

Oct. 30, 1928.

1,689,673

J. D. LALOR

GEAR PUMP

Filed June 13, 1925

2 Sheets-Sheet 1

FIG. I.

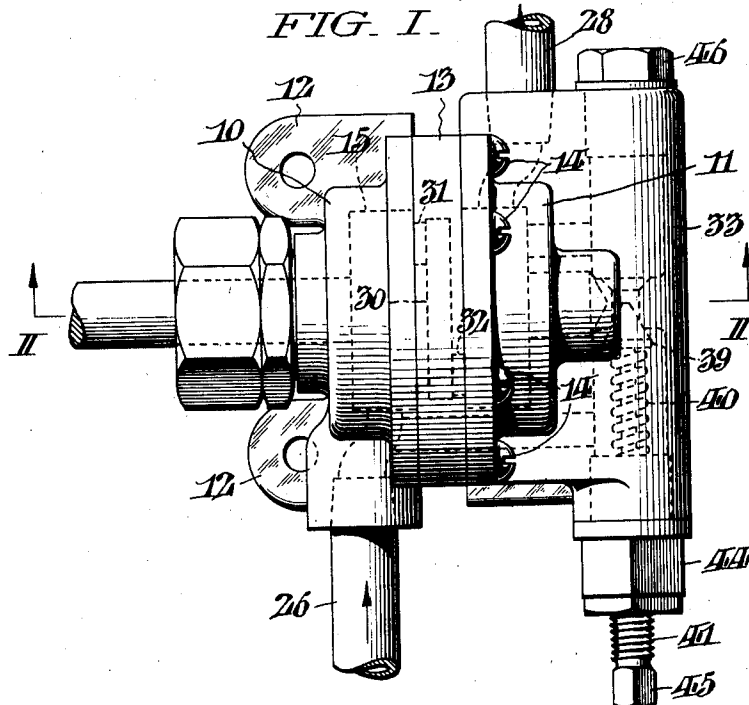
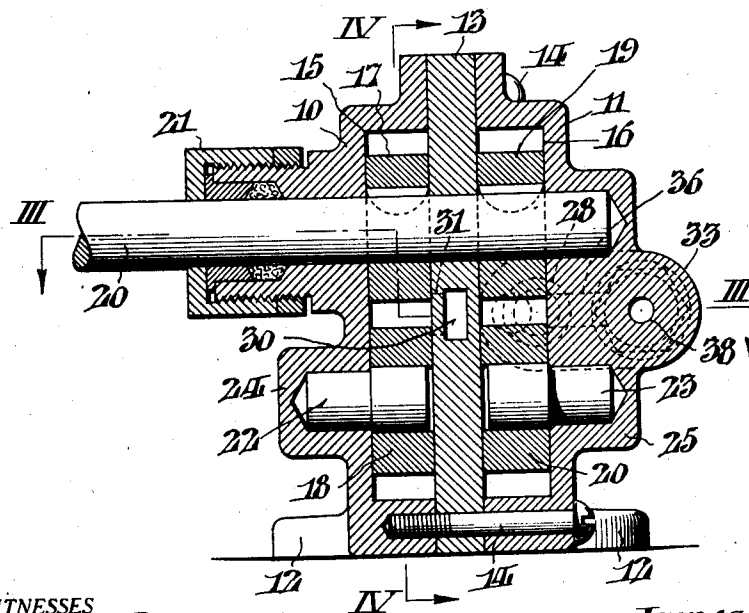


FIG. II.



WITNESSES

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FIG. III.

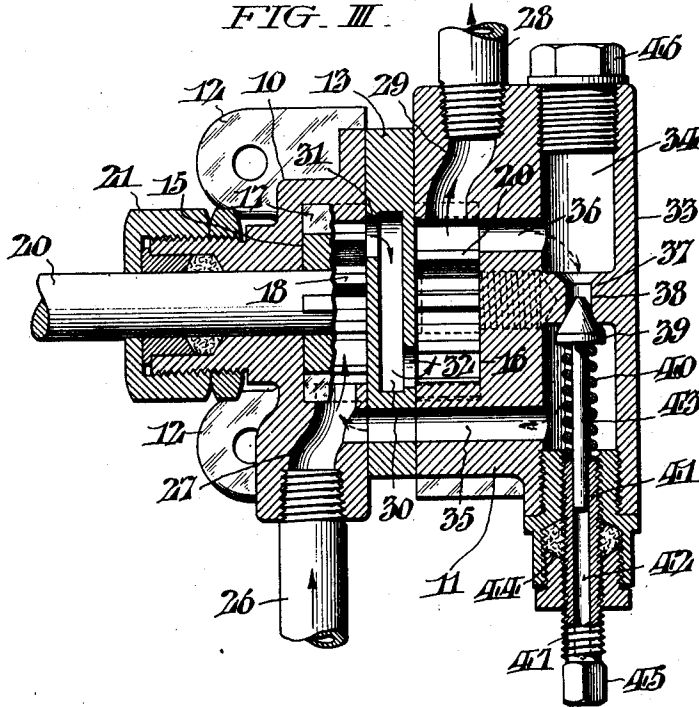
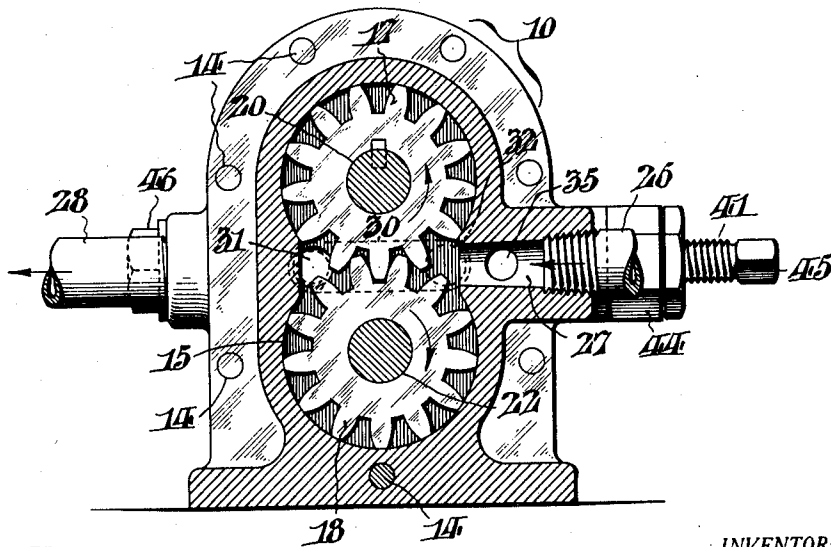


FIG. IV.



WITNESSES

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UNITED STATES PATENT OFFICE.

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GEAR PUMP.

Application filed June 13, 1925. Serial No. 36,860.

This invention relates to pumps of the type employing intermeshing gears for displacing the fluid which is to be moved.

The main object of my invention is to secure in connection with a pump of the character referred to, the advantages accruing to stage-wise or multi-plex action, and to enable this desideratum to be obtained in a uniformly compact structure which is entirely devoid of moving parts and complicity other than the fluid-displacing gears themselves, so that the highest operative efficiency is assured, and that absolute reliance may be placed upon it for continued service in practice.

A further object is to afford such a pump protection against injury likely to result from back pressure induced at times when used in installations designed for high velocity fluid delivery, by providing for local circulation of the fluid within the pump under control of suitable automatic means when back pressure becomes excessive.

With reference to the drawings which show a convenient embodiment of my invention, Fig. I is a plan view of a pump structure having the attributes mentioned.

Fig. II is an axial section taken as indicated by the arrows II—II in Fig. I.

Fig. III is a staggered sectional view through diverse planes as indicated by the arrows III—III in Fig. II; and,

Fig. IV is a transverse section viewed in the direction of the arrows IV—IV in Fig. II.

The pump herein depicted is designed for duplex or two-stage action, its casing comprising two complementary parts 10, 11, each provided with suitably pierced feet 12 for the purpose of securing the structures in place; and a partition section 13 which is interposed between the parts 10, 11, the whole being secured together by screws 14. The casing parts 10 and 11 are recessed as at 15, 16 for accommodation of gear sets comprising intermeshing fluid-displacing pinions 17, 18, and 19, 20, respectively, the corresponding gears 17, 19 being keyed on a common shaft 20 which extends to the exterior of the casing for power application, through a stuffing box 21; while the gears 18, 20 are each held to rotation by axially-aligned studs 22, 23 suitably journaled in

offset bosses 24, 25 formed in said casing parts 10, 11 respectively. The fluid to be pumped is received through a pipe 26 which communicates with the suction or intake space 27 adjacent one side of the gear set 17, 18; and delivery from the pump is by way of a pipe 28 leading from the pressure space 29 adjacent the opposite side of the second gear set 19, 20, see Fig. III. The delivery side of the first gear set 17, 18 is connected with the intake side of the second gear set by way of a longitudinal passage 30 in the partition 13, said passage communicating laterally with said sides by way of ports 31, 32.

In the operation of the pump, the liquid drawn through the pipe 26 is advanced by the first gear set 17, 18 for discharge through the port 31 into the passage 30 of the partition, and from the latter, by way of the port 32, to the second gear set 19, 20 whereby it is given a further impulse and conducted through the space 29 into the delivery pipe 28. By thus using two independent fluid-displacing gear sets I am able to substantially double the pressure of delivered fluid without complicity of parts or the addition of any movable parts except the displacing gears themselves. Obviously such sequential compounding may be extended indefinitely within the meaning of the appended claim.

As a means to protect the pump against injury in the event of back pressure therein, I make provisions as follows:

Referring more particularly to Fig. III it will be noted that the casing section 11 has an integral cylindric offset 33 whose axial bore 34 communicates, by way of lateral passages 35, 36 respectively, with the suction space 27 at the intake side of the first gear set 17, 18 and the space 29 at the delivery side of the second or last gear set 19, 20. The passage 34 is, however, obstructed by a transverse partition 37 pierced by a port 38 which is normally held closed by a valve 39 under the influence of a compression spring 40. At one end, this spring 40 butts against a screw 41 which is axially bored as at 42 to take the stem 43 of the valve 39, and which extends through a stuffing box 44 to the exterior of the casing where it is provided with a polygonal head

45 by which it may be conveniently turned to vary the power of said spring 40. The end of the bore 34 opposite that occupied by the stuffing box 44, is closed by a removable cap screw 46 which permits access to enable removal of any clogging matter that might collect in said passage. By the provisions just described it will be seen that in the event of back pressure upon the pump in a direction counter to the intended flow there-through, the liquid will be circulated locally, as indicated by the dotted arrows in Fig. III, by way of the passages 36, 34, 35, between the delivery side of the second gear set 19, 20 and the intake side of the first gear set 17, 18, the valve 39 yielding automatically to permit such action when the pressure is sufficient to overcome the adjusted compression of the spring 40.

20 Having thus described my invention, I claim:

A multi-stage gear pump comprising complementary parts with an intervening ported partition affording housing for independent fluid-displacing gear sets, said partition having a passage therethrough con-

necting the intake side of the high pressure stage and delivery side of the low pressure stage of the pump sequentially and continuously, a by-pass between the intake space adjacent the low pressure gear set and the delivery space proximate the high pressure gear set having an obstructive ported partition, a spring-pressed relief valve in the by-pass normally preventing flow through the ported partition but adapted to automatically establish local circulation between the intake and delivery sides aforesaid for relief of back pressure on the pump, a stuffing box threaded in the wall of said by-pass, a tubular adjusting screw threaded in the stuffing-box, said valve including a stem afforded guidance in said tubular adjusting screw, and a spring interposed between said valve and said adjusting screw, whereby provision is made for varying the power of the spring and for removal of the valve as a unit.

In testimony whereof I have hereunto signed my name at Philadelphia, Pennsylvania, this 4th day of June, 1925.

JAMES D. LALOR.