No. 883,931. PATENTED APR. 7, 1908.

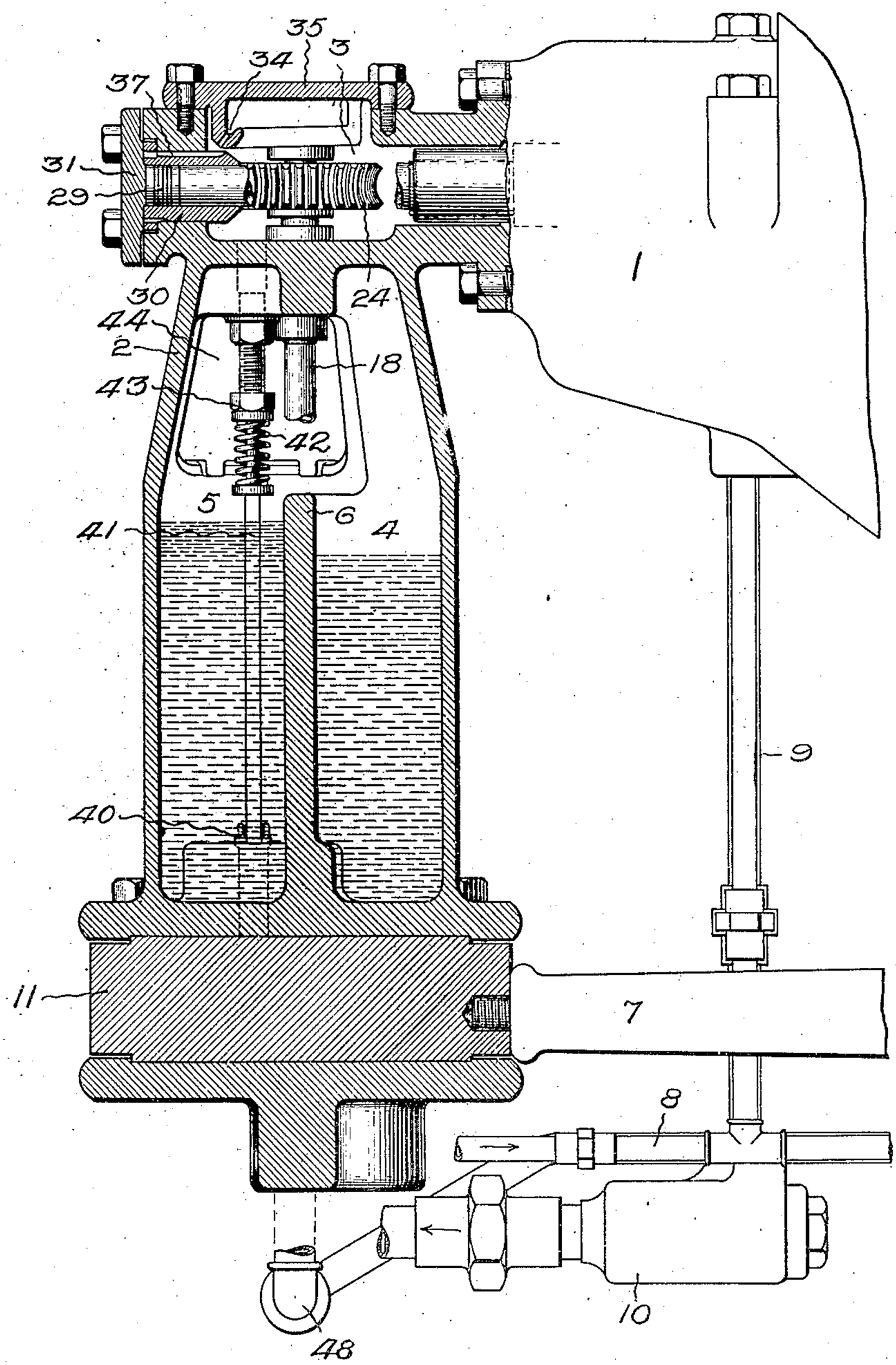
J. G. CALLAN.

GEAR PUMP.

APPLICATION FILED NOV. 11, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

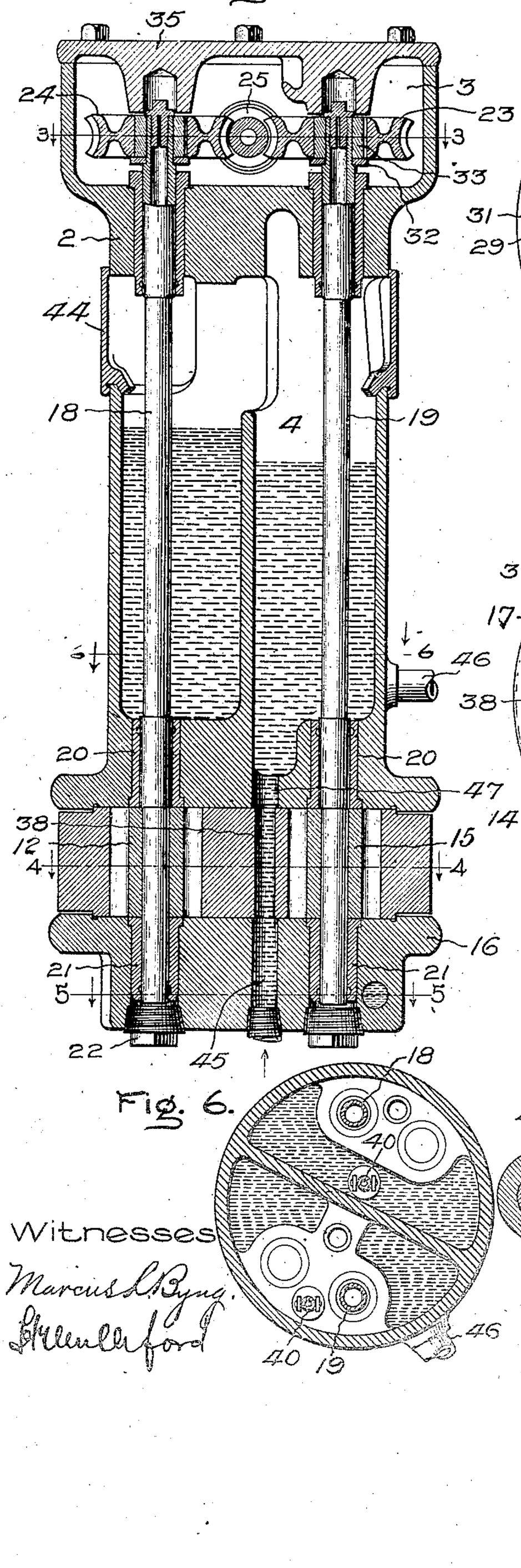

Fig. 3.

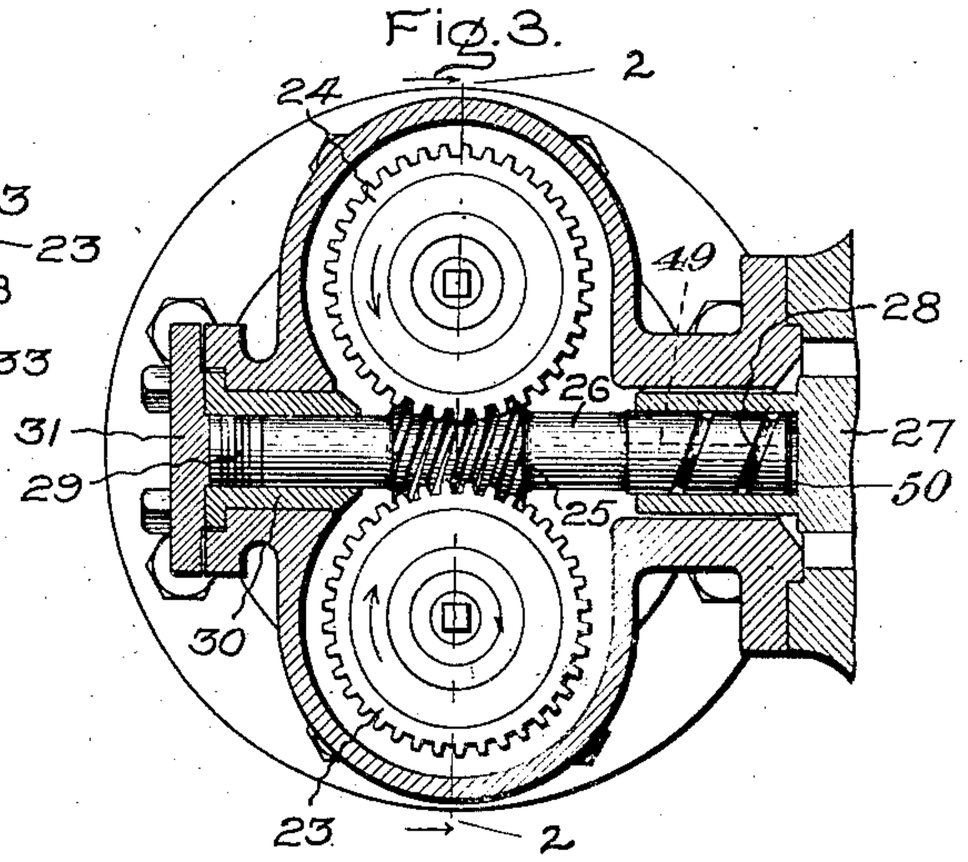

Fig. 4.

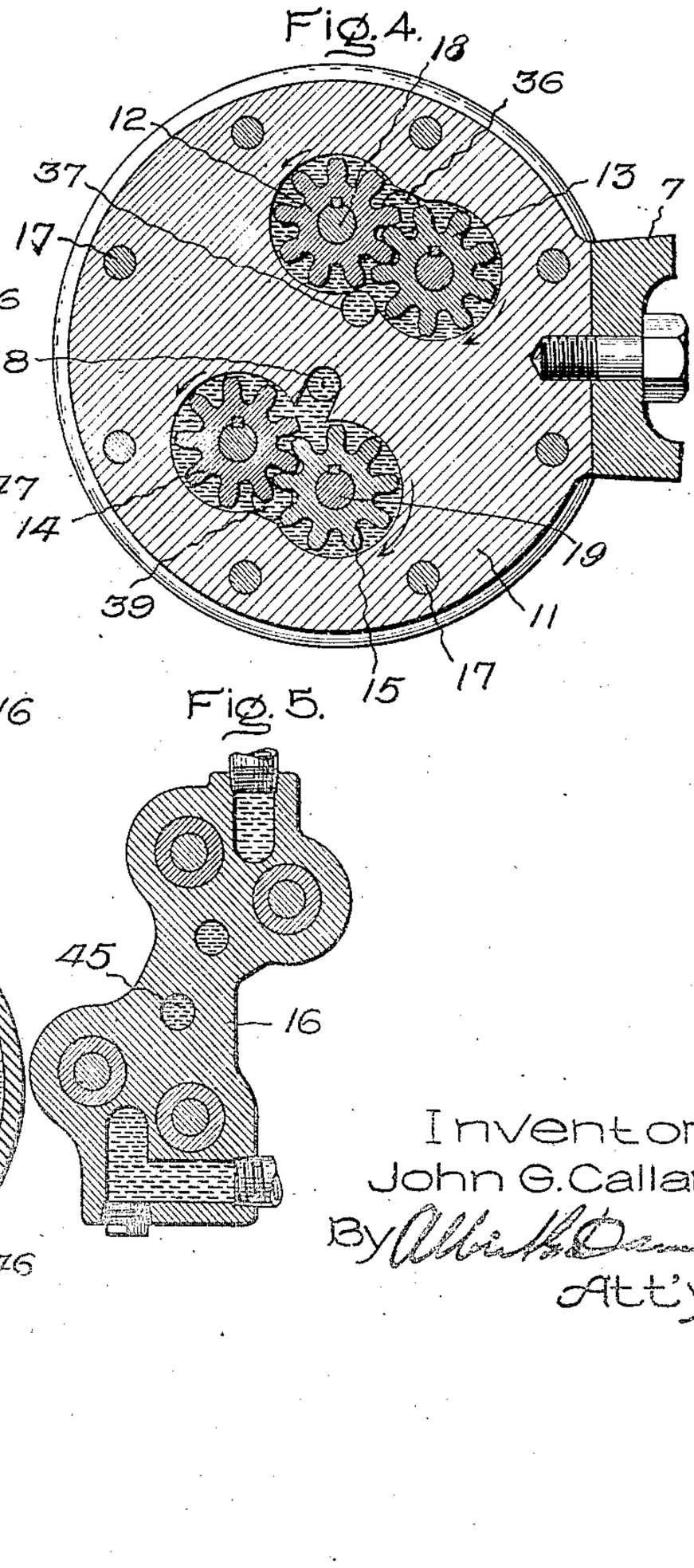

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

JOHN G. CALLAN, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

GEAR-PUMP.

No. 883,931. Specification of Letters Patent. Patented April 7, 1908.

Application filed November 11, 1905. Serial No. 286,832.

To all whom it may concern:

Be it known that I, JOHN G. CALLAN, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Gear-Pumps, of which the following is a specification.

The present invention relates to gear pumps and has for its object to improve their construction.

In the accompanying drawings which illustrate one embodiment of the invention, Figure 1 is a vertical section of the pump shown in position with respect to the bearings of a turbo-generator; Fig. 2 is a vertical section through the pump taken on line 2—2 of Fig. 3 looking in the direction indicated by the arrows; Fig. 3 is a cross section taken on line 3—3 of Fig. 2 looking in the direction of the arrows; Fig. 4 is a section taken on line 4—4 of Fig. 2 looking in the direction of the arrows; Fig. 5 is a section taken on line 5—5 of Fig. 2 looking in the direction of the arrows, and Fig. 6 is a section taken on line 6—6 of Fig. 2 looking in the direction of the arrows.

1 represents a bearing of a generator driven by a turbine or other suitable source of power. Bolted to the end of the bearing is a pump casing 2 containing a horizontally disposed chamber 3 in the upper end to receive the driving gears, and two vertically disposed chambers 4 and 5 which act as reservoirs for the pumps and are connected to the return side of the system. In the present instance the pumps are arranged to supply fluid under pressure to the bearings and also to the valve mechanism; each system being independent in its action of the other. The upper end of the chambers 4 and 5 communicate so that in event of the level of the liquid rising in one chamber above the top of the central partition 6 which acts as a dam, it can flow into the other chamber. To the lower end of the pump structure is connected a bracket 7 that is secured to the frame of the generator or other suitable support.

8 represents the pressure pipe of the pump connected to the bearings, the latter being supplied in multiple, and 9 represents the return pipe connected with the filter 10, the latter discharging into the chamber 4.

Other pressure pipes, such as 48, may lead to the valve mechanism or other parts of the apparatus where fluid under pressure is employed.

11 represents the plate that is chambered to receive the gears 12, 13, 14 and 15. Gears 12 and 13 constitute one pump and gears 14 and 15, the other. The chambered plate is secured between the casing 2 and a detachable head 16 on the underside; the parts are secured in place by vertically extending bolts 17 which pass through the lower head, the chambered plate, and a flange on the lower end of the casing 2. Extending vertically through the pump are shafts 18 and 19, the former driving one pump and the latter driving the other. These shafts pass through suitable packings 20 located above the pump gears, and packings 21 located below the pump gears. The openings in the lower head 16 in line with the shaft are closed by detachable screw threaded plugs 22.

As before stated, the upper end of the casing 2 is provided with a chamber 3, containing gears 23 and 24. These gears mesh with a centrally disposed worm 25; the latter being mounted on a short horizontally extending shaft 26 one end of which extends into the adjacent end of the shaft 27 of the generator or other rotating element and is connected to it by a spline 49 to form a slip joint and permit relative axial movement. It is necessary to provide a clearance at 50 to permit a certain amount of endwise movement between the shafts 26 and 27 in order that the commutator of the generator or the motor may not be injured by the brushes wearing grooves therein. In the periphery of the shaft 26 at the generator end is formed a spiral groove 28, Fig. 3, for lubricating purposes. The left hand end of the shaft 26 is provided with a roller thrust bearing 29 to take up the end thrust on the shaft. The rollers are contained in a sleeve 30 that also acts as a bearing for the worm shaft 26. This sleeve is held in place by a detachable plate 31 that also covers the end of the shaft. In order that the parts may be readily assembled and taken down, a special arrangement for attaching the driving gears 23 and 24 to the vertical shafts is provided. The upper end of each shaft is provided with a shoulder upon which is seated a collar 32. Surrounding the shaft and resting on the collar is a sleeve 33, which is prevented from turning, and is keyed or otherwise secured to the gear. The

sleeve is retained in place by a nut at the top which is screw threaded to the inside of the hollow vertical shaft. By removing the nut and the sleeve, each gear can be shifted horizontally away from the worm 25 and then removed from the shaft. Without such an arrangement it would be necessary to take down a large number of parts before the gears could be removed. The upper chamber 3 is covered by a cap 35 that contains inwardly extending projections, one of which is provided with a gutter 34, Fig. 1, for conveying lubricant from the chamber 3 and discharging it into the groove 37 in the bearing sleeve 30.

The pump gears 12 and 15 are driven by vertically extending shafts, and the gears 13 and 14 mesh with and are driven by said gears. These gears are of the construction ordinarily employed in pumps of this class. It will be noted that the driven gears are situated at one side of the driving gears as distinguished from placing all of the gears in the same straight line. This arrangement has the advantage of producing a pump of minimum diameter.

36 represents the suction port of the pump on the upper side of Fig. 4 and 37 the discharge port. 38 is the suction port for the pump on the lower side and 39 the discharge port.

In pumps of this construction it is desirable to so arrange them that they deliver an amount of liquid in excess of that normally required so that they can take care of any emergency condition which may arise. In order to regulate the passage of liquid through the conduit, each pump is provided on the discharge side with an adjustable relief valve 40, Fig. 6. Each of these valves is provided with a stem 41 as shown in Fig. 1, which stem has a shoulder arranged to receive the lower end of the compression spring 42. The spring is adjusted by means of a nut 43 on the screw threaded stem. Access to this nut is had through the opening in the upper part of the casing, the latter being provided with a curved removable cover 44 having inwardly extending projections on the lower end. The relief valves can be set to give similar or dissimilar pressures at the point of discharge. For many purposes it is necessary to have the pressure of the bearing above that required to actuate the valve mechanism. This is the arrangement which I prefer to employ.

Referring to Fig. 2, 45 represents a conduit in the lower head 16 of the pump which communicates with the return pipe 9 of the bearing or with that from the valve actuating mechanism. This conduit registers with the suction port 38 of one of the pumps. With this arrangement, little or no fluid returning to the pump enters the chamber or reservoir 4 because it is immediately acted upon by the pump and forced out again through the discharge port 39. This arrangement has many advantages, among which is the fact that it creates a substantial suction in the return pipe, the latter being desirable when the lubricant is chilled and does not flow freely. On the other hand there are conditions in which the lubricant returning to the pump is more or less frothy in its nature. When this is the case it is preferable to discharge the fluid directly into the chamber 4 through a conduit such as 46, and from the chamber the fluid flows to the pump through the passage 47. I may use one or both of the arrangements above described at the same time. It depends largely upon the nature of the service to be performed by the pump.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a pump, the combination of a casing containing a chamber which acts as a reservoir, a chambered plate attached to the casing, gears in the chamber in the plate that act as a pump, a port leading from the reservoir to the pump, a driving shaft passing through the reservoir, a second shaft for driving the first, and gearing between the shafts.

2. In a pump, the combination of a plate having a plurality of chambers, a set of gears arranged in each chamber to form an independent pump, parallel shafts for driving the pumps, driving gears on the shafts, and a common shaft which actuates the driving gears.

3. In a pump, the combination of a chambered plate, sets of gears arranged in the plate-chambers to form pumps, a casing containing a chamber, shafts extending from the pump into the casing chamber, gears on the shafts and located in the casing chamber, a driving shaft located at an angle to the pump shafts, and a worm mounted on the driving shaft which is common to and engages the gears on the pump shafts.

4. In a pump, the combination of a chambered plate, gears arranged in the chamber to form a pump, a casing, a pump shaft, a two part driving shaft geared to the pump shaft, and a slip joint between the parts of the driving shaft.

5. In a pump, the combination of a chambered plate, gears arranged in sets in the chambers in the plate, a head on one side of the plate, a casing containing a reservoir on the other, pump shafts extending through

the casing, gears on the ends of the shafts, a worm located between and common to the gears, and a driving shaft for the worm.

6. In a pump, the combination of a casing containing a chamber acting as a reservoir, a chambered plate attached to the casing, gears in the chambered plate forming a pump, a port connecting the suction side of the pump with the reservoir, a port connecting the pump with the return conduit, the said pump being situated between the ports in such a manner as to shunt the reservoir, and a discharge port.

7. In a pump, the combination of a casing containing separate reservoirs, gears arranged in sets to form pumps, each pump having a suction and a discharge port, a relief valve on the discharge side of each pump, parallel shafts connected to the pump gears, worm gears on the pump shafts, and a worm situated between and driving both of the worm gears.

8. In a pump, the combination of a chambered plate, pump gears therein arranged in sets, a head located on one side of the plate, a casing located on the other and containing reservoirs and a chamber, parallel shafts connected to the pump gears and extending through the reservoirs into the chamber, worm gears on the shafts located in the chamber, a worm situated between and engaging the gears, a two part shaft for driving the worm, and a slip joint between the parts.

9. In a pump, the combination of pump gears, a casing therefor, parallel shafts connected to the gears, worm gears mounted on the shafts, a worm arranged between the gears and engaging both, and sleeves situated between the worm gears and their respective driving shafts by means of which the gears can be removed without disturbing the worm.

10. The combination of a pump having rotary pumping members, a casing therefor, a partition in the casing which forms separate supply reservoirs and also acts as a dam, driving shafts for the pumping members, pressure pipes leading from the pumps, and return pipes discharging into the reservoirs.

11. In combination, a bearing containing a driving shaft, a pump casing secured thereto, a gear situated adjacent one end of the shaft and driven thereby, a driving shaft for the pump receiving motion from the gear, and a rotary pump element secured to the last mentioned shaft.

In witness whereof, I have hereunto set my hand this ninth day of November 1905.

JOHN G. CALLAN.

Witnesses:

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HENRY O. WESTENDARP.