Aug. 13, 1935. J. M. SHARP 2,011,304

DOUBLE ACTING PISTON PUMP

Filed April 18, 1934 2 Sheets-Sheet 1

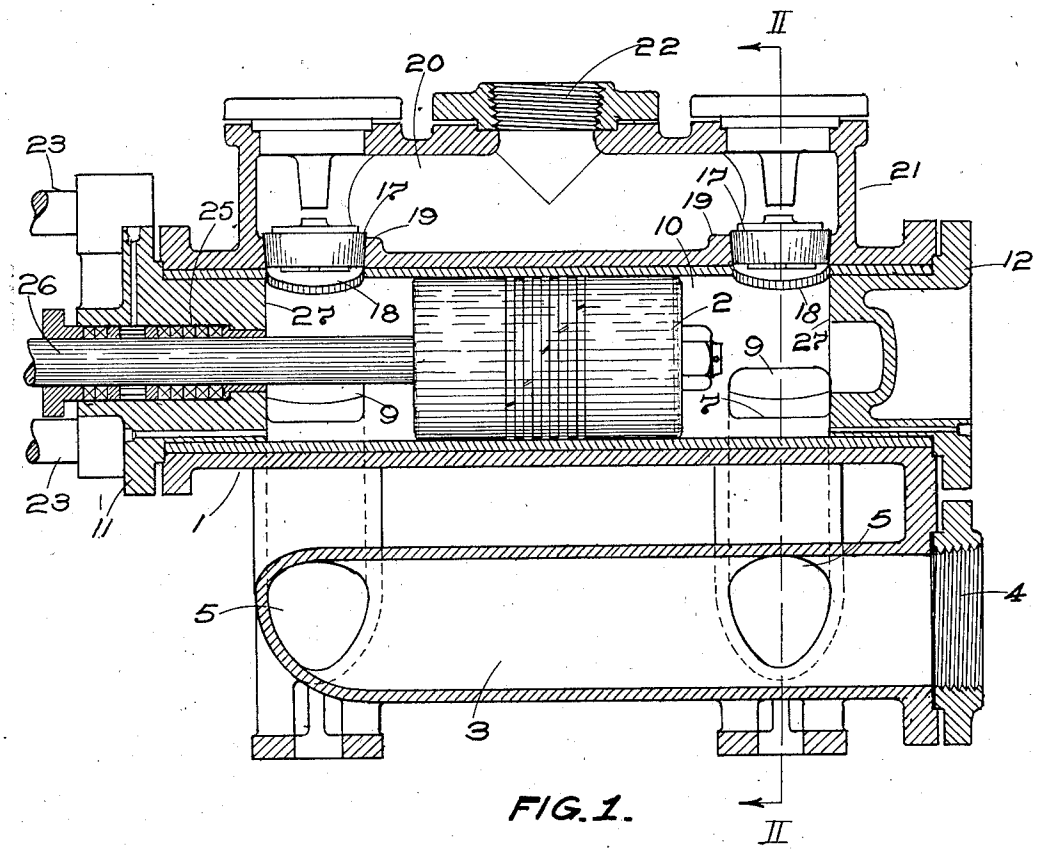

FIG. 1.

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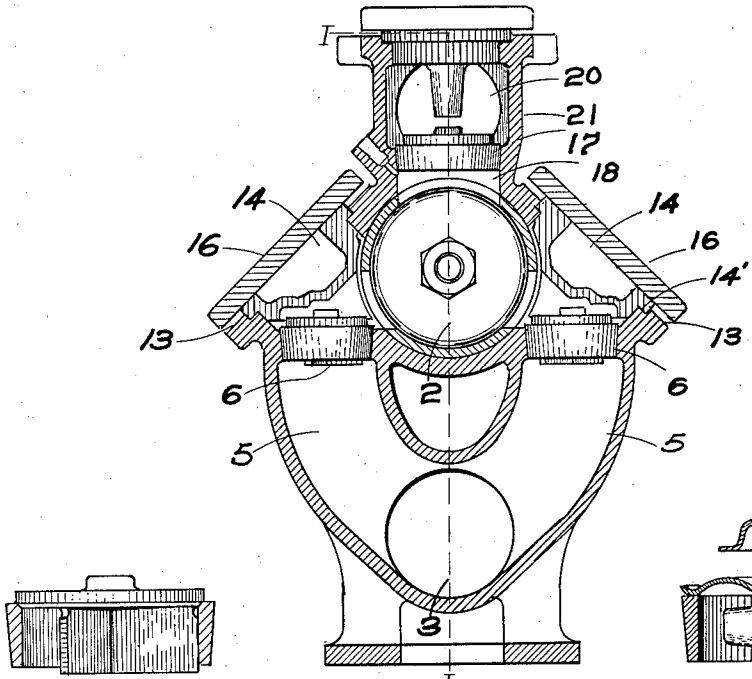

FIG 4

FIG. 2

FIG. 5.

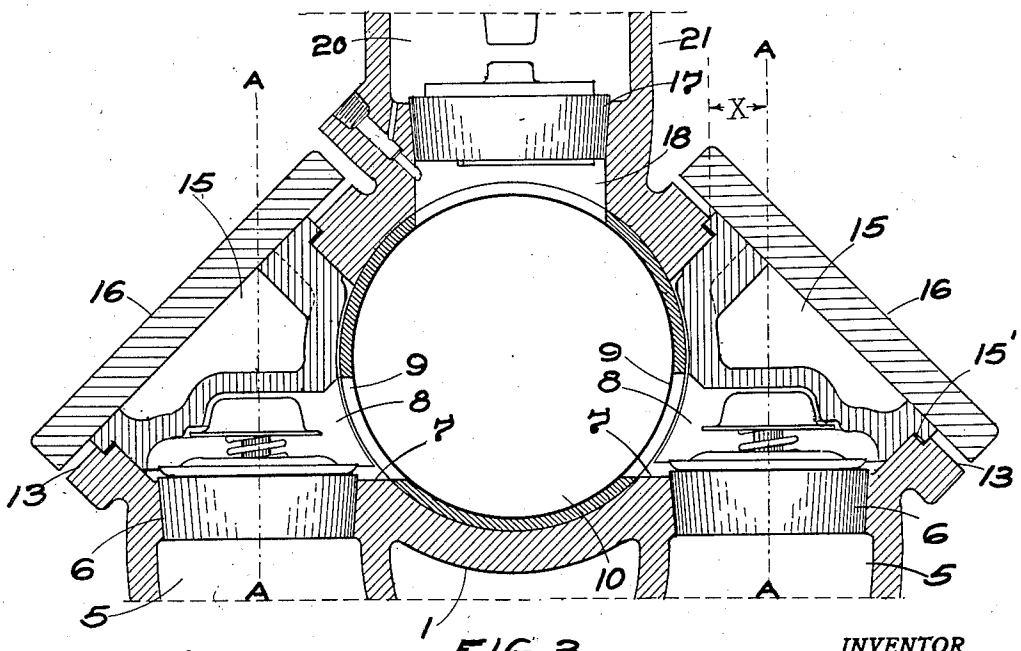

FIG. 3.

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DOUBLE ACTING PISTON PUMP

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Application April 18, 1934, Serial No. 721,094

3 Claims. (Cl. 103—175)

The primary object of this invention is, to provide a double acting piston pump having a higher degree of volumetric efficiency than other pumps of this type heretofore produced.

The other objects are:

To provide a general service pump suitable for pumping volatile liquids of various kinds of which gasoline is a common example.

To provide a pump which may be readily converted into a compressor or vacuum pump having a volumetric efficiency approximately equal to machines primarily constructed for these specific purposes.

Still another object is to provide a pump cylinder in which the axes of all of the valve ports extend vertically and the faces of the valve decks adjacent to said ports respectively extend in parallel horizontal planes so that they may be machined at a single setting of the cylinder casting, whereby a material reduction in cost and increase of facility of manufacture, together with greater accuracy are attainable.

The practical embodiment of my inventive ideas whereby said objects are attained is clearly illustrated in the accompanying drawings in which:

Fig. 1 is a central, vertical longitudinal section through a pump cylinder organization constructed in accordance with my inventive idea. This section is taken on line I—I of Fig. 2.

Fig. 2 is a vertical transverse section on line II—II of Fig. 1.

Fig. 3 is an enlarged, vertical transverse section of that portion of the pump cylinder which includes, and is adjacent to, the suction and discharge valves; the point at which this section is taken is also on line II—II of Fig. 1.

Fig. 4 is an enlarged view partly in side elevation and partly in central, vertical section, of the type of valve shown in Fig. 2.

Fig. 5 is a central, vertical section of the type of suction valve shown in Fig. 3.

The construction shown in said drawings, is a double acting pump, the details of which are substantially as follows:

The cylinder organization or main casting comprises a cylinder 1 in the bore of which a piston 2 reciprocates, with a stroke of sufficient length to cause the respective end faces of said piston to approach very nearly into contact with the respectively adjacent end walls of the cylinder bore; a tubular suction member is shown at 3; the inlet port of which is indicated by the numeral 4; two oppositely disposed, laterally extending, arcuate tubular branches 5, 5, lead from the duct of said suction chamber to the ports in which the suction valves 6, 6, are mounted; the suction valve deck is indicated at 7, 7; this deck forms a horizontally disposed floor or lower wall of the valve chamber 8—8 into which the upper portion of said valves extend and in which said upper portions are housed; a port 9 leads from each of said valve chambers, respectively, into the adjacent side of the bore 10 of said cylinder 1. The extreme wall of each of said ports 9 is in substantial coincidence with the inner face of its respectively adjacent cylinder head 11 or 12; the lower wall or line of said ports being in proximity to the bottom wall of the cylinder bore.

Any suitable type of valve may be mounted in said inlet valve ports, and the particular type chosen will depend upon the class of service in which the pump is used; the type of valves shown in the drawings, Figs. 2 and 3, also as details in Figs. 4 and 5, are well known types of commercial valves which are both largely used in pumping liquids, both hot and cold, including water, the more viscous liquids, also volatile liquids; a suitable type of valves for use in compressors may be substituted when the pump is being used as a compressor. As shown in Fig. 3, the axial line A—A of said valves is spaced laterally outside of the structural limits, that portion of the cylinder organization which extends above the suction valve housing, as indicated by the dimension X, thus providing the freedom of access to the suction valve decks for the purpose of machining them, as well as for inspection and replacement of suction valve element when necessary.

The arrangement of the cylinder organization in all of its parts from the inlet passage 3 upwardly, including the arcuated passages 5, the concentric position of suction valves 6 at the upper ends of said passages, the close proximity of said valves to and below the center of the bore 10 of the cylinder, the position of the discharge valves 17 directly above the center of said bore at their respective ends of the cylinder organization are all so constructed and relatively positioned as to cooperatively produce a substantially direct upward flow of fluid through the pump, which flow is not impeded by either abrupt turns or reversals of direction. This attainment is in advance of any thing of which applicant is aware in this type of a pump, and is conducive to both volumetric efficiency and reduction of the power requirement of the pump.

For the purpose of aiding in the attainment of the efficiency above mentioned by the construction of the cylinder organization proper (in addi-

tion to the employment of supplementary elements for this purpose), the upper faces 13 of the suction valve housings are formed at an outward, downward trend of substantially 45 degrees; the valve chambers of said housings are of circular form and their assumed axes extend perpendicularly to said angle. In order to eliminate the surplus volume or space which this construction produces in the chambers 8 of said housings, (and which would otherwise lower the volumetric efficiency of the pump) there is introduced into each of said chambers an insert filler or clearance reducing member, as indicated at 14 in Fig. 2 or 15 in Fig. 3, in conformity to the type of valve employed.

The chamber wall-contacting faces of said fillers are so formed as to be a contacting counterpart of the walls of said chamber, which walls may or may not consist partially of a portion of the periphery of the cylinder liner; the portions of said fillers which are in juxtaposition, respectively to a valve, are a spaced counterpart or enlarged entaglio of the valve structure except that portion of said fillers which is open to afford unrestricted passage of fluid to and through the cylinder ports 9. Said spaced relation is maintained by means of the shoulders 14' or 15' respectively, and said fillers are secured in position by means of the cover plates 16, and these plates may in turn be secured in position in any suitable manner. The construction thus produced affords the utmost facility of insertion and removal of said fillers, since both of these functions may be performed by the simple movement of the filler in the direction perpendicular to the face 13.

Said clearance reducers are retained in their service position by means of the cover plates 16, which plates may be secured in position in any suitable manner, as by screws, bolts, or a yoke such as commonly employed for like purposes.

In respect to the arrangement and mounting of the discharge valves 17—17, it will be readily noted by reference to Fig. 1 that the ports 18—18, at both ends of the cylinder extend directly through the wall of the cylinder; that the upper face of the decks 19, 19, of said ports is horizontally disposed, thus causing said faces to be parallel with the corresponding faces of the decks, 7, 7, of the inlet valves; the axial line of all of these ports are true vertical, also parallel lines; this arrangement is materially conducive to facility and economy of manufacture of this pump, because machining operations upon all of these ports and their deck faces may be accomplished at a single setting up of the casting.

The discharge passage 20 in conjunction with its wall 21, form a housing for the discharge valves; said passage also functions as an outlet for the pumped fluid, which is finally discharged from the pump through the outlet 22.

The pump shown is adapted to be operated by any suitable power appliance, (such as a direct-acting steam cylinder) to which it may be connected by means of the tie rods 23, 23.

The cylinder head 11 is provided with a stuffing box 25 through which the piston rod 26 operates.

The working limits of the cylinder are defined by the inner faces 27, 27, of the cylinder heads, and the extreme walls of all the valve ports are caused to coincide with said faces so that no portion of the actuated fluid can be entrapped between the juxtaposed faces of said heads and the piston, at the instant of extreme limit of the piston stroke in either direction.

I claim the following:

1. In a pump of the close clearance type and that class which includes a cylinder organization having a piston reciprocatively operative in the bore thereof, one or more fluid inlet passages and one or more fluid outlet passages having communication with said bore together with inlet valves and outlet valves operatively associated with said passages respectively; a novel cylinder casting for such pump having a bore extending longitudinally through said casting for the reception of a reciprocative piston; a longitudinally-extending, tubular suction chamber spaced centrally below, extending parallel with said bore and provided at one end thereof with a fluid-inlet port; a longitudinally-extending tubular discharge chamber positioned centrally above and extending parallel with said bore, the axis of said bore and said chambers being in vertical alignment; an upwardly opening valve chamber in said casting positioned laterally of and adjacent each end of said bore, said chambers being each adapted for the reception of a clearance-limiting member and a cover plate, the seating faces for said cover plate being formed at an outward, downward trend, there being also a valve-seating port having a vertically-extending axis formed in the bottom of said chamber, the axial line of each of said ports being spaced outside of the structural limits of that portion of the cylinder casting which is above said ports; a tubular, arcuated branch leading from said suction chamber into each of said valve-seating ports and into which the upper ends of said branches respectively concentrically terminate; a port leading from each of said valve-chambers into said bore, said last-mentioned ports being positioned below the center of said bore; a valve-seating port having a vertically disposed axis positioned adjacent each end of the upper central portion of said bore in communication with said discharge chamber, and a closable port in the upper wall of said chamber positioned respectively concentrically above said valve-seating ports.

2. In a pump of the close clearance type and the class which embraces a cylinder having a piston reciprocatively operative in the bore thereof, one or more fluid inlet passages and one or more fluid outlet passages having communication with said bore, also inlet valves and outlet valves respectively associated with said passages; an improved cylinder body for such pumps wherein the main inlet passage, the bore of the cylinder and the main outlet passage are positioned in vertical relation and alignment, in the order stated and in parallel relation each to the other; the walls of said cylinder body at and adjacent to the point of location of each inlet valve being formed into a laterally-extending, upwardly-opening, closable housing for the reception and mounting of the inlet valve, the bottom wall of the chamber of said housing being horizontally disposed, positioned below a horizontally-extended center line of the said bore with a valve seating port extending therethrough, its axis extending vertically and spaced outwardly from the inner structural wall of said housing to an extent sufficient to permit the arbor of a boring bar which extends vertically, to pass thereby in close relation thereto; the upper, cover-seating face of the walls of said housing being formed at an outwardly, downwardly-extending slant, whereby a minimum distance between the adja-

cent inner wall of the bore of said cylinder, and the outward limit of the adjacent portion of the structural wall of said housing, also a minimum distance from said inner wall to axis of the valve port in said housing are attained; the chamber of said housing being adapted for the reception of a suitable inlet valve and a clearance-reducing member in conformity to said chamber and the valve therein.

3. In a pump of the close clearance type and the class which embraces a cylinder having a piston reciprocatively operative in the bore thereof, one or more fluid inlet passages and one or more outlet passages having communication with said bore, also inlet valves and outlet valves respectively associated with said passages; an improved cylinder for such pumps wherein the main inlet passage, the bore of the cylinder and the main outlet passage, are positioned in vertical relation and alignment, in the order stated and in parallel relation each to the other; the walls of said cylinder body at and adjacent to the point of location of each inlet valve being formed into a laterally-extending, upwardly-opening, closable housing for the reception and mounting of an inlet valve, the bottom wall of the chamber of said housing being horizontally disposed, positioned below a horizontally-extended center line of the said bore with a valve seating port extending therethrough, its axis extending vertically and spaced outwardly from the inner structural wall of said housing to an extent sufficient to permit the arbor of a boring bar which extends vertically to pass thereby in close relation thereto, there being a laterally-extending inlet passage, positioned below a horizontally-extended center line of said bore and connecting same with the chamber within said housing, also an arcuated inlet branch leading from said main inlet passage into said housing chamber with its upper end terminating concentrically in the valve port therein; the upper, cover-seating face of the walls of said housing being formed at an outwardly, downwardly-extending slant, whereby a minimum distance between the adjacent inner wall of the bore of said cylinder, and the outward limit of the adjacent portion of the structural wall of said housing, also a minimum distance from said inner wall to axis of the valve port in said housing are attained; the chamber of said housing being adapted for the reception of a suitable inlet valve and a clearance-reducing member in conformity to said chamber and the valve therein.

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