G. I. LEONARD.

PUMP FOR LIQUIDS.

APPLICATION FILED MAY 22, 1916.

1,233,069.

Patented July 10, 1917.

2 SHEETS—SHEET 1.

Fig. 1.

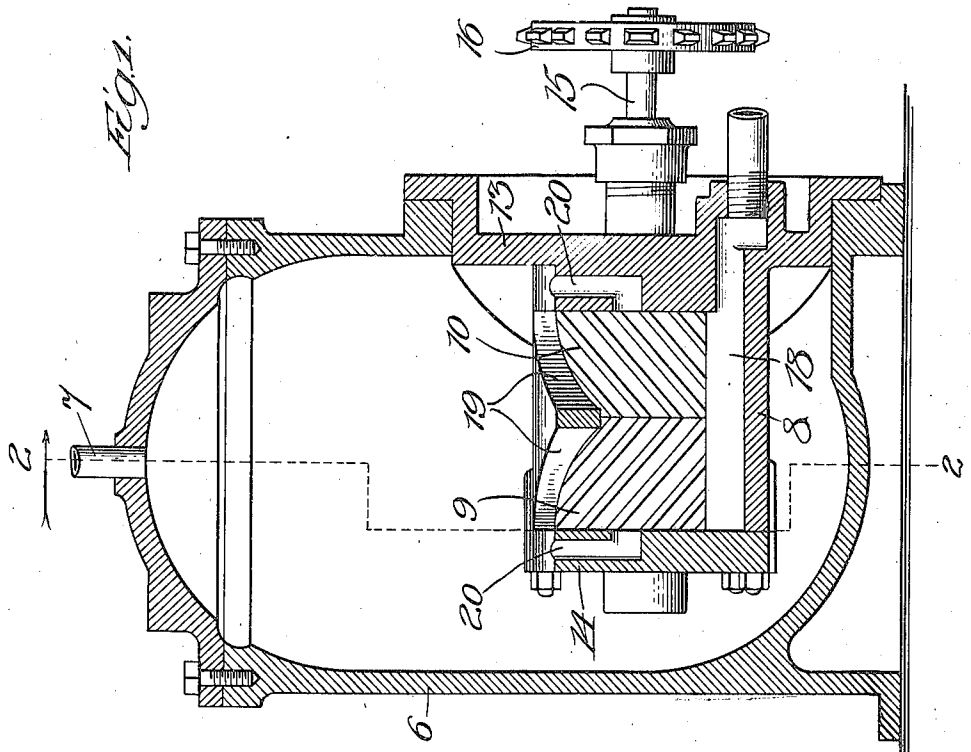
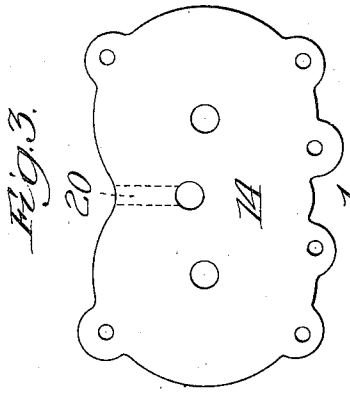


Fig. 3.



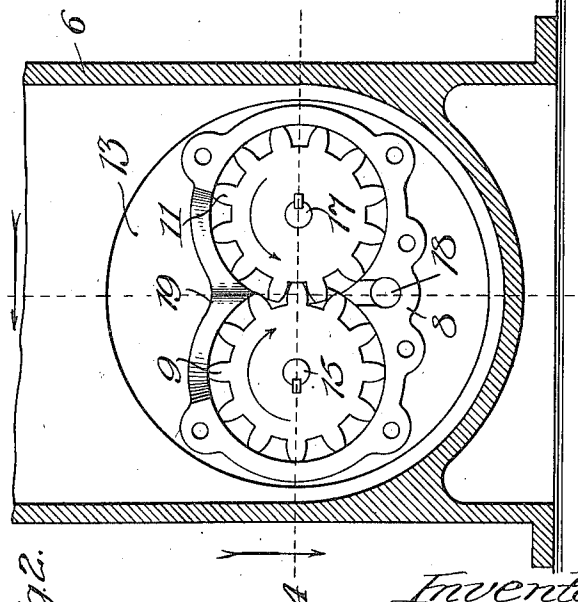


Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 5.

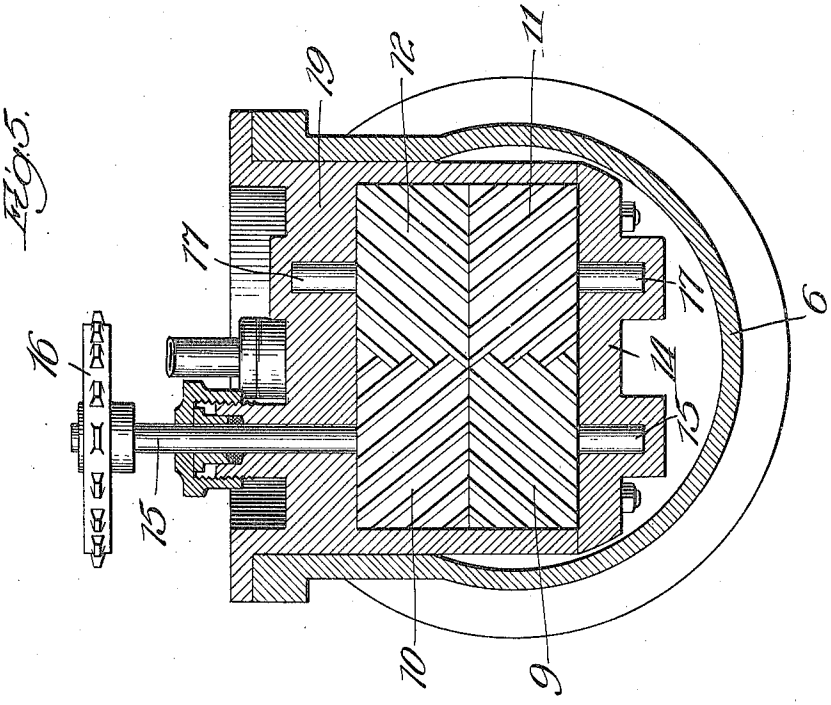
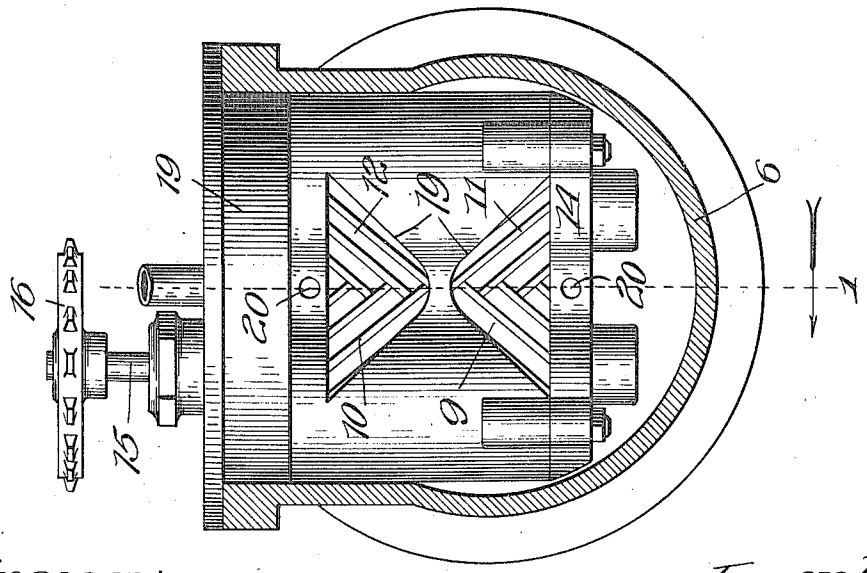


Fig. 4.



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UNITED STATES PATENT OFFICE.

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PUMP FOR LIQUIDS.

1,233,069. Specification of Letters Patent. Patented July 10, 1917.

Application filed May 22, 1916. Serial No. 99,080.

To all whom it may concern:

Be it known that I, GEORGE I. LEONARD, 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 Pumps for Liquids, of which the following is a specification.

This invention relates more particularly to gear pumps for pumping liquids; and my objects, generally stated, are to provide improvements in gear pumps, preferably, though not necessarily, of the herring-bone type whereby the gears of the pumps may be made closely fitting to effect a high degree of efficiency of the pump, with a minimum expenditure of power.

Referring to the accompanying drawings,—Figure 1 is a view in vertical sectional elevation of a pump constructed in accordance with my invention, the section being taken at the lines 1 on Figs. 2 and 4 and viewed in the direction of the respective arrows. Fig. 2 is a view in sectional elevation of the lower portion of the structure shown in Fig. 1, this view being taken at the line 2 on Fig. 1 and viewed in the direction of the arrow. Fig. 3 is a face view of the inner surface of the plate which forms the removal end wall of the gear-case. Fig. 4 is a section taken at the line 4 on Fig. 2 and viewed in the direction of the arrow, this view showing the gear-case in plan; and Fig. 5, a section taken at the line 4 on Fig. 2 and viewed in the direction of the arrow, showing the gear-case in section.

The illustrated embodiment of my invention involves a casing 6 for the pumped liquid, and having an outlet 7, and a gear-case 8 in the casing 6 in which gears 9, 10, 11 and 12 are rotatably mounted, the gear-case in the arrangement shown being provided on the plate section 13 of the side wall of the casing 6 and projecting inwardly therefrom, the inner end wall 14 of the case 8 being a separate plate bolted to the side wall of the case. The gears 9 and 10 are secured in alinement on a shaft 15 journaled at its opposite ends in the end walls of the case 8 and adapted to be driven as through the medium of a sprocket 16. The gears 11 and 12 are similarly positioned on a shaft 17 which extends parallel with the shaft 15 and is similarly journaled. The gears 9, 10, 11 and 12, in the particular construction illustrated, are of the herring-bone type, the teeth of the gears on the shaft 15 converging toward the shaft 17 and the teeth on the other gears converging toward the shaft 15, respectively, and having accurate fit with each other. The inlet for the pump is represented at 18 and is in the form of a slot in, and extending longitudinally of, the bottom of the gear-case 8, this slot opening into the space in the gear-case 8 in which the said gears are located, adjacent the point at which the several gears intermesh.

The main outlets in the gear-case 8, for the liquid which is pumped as hereinafter described, are provided in the top of the case 8, and are preferably of the form as shown at 19. In addition to these outlets other, supplementary, outlets 20 are provided which are located in the end walls of the gear-case 8, these outlets opening through the inner faces of these walls, preferably at a point slightly above the axes of the gears and substantially midway therebetween; or, in other words, at points which are coincident with those points at which the teeth of the gears finally contact, the outlets 20 opening at their opposite ends into the casing 6.

In the operation of the pump described, the gears 9, 10, 11 and 12 rotate in the direction of the arrows in Fig. 2 and as the pockets, formed in the gears between their teeth, move out of intermeshing relation with the opposing gear-teeth, the said intermeshing of the teeth having forced out of these pockets the contents thereof, the liquid in the inlet 18 is sucked into these pockets and thence carried therein up and around the gears as the latter revolve, where it is acted upon by the gear-teeth which intermesh with these pockets. The intermeshing action just referred to is a progressive one, and as the gears continue to rotate the liquid is forced from the inner ends of the pockets toward the ends thereof at the ends of the gears, adjacent the end walls of the gear-case, the liquid in this operation passing upwardly through the openings 19 in the gear-case. As the gears in their progressive movement reach a point where the final points of contact of the gears with each other takes place, a certain amount of the liquid is retained in the pockets against escape through the open-

ings 19. It will be manifest that if this remnant of liquid is permitted to remain in the pockets it will result either in effecting such resistance as to seriously affect the proper operation of the pump, or cause it to become locked. According to the present invention provision is made for relieving this remnant of liquid and this is accomplished through the medium of the outlets 20 into which the final remnant of liquid is squeezed in the movement of the gears to a position in which their teeth are at the final points of contact.

It will therefore be understood from the foregoing that by constructing a pump in accordance with my invention, wherein the liquid operated on by the pump is free to be forced from the gear-case and the final remnant of the liquid entrapped between the gears, is relieved, the pump may be operated with minimum power and with maximum effectiveness.

Inasmuch as liquids are non-compressible, it is necessary that the openings 19 (or the opening if one only is employed) be of such size that the pockets in the gears will be open to the interior of the casing 6 from the moment that the coöperating teeth of the gears intermesh therewith. It is preferred, however, that these outlets be of such shape and size that only those pockets wherein the pressure-producing operation is being performed, be subjected to the pressure of the liquid previously pumped, in order that the amount of surface of the gears that is subjected to the pressure of the liquid in casing 6 will be reduced to the minimum and therefore pressure on the bearings minimized. By making the openings 19 as shown, the desired communication between pockets of the gears and the interior of the casing 6 is effected and the pressure on the bearings is minimized.

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

1. A liquid pump comprising, in combination, a gear-case, and closely fitting intermeshing gears rotatably mounted in said case, said case opening through its side walls at opposite sides of the centers of the gears for inlet and discharge of the liquid being pumped and at the discharge side of said gears through the inner surface of an end of the case coincident with the last points of contact of the teeth of the gears, whereby the remnant of liquid between the intermeshing teeth at their last points of contact is forced from the case, the opening through the side wall of said case and forming said discharge being so shaped as to register substantially with only those parts of the teeth of the gears which are in mesh.

2. A liquid pump comprising, in combination, a gear-case, and closely fitting intermeshing gears rotatably mounted in said case, the teeth on said gears being obliquely disposed and arranged to force liquid supplied thereto in opposite directions toward the end of said case, said case opening through its side walls at opposite sides of the centers of the gears for inlet and discharge of the liquid being pumped, and at the discharge side of said gears through the inner surfaces of the ends of said case coincident with the last points of contact of the teeth of the gears, whereby the remnant of liquid between the intermeshing teeth at their last points of contact at opposite ends of the gears, is forced from said case, the opening through the side wall of said case and forming said discharge being so shaped as to register substantially with only those parts of the teeth of the gears which are in mesh.

GEORGE I. LEONARD.