June 5, 1934. G. L. KOLLBERG 1,961,769

OIL PUMP

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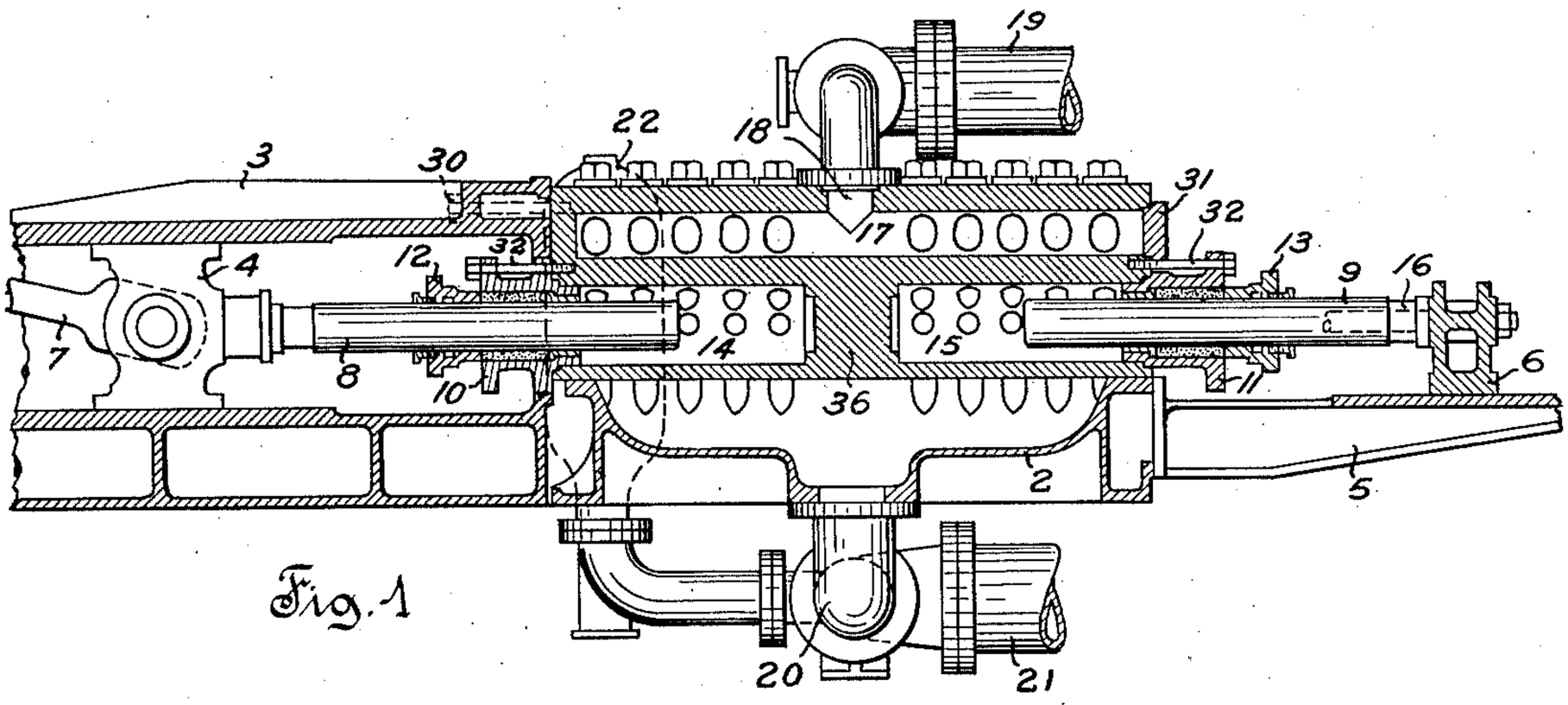

Fig. 1

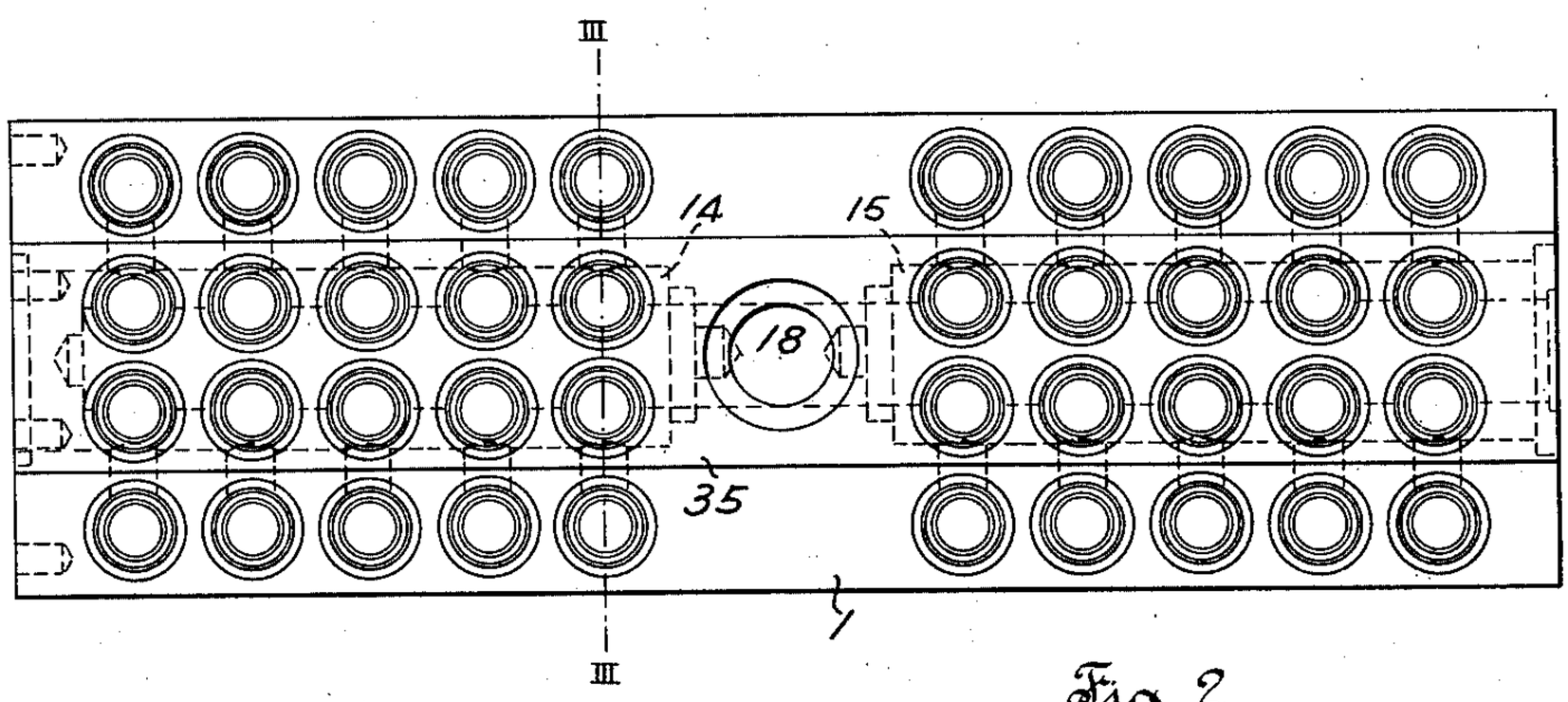

Fig. 2

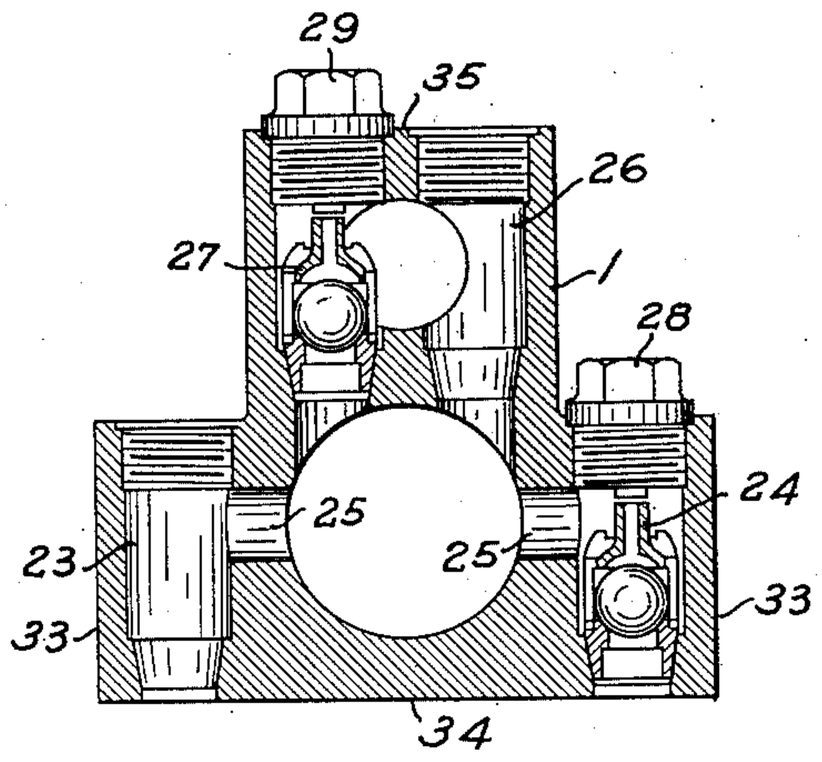

Fig. 3

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OIL PUMP

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9 Claims. (Cl. 103—171)

This invention relates in general to the art of pumps and relates more specifically to a divided suction type of plunger pump having a one-piece pump body machined from a single rolled steel billet or forging.

An object of the invention is to provide a divided suction type of high pressure pump having a one-piece pump body machined from a rolled steel billet or forging thereby assuring a perfectly sound and homogeneous material with exact distribution of metal and reducing the pressure joints to a minimum.

Another object of the invention is to provide a double acting high pressure pump having tandem plunger chambers and divided suction with short direct passages between the plunger chambers and the inlet and discharge valve chambers.

Another object of the invention is to provide a one-piece plunger pump body having divided suction wherein the cross-connection passages for the inlet valve chambers are formed from within the plunger chamber thereby eliminating several undesirable plugged openings, thus providing greater safety and less fluid leakage than exists when the construction involves a number of passageways plugged at one side, with constantly existing danger of the plugs being blown out or causing a fluid leakage, if they are improperly seated in the threaded openings provided for them.

Another object of the invention is to provide a high pressure divided suction type of plunger pump having a one-piece pump body machined from a rolled steel rectangular billet or forging and having a single cast iron suction chamber serving both sides of the pump body.

Another object of the invention is to provide a double-acting plunger pump having axially spaced plunger chambers and a longitudinal discharge chamber common to the plunger chambers, with an outlet from the intermediate portion of the discharge chamber.

Another object of the invention is to provide a horizontal, double-acting, steel, plunger pump that is simple and compact in construction and therefore economical in construction and of occupying space.

Other objects and advantages of the present invention will become apparent from a reading of the specification and of the drawing forming a part thereof and on which the same reference numerals are used to designate the same parts throughout the various views.

Fig. 1 is a central longitudinal vertical sectional view of a high pressure pump constructed according to this invention.

Fig. 2 is an enlarged top view of the steel pump body.

Fig. 3 is a vertical transverse sectional view taken along the line III—III of Fig. 2.

Referring to Fig. 1 it will be seen that the pump consists essentially of a pump body 1, a suction chamber 2 secured to the bottom 34 of pump body 1, a back cross-head slide 5 secured to one end of the suction chamber frame and a front cross-head frame 3 secured to an end of pump body 1 by bolts 30. The front cross-head frame 3 is provided with a slide preferably integral with the frame for supporting and guiding a front or main cross-head 4 to which a connecting rod 7 of a driving mechanism is shown pivotally connected. Rigidly connected to cross-head 4 is a front plunger 8 of somewhat smaller diameter than that of the front plunger chamber 14, formed in pump body 1, in which it is axially received for reciprocation. A similar plunger 9 is secured to back cross-head 6 which in turn is mounted upon and guided by slide 5. Plunger 9 is axially received and reciprocates within a rear plunger chamber 15 in axial alignment with plunger chamber 14. The end faces of pump body 1 are preferably provided with scored annular seats for receiving the seat portions of front and rear stuffing boxes 10 and 11, respectively. These stuffing boxes receive packing glands 12 and 13 for sealing the plunger openings against leakage. The plunger pump of this disclosure is therefore of the outside packed kind as distinguished from the inside packed kind in which the arrangement of this invention could not be employed. Stuffing boxes 10 and 11 may be secured by means of annular series of bolts 32 passing through annular flanges on the stuffing boxes and which are threaded into the ends of pump body 1 as shown. It will be further observed that the stuffing box 10 is provided with two annular flanges one of which is closely received within an identical aperture in the pump body end of cross-head frame 3. This permits of a quick, accurate alinement of the pump body 1 with the frame 3 by telescoping the plunger chamber 14 over the corresponding projecting end of the stuffing box 10. The arrangement of stuffing boxes 10 and 11 and their ready removability from pump body 1 is especially appreciated when occasion arises when it is desirable to use a different diameter plunger. In such a case it would only be necessary to remove the old stuffing box and replace it with one made to receive a plunger of the desired diameter.

Referring to Figs. 2 and 3 it will be seen that pump body 1 is T-shaped in cross-section and has straight machined faces, the leg of the T extending upwardly when the pump is assembled. Pump body 1 is machined from a rolled steel rectangular billet or forging just large enough to permit of machining the same to the desired T size. Reference numerals 33, 34 and 35 are used to designate the sides, bottom and the top re-

spectively, of machined pump body 1. Tie rods or plunger distance rods 16 have their ends connected to front and back cross-heads 4 and 6 in such a manner that their intermediate portions are held in close parallel relation to the sides 33 of pump body 1. These tie rods constitute the greatest transverse dimension of the pump as the suction chamber 2 and the pump supporting frame formed integral therewith and to which slide 5 is attached may easily be designed to be within the space taken by the bottom 34 of pump body 1.

Suction chamber 2 is bolted to the bottom 34 of pump body 1 and may be of cast iron, since the joints formed by it and the bottom 34 of pump body 1 are not under discharge pressure. It will be noted that a single suction chamber is provided which serves both sides of pump body 1 or in other words both rows of inlet valve chambers at opposite sides of a plunger chamber and which also serves both plunger chambers 14 and 15. This is another important feature of this invention. Suction chamber 2 is further provided with an inlet 20 in its central portion, which is connected with a liquid supply conduit 21 and an air casing 22 of bottle shape, the purpose of the latter being to provide an air cushion on the supply line adjacent the pump to prevent surges and to maintain a positive flow of liquid, especially when a pressure of a few pounds is maintained on the supply line, as is frequently done. These latter elements, save possibly the air casing 22, as shown, may be positioned below the level of the foundation or floor on which the pump is to be mounted. All the above named features of the pump herein disclosed are conducive to a saving of space in the room or building in which it is to be installed, a factor that is very important from an engineering as well as from a financial standpoint.

Directly above the plunger chambers 14 and 15 and located in the leg portion of the T-shaped pump body 1 is a discharge chamber 17 shown cylindrical in form and extending from the back end face to a point near the opposite end face. A plug 31 engaging with a scored seat in the former face of pump body 1 and secured thereto by any suitable means, as by bolts, is used to close off chamber 17 at this end. A single discharge outlet 18 from the intermediate portion of discharge chamber 17 is connected with a larger discharge conduit 19. In order that this arrangement of discharge outlet and discharge chamber may be attained, pump body 1 is spread out in a lengthwise direction so as to leave a desirable amount of body material 36 between the inner end walls of plunger chambers 14 and 15, directly below outlet 18 to properly carry the connected discharge conduit 19. This arrangement shortens the discharge paths in pump body 1 and also dispenses with undesirable discharge conduit connections to an end of the discharge chamber as has been the practice. This arrangement is another important feature of the disclosed pump.

Now having described the general arrangement of pump elements the basic features, namely, the location and arrangement of inlet and discharge valve chambers 23 and 26, respectively in one-piece pump body 1, will be described in detail. Although the pump shown has ten inlet and ten discharge valve chambers for each plunger chamber, this invention is not limited to a pump having this number of valve chambers or any particular number of such chambers, since their number may well vary in pumps of different capacities. For a given capacity of pump, however, it is good engineering practice to extend the number of valves rather than to extend the sizes of a lesser number, since the noise of operation of the pump is thereby reduced to a minimum. The inlet valve chambers are provided in pairs at opposite sides of plunger chambers 14 and 15 by drilling non-uniform bores in directions perpendicular to bottom 34 of pump body 1. In these non-uniform bores are located the inlet valves 24 preferably and as shown of the ball type with the usual guards or cages to prevent displacement. At intermediate portions of these inlet valve chambers 23, are inlet cross-connection passages 25 which complete short direct divided suction paths for the pump. The upper ends of chambers 23 are closed by screw plugs 28 facilitating removal of the inlet valves 24 for replacement or repair.

The similarly formed discharge valve chambers 26, located in spaced parallel relation with the inlet valve chambers 23 and in transverse alinement with the pairs of the latter chambers, are provided by drilling downwardly through the leg portion of the T-shaped pump body 1, to cut the surfaces of the respective plunger chambers circumferentially adjacent the cross-connections 25. The upper enlarged ends of chambers 26 are likewise closed by screw plugs 29 facilitating removal of discharge valves 27, which are also shown of the ball type, for replacement or repair. These discharge valves 27 are arranged in two sets one on each side of the center line and each set independently receiving the fluid which has been admitted to the plunger chamber past the corresponding set of inlet valves 24. This arrangement provides the shortest and most direct passage for the fluid thereby reducing friction and insuring that the velocity of the discharge is not higher than the velocity through the inlet valves. By drilling discharge valve chambers 26 close together so that they cut the wall of discharge chamber 17, cross-connections therefrom are dispensed with and the upper central portion of pump body 1 may therefore also be reduced in width giving the T-shape thereto.

The cross-connections 25 are provided in pump body 1 preferably by drilling from within the pump chambers but this invention is not intended to be limited to a specific means employed in forming the cross-connections 25 from within the pump chambers. These connections can actually be formed in less time by drilling from within the chambers than what was required in drilling from the outside through a wall of the pump body, which latter method furthermore would require the plugging of undesirable openings having no function or utility after the connections have been formed.

It is apparent that by simple extensions of the piping connections that a plurality of pumps may be operated together, as in duplex or triplex designs. And among the many applications of the pump herein disclosed is high pressure pipe line pumping of oil in the oil field industry.

It should be understood that it is not desired to limit the invention to the exact details of construction herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. In a divided suction type of plunger pump, a one-piece pump body having a cylindrical plunger chamber, said body having a pair of inlet valve chambers on opposite sides of said plunger

chamber, passages formed within said pump body, to effect communication between said plunger chamber and each of said valve chambers, said passages opening into said plunger chamber in portions thereof located in a diametrical plane passing through the plunger chamber and neither of said passages piercing the exterior boundary of said body.

2. In a divided suction type of plunger pump, a one-piece pump body machined from a rectangular rolled steel billet or forging and having a cylindrical plunger chamber, said body being provided with a pair of inlet valve chambers on opposite sides of said plunger chamber, passages formed within said pump body, to effect communication between said plunger chamber and each of said valve chambers, said passages opening into said plunger chamber in portions thereof located in a diametrical plane passing through the plunger chamber.

3. In a double-acting, divided suction type of plunger pump, a one-piece pump body having a plurality of cylindrical plunger chambers, said body being provided with a pair of inlet valve chambers for each plunger chamber, the valve chambers of each pair being on opposite sides of said plunger chambers, passages formed within said pump body, to effect communication between said plunger chambers and each of the inlet valve chambers of the respective pairs, said passages opening into the respective plunger chambers in portions thereof located in a diametrical plane passing through the plunger chambers and neither of said passages piercing the exterior boundary of said body.

4. In a double-acting, divided suction type of plunger pump, a one-piece pump body machined from a rectangular rolled steel billet or forging and having a plurality of cylindrical plunger chambers, said body being provided with a pair of inlet valve chambers for each plunger chamber, the valve chambers of each pair being on opposite sides of said plunger chambers, passages formed within said pump body, to effect communication between said plunger chambers and each of the inlet valve chambers of the respective pairs, said passages opening into the respective plunger chambers in portions thereof located in a diametrical plane passing through the plunger chambers.

5. In a divided suction type of plunger pump, a one-piece pump body machined from a rectangular rolled steel billet or forging and having a longitudinal, cylindrical plunger chamber, said body being provided with a pair of inlet valve chambers on opposite sides of said plunger chamber, passages formed within said plunger chamber, to effect communication between said plunger chamber and each of said valve chambers, said passages opening into said plunger chamber in portions thereof located in a diametrical plane passing through the plunger chamber, neither of said passages piercing the exterior boundary of said body, and a single cast iron suction chamber secured to said pump body and communicating with said plunger chamber through each of said inlet valve chambers.

6. In a double-acting, divided suction type of plunger pump, a one-piece pump body machined from a rectangular steel billet or forging and having tandem, longitudinal, cylindrical plunger chambers, said body being provided with a pair of inlet valve chambers for each plunger chamber, the valve chambers of each pair being on opposite sides of said plunger chambers, passages formed within said pump body, to effect communication between said plunger chambers and each of the inlet valve chambers of the respective pairs, said passages opening into the respective plunger chambers in portions thereof located in a diametrical plane passing through the plunger chambers, neither of said passages piercing the exterior boundary of said body, and a single cast iron suction chamber secured to said pump body and communicating with said plunger chambers through the pairs of inlet valve chambers.

7. In a divided suction type of plunger pump, a one-piece pump body having a cylindrical plunger chamber, said body having a pair of inlet valve chambers on opposite sides of said plunger chamber, passages formed within said pump body to effect communication between said plunger chamber and each of said valve chambers, said passages opening into said plunger chamber in portions thereof located in a diametrical plane passing through the plunger chamber, neither of said passages piercing the exterior boundary of said body, and said body further having a pair of discharge valve chambers, each of the discharge valve chambers being located closely adjacent to its corresponding inlet valve chamber.

8. A one-piece plunger pump body, comprising an elongated block of steel having formed therein two independent plunger chambers bored longitudinally in axial alinement from the respective ends thereof, a plurality of discharge valve chambers drilled vertically from the top of said block into communication with said plunger chambers, a common discharge chamber bored longitudinally of said block above said plunger chambers and intersecting each of said discharge valve chambers, an outlet opening extending from the top of said block at the middle thereof into communication with said discharge chamber, a plurality of inlet valve chambers drilled vertically in said block at the sides of and spaced from said plunger chambers, and drilled inlet ports communicating only between said inlet valve chambers and said plunger chambers.

9. A one piece plunger pump body, comprising an elongated block of steel having formed therein two independent plunger chambers bored longitudinally in axial alinement from the respective ends thereof, a plurality of discharge valve chambers drilled vertically from the top of said block into communication with said plunger chambers and arranged in pairs disposed in planes transverse to said plunger chambers, a common discharge chamber bored longitudinally of said block above said plunger chambers between and intersecting the valve chambers of each of said pairs, an outlet opening bored from the middle of the top of said block into communication with said discharge chamber, a plurality of inlet valve chambers drilled vertically in said block at the sides of and spaced from said plunger chambers and arranged in pairs in the transverse planes of said discharge valve pairs, and drilled inlet ports communicating only from said inlet valve chambers to said plunger chambers.

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