, a valve-casing such as 32, together with its complementary check-valves, may be attached to the pipe 57.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A reciprocating pump, including in combination: a first pump-unit and a complementary second pump-unit one of which is movable toward and away from the other to effect the pumping of fluid; the said first pump-unit being formed with an inner piston and with a ring-like outer piston-chamber surrounding the said inner piston; the said second pump-unit being formed with a ring-like outer piston and with an inner piston-chamber located within the said ring-like outer piston; the inner piston of the said first pump-unit fitting into the inner piston-chamber within the outer piston of the said second pump-unit and the ring-like outer piston of the said second pump-unit fitting into the ring-like outer piston-chamber of the said first pump-unit; means providing for the inflow and outflow of fluid with respect to the said inner piston-chamber; a fluid-receptacle; means connecting the said fluid-receptacle with the aforesaid ring-like outer piston-chamber and constructed and arranged to provide for the transfer in both directions of lubricant between the said outer piston-chamber and the said fluid-receptacle as one of the said pump-units reciprocates with respect to the other; and means for reciprocating one of the said pump-units with respect to the other.

2. A reciprocating pump, including in combination: a first pump-unit and a complementary second pump-unit one of which is movable toward and away from the other to effect the pumping of fluid; the said first pump-unit being formed with an inner piston and with a ring-like outer piston-chamber surrounding the said inner piston; the said second pump-unit being formed with a ring-like outer piston and with an inner piston-chamber located within the said ring-like outer piston; the inner piston of the said first pump-unit fitting into the inner piston-chamber within the outer piston of the said second pump-unit and the ring-like outer piston of the said second pump-unit fitting into the ring-like outer piston-chamber of the said first pump-unit; means extending longitudinally through the inner piston of the said first pump-unit and providing for the inflow and outflow of fluid with respect to the said inner piston-chamber; a fluid-receptacle; means interconnecting the said fluid-receptacle and the said outer piston-chamber and constructed and arranged to provide for the interchange of fluid in both directions between the said fluid receptacle and the said outer piston-chamber; and means for reciprocating the said second pump-unit with respect to the first first pump-unit.

3. A reciprocating pump, including in combination: a pump-casing and a complementary pump-plunger one of which is reciprocable with respect to the other; the said pump-casing being provided at each of its respective opposite ends with one of two inner pistons each projecting toward the other; the said pump-casing also being formed with two ring-like outer piston-chambers each of which opens toward the other and each of which surrounds one of the aforesaid inner pistons; the said pump-plunger being formed at its respective opposite ends with one of two ring-like outer pistons and with one of two inner piston-chambers respectively located within one of the said ring-like outer pistons; the inner pistons of the said pump-casing re-

spectively fitting into one of the inner piston-chambers within the outer pistons of the said pump-plunger and the ring-like outer pistons of the said pump-plunger respectively fitting into one of the ring-like outer piston-chambers of the said pump-casing; fluid-conducting means interconnecting one of the piston-chambers adjacent one end of the structure with a piston-chamber at the other end of the pump-structure to provide for the interchange of fluid therebetween; and means for causing reciprocatory movement between the said pump-casing and the said pump-casing and the said pump-plunger.

4. A reciprocating pump, including in combination: a pump-casing and a complementary pump-plunger one of which is reciprocable with respect to the other; the said pump-casing being provided at each of its respective opposite ends with one of two inner pistons each projecting toward the other; the said pump-casing also being formed with two ring-like outer piston-chambers each of which opens toward the other and each of which surrounds one of the aforesaid inner pistons; the said pump-plunger being formed at its respective opposite ends with one of two ring-like outer pistons and with one of two inner piston-chambers respectively located within one of the said ring-like outer pistons; the inner pistons of the said pump-casing respectively fitting into one of the inner piston-chambers within the outer pistons of the said pump-plunger and the ring-like outer pistons of the said pump-plunger respectively fitting into one of the ring-like outer piston-chambers of the said pump-casing; means providing for the inflow and outflow of fluid with respect to the two said inner piston-chambers; and fluid-conducting means interconnecting the two said outer piston-chambers with each other and providing for the interchange of lubricant therebetween; and means for causing reciprocatory movement between the said pump-casing and the said pump-plunger.

5. A reciprocating pump, including in combination: a pump-casing and a complementary pump-plunger one of which is reciprocable with respect to the other; the said pump-casing being provided at each of its respective opposite ends with one of two inner pistons each projecting toward the other; the said pump-casing also being formed with two ring-like outer piston-chambers each of which opens toward the other and each of which surrounds one of the aforesaid inner pistons; the said pump-plunger being formed at its respective opposite ends with one of two ring-like outer pistons and with one of two inner piston-chambers respectively located within one of the said ring-like outer pistons; the inner pistons of the said pump-casing respectively fitting into one of the inner piston-chambers within the outer pistons of the said pump-plunger and the ring-like outer pistons of the said pump-plunger respectively fitting into one of the ring-like outer piston-chambers of the said pump-casing; fluid-conducting means interconnecting one of the piston-chambers adjacent one end of the structure with a piston-chamber at the other end of the pump-structure to provide for the interchange of fluid therebetween; and means for reciprocating the said pump-plunger in the interior of the said pump-casing.

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