Feb. 13, 1951 R. E. MOULE 2,541,086

PUMP AND CONTROL

Filed June 23, 1947 2 Sheets-Sheet 1

Fig. 1.

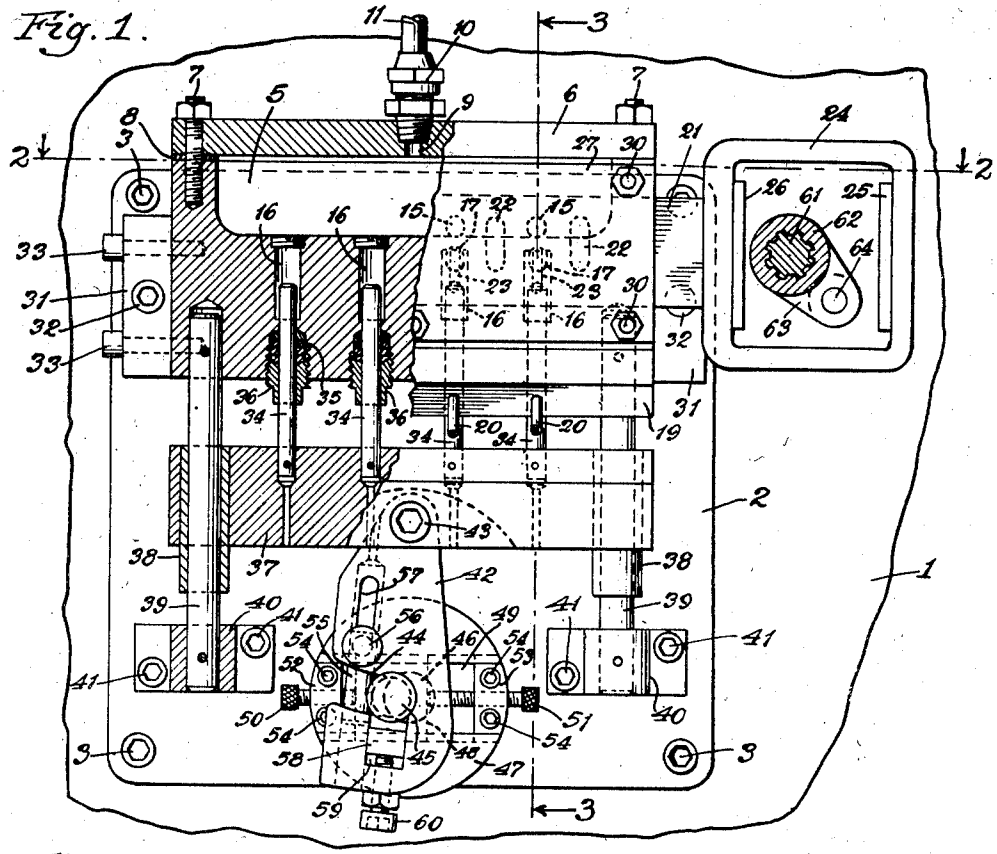


Fig. 2.

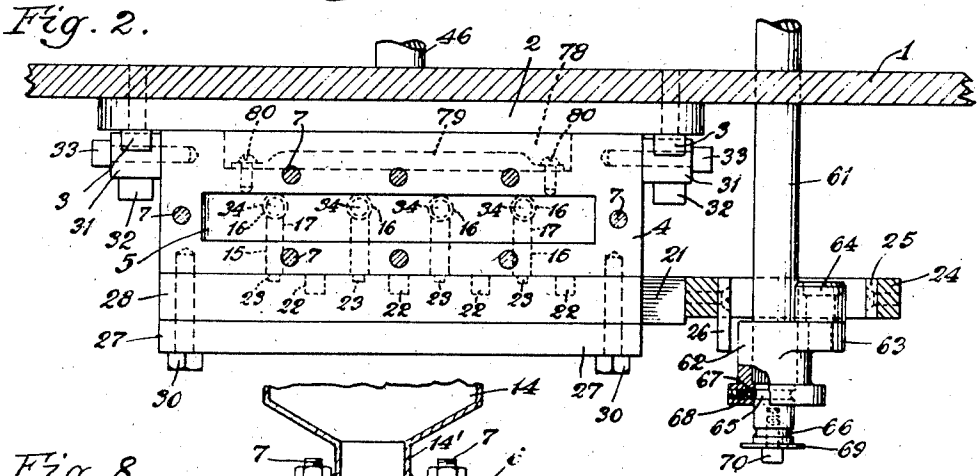
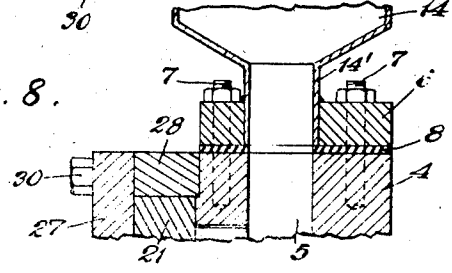


Fig. 8.



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Fig. 3.

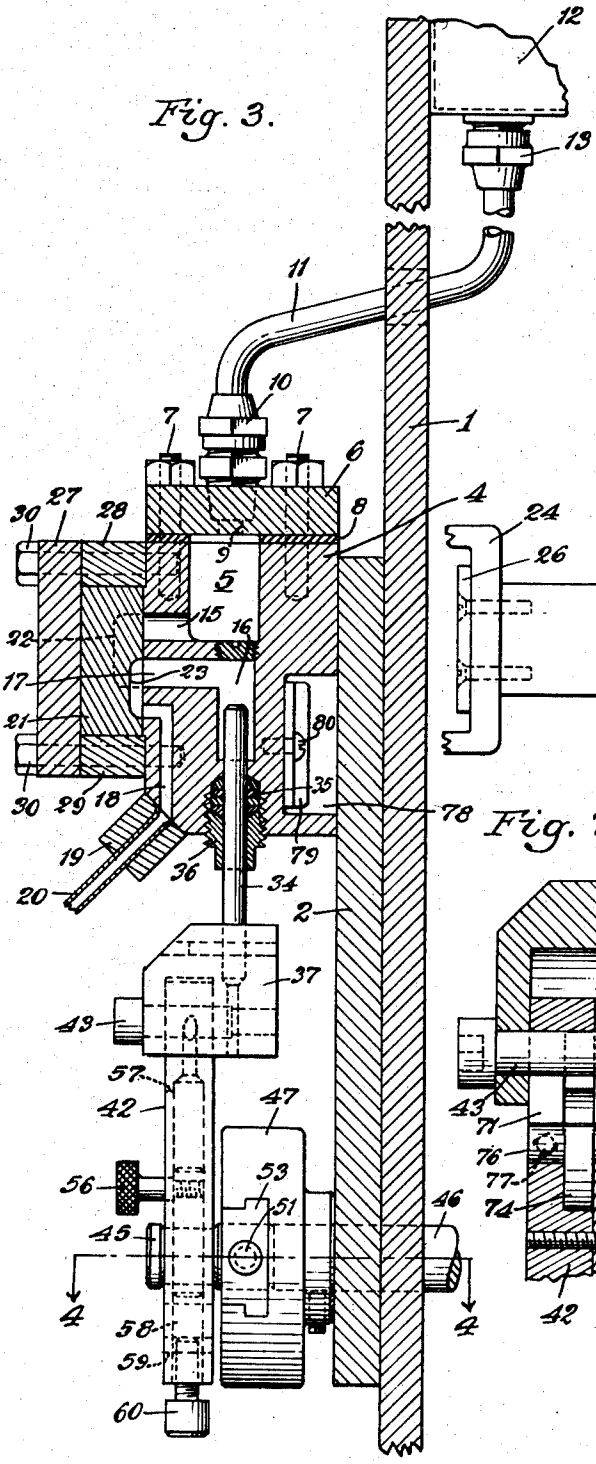


Fig. 4.

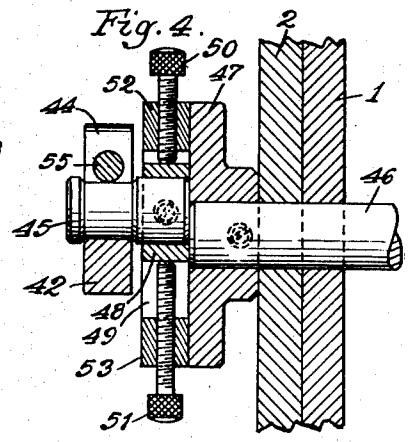


Fig. 5.

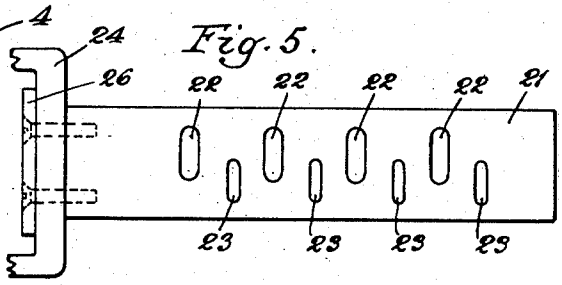
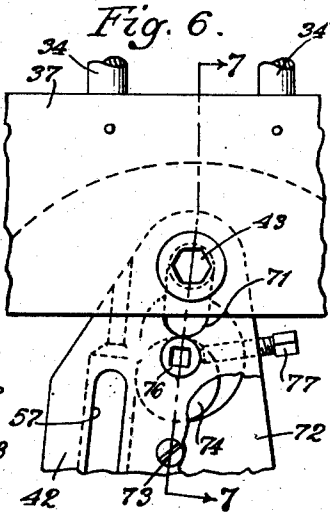


Fig. 7.

Fig. 6.



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Patented Feb. 13, 1951

2,541,086

UNITED STATES PATENT OFFICE

2,541,086

PUMP AND CONTROL

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Application June 23, 1947, Serial No. 756,568

11 Claims. (Cl. 103—38)

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This invention relates to a pump, and it has for one object to provide a pump suitable for use in pumping oily and viscous liquids.

It has for another object to provide a pump suitable for pumping pastes such as pastes containing water soluble powders.

It has for another object to provide a pump and means in connection therewith for accurate adjustment of the pump operation and discharge.

Another object is to provide adjusting means in connection with such a pump for permitting the continuous operation of the pump plungers, while stopping discharge. This is important where pasty material is being pumped, and it is important to keep the material in agitation even though discharge is not taking place.

Other objects will appear from time to time throughout the specification and claims.

This invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a side elevation of the pump of this invention, with parts broken away and parts in section;

Figure 2 is a transverse section taken at line 2—2 of Figure 1, with parts in elevation and illustrating the top of the pump with the cover removed;

Figure 3 is a section taken on an enlarged scale at line 3—3 of Figure 1, at right angles to the section of Figure 2;

Figure 4 is a sectional detail taken at line 4—4 of Figure 3;

Figure 5 is a side elevation of the slide valve removed from the pump;

Figure 6 is a side elevation of a modified form of adjustment;

Figure 7 is a section at line 7—7 of Figure 6; and

Figure 8 is a section through a modified form of reservoir.

Like parts are indicated by like characters throughout the specification and drawings.

The pump may be supported on any suitable support. As here shown it is carried on a wall or plate 1 which is a convenient means of carrying it. The pump includes preferably a base member or plate 2 which may be secured to the member 1 by screws 3, or otherwise. The pump includes a housing member or cylinder block 4 which, as shown particularly in Figures 1 and 3, is provided with a chamber 5. This chamber 5 is a common intake or manifold supply chamber. A cover plate or top 6 is secured to the pump housing 4 by bolts, screws or other members 7. A gasket 8 may be interposed between the cover

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6 and the housing 4, if desired. The cover plate, as shown in Figures 1 and 3, is perforated, as at 9, to receive a connection 10 which is joined to a pipe or conduit 11, which is itself joined to a tank or container 12 by a connection 13. Material is fed thus from the tank 12 to the manifold supply chamber 5. For some purposes it is desirable to have the tank or reservoir as close to the pump as possible. One suitable structure for this purpose is shown in Figure 8. As there shown the tank or reservoir 14 is provided with a passage member 14' which extends directly into a suitable opening in the pump cover 6. Preferably the member 14' is slotted and extends the full length of the pump housing 4, and the opening in the member 6 in the form of Figure 8 is correspondingly slotted.

The pump may be arranged to provide a single discharge or a plurality of discharges. Ordinarily a plunger or piston is provided for each discharge and where a plurality of plungers is used, the pump becomes, in effect, a plurality of pumps, each pump however or each discharge being fed from the single inlet chamber 5. The chamber 5 is provided with a plurality of outlets 15 which function as fluid supply ports or intake ports for the pumps. In this case four such outlets are provided.

Beneath each intake or fluid supply port 15 is a pump chamber 16 which conventionally is known as a cylinder. A conduit or transfer port 17 communicates with each chamber 16. Preferably the ports 15 and 17 and the pump chamber 16 are located in alignment. As shown in Figures 1 and 3 they are vertically aligned with respect to each other.

An outlet port or passage 18 is provided for each pump chamber, and each of these passages 18 is connected by a connector 19 to an outlet conduit 20 through which the material being pumped is discharged to a point of use or further treatment.

To govern the operation of the pump and to control the discharge from the pump, a slide valve or plate member 21 is provided. It has a series of large ports 22 cut or formed in it and a series of smaller ports 23 similarly cut or formed in it. Positioned preferably at one end of the slide 21 is a box-like follower member or yoke 24, which may be provided on its opposite interior faces with contact plates or members 25, 26. The slide valve, as shown generally in Figure 1 and in detail in Figure 3, is mounted for reciprocation along one side of the pump, so that the ports 22 and 23 may be brought into and out of communication with respect to the ports or

passages 15, 17 and 18. As shown in Figure 3 the slide valve is held in place by a covering plate 27 and spacers 28 and 29. Screws or other fastening means 30 hold the parts in assembled position.

The pump housing 4 may be secured to the plate 2 in any desired manner. As shown, spacing members 31 are fastened to the plate 2 by screws 32 and are fastened to the pump housing 4 by screws 33.

In each of the cylinders or cavities 16 is positioned a piston 34. The pistons fit loosely within the chambers or cylinder-like portions 16 and are surrounded by packing 35. A packing gland 36 holds the packing under the desired degree of compression.

At its lower end each piston is fixed to a block 37. Sleeves 38 are positioned within suitable openings in the block and are mounted to slide upon fixed pins or rods 39. Each rod 39 is fitted into the pump housing 4 at its upper end and is secured therein. At its lower end each rod 39 is fixed in a support 40. The supports are fastened by screws 41, or otherwise, to the plate 2 of the pump assembly.

The piston block is reciprocated by means of a hook-like member or link 42. In the form of Figures 1 and 3 this hook is pivoted, as at 43, upon the piston block 37. At its lower end it is notched, as at 44, and engages a pin or crank 45 which, as shown in Figure 1, is eccentrically positioned with respect to a shaft 46. An adjusting member 47 is mounted on the shaft and is preferably concentric with respect to it. It carries the pin 45 in an adjustable mounting which is shown generally in Figures 1 and 3 and in detail in Figure 4. The adjustable mounting includes a bearing block 48 positioned within a slot 49 in the member 47. Set screws 50 and 51 are arranged to vary the position of the bearing block 48 and to hold it in adjusted position.

The adjusting screws 50 and 51 are mounted, respectively, in members 52, 53 which are fixed to the member 47 by pins 54, or otherwise. The members 52 and 53 may be dovetailed as shown in Figure 3.

As a means for preventing the escape of the pin 45 from the notch 44 of the hook-like member 42, there is provided a pin 55. The pin is adjustably positioned in the member 42 and may be fastened in adjusted position by a set screw 56, which extends through a slot 57 in the member 42. As a further means for controlling the movement and position of the pin 45 in the hook 42 there is provided an adjustably mounted block 58 which slides in a slot 59 in the member 42 and may be fastened in adjusted position by a set screw 60.

The means for driving or reciprocating the slide valve 21 include a shaft 61 which is splined, as shown in Figure 1, and on which a hub-like member 62 is slidably mounted. This member carries an arm 63 in which a pin or crank 64 is mounted for rotation. As shown in Figure 2, the pin 64 may lie within the space bounded by the member 24 and between the contact parts 25 and 26. As shown in Figure 2, the contact part 26 extends laterally outside of the space bounded by the member 24. The shaft 61 is provided with two grooves or depressions 65 and 66. A locking ball 67 is positioned within the member 62 and is provided with a spring 68 biased to force it inwardly.

At its outer end the shaft 61 carries a stop 69 held in place by a screw 70. Because of the splined relationship between the shaft 61 and the member 62, the latter may be moved longitudinally with respect to the shaft. The locking ball 67 will fit into either of the grooves 65 or 66. With the parts as shown in Figure 2, the groove 65 is engaged and the pin 64 lies within the space bounded by the member 24. The member 62 may be moved laterally and when so moved, the ball 67 springs out of the groove 65 and remains raised against the resistance of the spring 68 until the member 62 has been moved far enough to bring the ball in register with the groove 66. It is then moved into the groove and so locks the member 62 in position. Thus means are provided for locking the member 62 in either of the two predetermined positions. When it has been locked into the groove 66 the pin 64 is withdrawn from the space bounded by the member 24.

In the modified form of Figures 6 and 7, an adjustable bearing is provided for the upper end of the link 42. As above mentioned, the upper end of this member is pivoted on the pin 43 which is mounted in or upon the piston block 37. As shown in Figure 1, the structure comprises a simple or non-adjustable connection. However, as shown in Figures 6 and 7, an adjustment is provided. The pin 43 is received in a slot 71 in the link 42. This construction provides a certain amount of play or lost motion at the top of the hook so that during a part of the movement of the link 42, the pistons are not moved and thus a time interval is provided for movement of the valve plate 21. The link 42, instead of being a single or solid piece, as shown in Figures 1 and 3, may have added to it a plate 72 which is held in place by one or more pins or screws 73. Between the link 42 and the plate 72 is mounted an adjustable stop member 74. As shown, this is provided with pin-like portions 75, 76.

The member 75 is supported by the plate 72 and the member 76 is supported by the link 42. The member 74 may be rotated about the axes of the part 75, 76 to extend more or less into the slot 71 and thus to reduce or increase the amount of play possible for the pin 43 within the slot. A set or locking screw 77 bears either upon the member 75 or the member 76 and locks the member 74 is adjusted position.

If desired, the pump housing 4 may be formed with a cavity 78 within which a heating element 79 may be positioned. This may be of any desired construction and may be held in place by screws 80, or otherwise.

Although I have shown an operative form of my invention, it will be recognized that many changes in the form, shape and arrangement of parts can be made without departing from the spirit of the invention, and my showing is therefore to be taken as, in a sense, diagrammatic.

The use and operation of this invention are as follows:

The pump as shown is mounted on a suitable support and is connected to a supply of material to be pumped. The outlet passages 20 from each pump cylinder 16 are connected to points of use or disposal. The shafts 46 and 61 are caused to rotate. Assuming that the member 62 and the pin 64 are in the position shown in Figure 2, rotation of the shaft 61 will cause reciprocation of the slide valve 21. At the same time, rotation of the shaft 46 will cause movement of the link 42 and, depending upon the setting of the adjustable throw crank 45, will reciprocate the piston block 37 and the pistons 34. When the slide valve 21 is in the position shown in Fig-

tires 1 and 3, upward reciprocation of the pistons will cause discharge of material from the cylinders 16 through the outlet passages 20. This is possible because the ports 23 in the plate 21 are in line with the two passages 17 and 18. When the slide valve 21 is moved to the left, from the position shown in Figure 1, the ports 23 are brought out of register with the passages 17 and 18 and the ports 22 are brought into register with the passages 15 and 17. When that occurs, material may flow or be drawn from the inlet chamber 5 through the passages 15 and 17 and the ports 22 into the cylinders 16.

Thus with each reciprocation of the slide 21 each cylinder 16 is alternately connected with the inlet chamber 5 and with its respective outlet passage 20. The relationship and timing of the parts is such that the down or suction stroke of the pistons occurs when the cylinders 16 are connected to the inlet or manifold supply chamber 5 and the up or discharge stroke of the pistons occurs when each cylinder is connected with its respective outlet passage. The slide valve 21 is reciprocated by contact of the pin 64 with the bearing surface members 25 and 26.

When it is desired to stop pumping but to permit the pump to operate, the member 62 is moved from the position of Figure 2 outwardly until the ball 67 engages the groove or slot 66. In that position further rotation of the shaft 61 will bring the pin 64 into contact with the member 26 and will move the slide 21 until the ports 22 are in register with the passages 15 and 17. In this adjusted position the part 25 is out of line with the pin 64 and is not contacted by that pin as it continues to move about with the rotation of the shaft 61. Hence the slide will not be further moved until the parts are readjusted to bring the pin 64 into the position of Figure 2.

The outlet passages 20 are then closed and continued reciprocation of the pump plungers merely agitates the material within the several pump chambers, the manifold supply or common intake chamber and the connecting passages. This operation is useful where thick or pasty material is being pumped and where it is desired temporarily to interrupt pumping and at the same time to prevent hardening or sticking of the material within the pump.

This operation may, of course, be useful under many conditions even where the material is not thick, but where it is desired to keep it agitated while pumping discharge is not taking place.

In general operation of the pump, accuracy of the discharged quantity is necessary. The pump is therefore made accurately and acts as a metering pump, each stroke of each pump plunger discharging an accurate, predetermined quantity of material. The arrangement of the pistons out of contact with the cylinder walls prevents relative wear and causes the pump to remain accurate far longer than would be the case were the plungers reciprocated in close contact with the cylinder walls.

The link 42 which operates the pistons is arranged to provide variable play. As shown in Figure 1, the block 58 may be raised or lowered with respect to the pin 45. It may even be brought into contact with the pin. When it is adjusted to be out of contact with the pin, some play occurs and as the pin starts up, it comes into contact with the link and starts movement of the piston. Similarly, the construction of Figures 6 and 7 permits play at the upper end of the hook 42. With that construction, when the link starts upwardly the block 57 is not moved upwardly until the pin 43 comes in contact with the upper surface of the member 74.

Thus two forms of an adjustable play arrangement are shown. During the play in the stroke the valve slide 21 moves but the pump pistons do not move. This permits a perfect and an accurate metering which would not be possible without the play. The movable block 58 or the movable member 74 or both of them can be used to accomplish fine adjustment and accurate metering. Ordinarily both of these adjustments would not be used on a single link.

I claim:

1. A pump comprising a pump chamber having a transfer port, a piston reciprocable in the chamber, a slide valve for controlling flow through the transfer port and reciprocable between an intake position wherein it establishes communication from an intake to the transfer port and a discharge position wherein it establishes communication from the transfer port to an outlet, and mechanism for reciprocating the valve in timed relation to the reciprocation of the piston including a follower on the valve, a shaft, and a driving member mounted for axial adjustment on the shaft between two positions, in each of which it rotates with the shaft, said follower and driving member being so formed that in one of said two positions of the member it acts on the follower to reciprocate the valve between its intake and discharge positions for pumping purposes, and in the other position of the member it acts on the follower to maintain the valve in its intake position for agitating purposes without pumping.

2. A pump comprising a pump chamber having a transfer port, a piston reciprocable in the chamber, a slide valve for controlling flow through the transfer port and reciprocable between an intake position wherein it establishes communication from an intake to the transfer port and a discharge position wherein it establishes communication from the transfer port to an outlet, and mechanism for reciprocating the valve in timed relation to the reciprocation of the piston including a yoke on the valve, a shaft extending through the yoke, a crank arm axially adjustable on the shaft between two positions, in each of which it rotates with the shaft, said arm in one of its positions being adapted to engage opposite sides of the yoke as it rotates to reciprocate the valve and in its other position to engage only one side of the yoke as it rotates to maintain the valve in its intake position.

3. A pump comprising a cylinder block having a plurality of pump cylinders therein, pistons reciprocable in the cylinders, the block being provided with a manifold supply chamber, an intake port for each cylinder leading from the chamber to one side of the block, a transfer port for each cylinder leading from the cylinder to said side of the block, and an outlet port for each cylinder leading from said side of the block, a slide valve slidable on said side of the block between an intake position wherein it places the intake ports in communication with the respective transfer ports and a discharge position wherein it places the transfer ports in communication with the respective outlet ports, and mechanism for reciprocating the valve in timed relation to the reciprocation of the piston including a valve driving member which is selectively adjustable either to reciprocate the valve for pumping purposes or to maintain it in its intake position so

that in the latter case reciprocation of the pistons may be continued for agitating purposes without pumping.

4. A pump as set forth in claim 3, wherein the pistons all are fixed to a reciprocable block, and mechanism for reciprocating the latter to reciprocate the pistons comprising an adjustable-throw crank linked to the reciprocable block.

5. A pump as set forth in claim 3, wherein the pistons all are fixed to a reciprocable block, and mechanism for reciprocating the latter to reciprocate the pistons comprising an adjustable-throw crank linked to the reciprocable block by a link having an adjustable lost-motion connection with the reciprocable block.

6. A pump comprising a pump chamber having a transfer port, a piston reciprocable in the chamber, a slide valve for controlling flow through the transfer port and reciprocable between an intake position wherein it places the transfer port in communication with an intake and a discharge position wherein it places the transfer port in communication with an outlet, mechanism having a lost-motion connection with the piston for reciprocating the position to effect suction and discharge strokes with periods of rest therebetween, and mechanism operable in timed relation to the reciprocation of the piston for moving the valve during said periods of rest, the valve remaining stationary during movement of the piston.

7. A pump comprising a plurality of pump chambers each having a transfer port, pistons reciprocable in the chambers, a valve for controlling flow through the transfer ports and movable between an intake position wherein it places all the transfer ports in communication with a common intake and a discharge position wherein it places the transfer ports in communication with outlets for the respective pump chambers, mechanism for reciprocating the pistons in unison to cause them to effect suction and discharge strokes with periods of rest between strokes, and mechanism operable in timed relation to the reciprocation of the pistons for moving the valve during said periods of rest, the valve remaining stationary during movement of the pistons.

8. A pump comprising a plurality of pump chambers each having a transfer port, pistons reciprocable in the chambers, a slide valve for controlling flow through the transfer ports and reciprocable between an intake position wherein it places all the transfer ports in communication with a common intake and a discharge position wherein it places the transfer ports in communication with outlets for the respective pump chambers, mechanism having a lost-motion connection with the pistons for reciprocating the pistons in unison to cause them to effect suction and discharge strokes with periods of rest between strokes, and mechanism operable in timed relation to the reciprocation of the pistons for moving the valve during said periods of rest, the valve remaining stationary during movement of the pistons.

9. A pump comprising means forming a plurality of pumping chambers in side by side relationship, a set of pistons mechanically joined together there being a piston in each pumping chamber, a fluid supply passage adjacent each chamber, a fluid outlet passage adjacent each chamber but spaced from the fluid supply passage, a valve having a plurality of each of two sets of ports said valve being movable between

two positions in one of which it connects all of said fluid supply passages to said chambers respectively and in the other of which it connects all of the fluid outlet passages to said chambers respectively, means for reciprocating all of the pistons in unison to cause them to effect suction and discharge strokes said means causing said pistons to stop for appreciable periods of time at the end of each stroke in each direction, and mechanism operating in timed relation to the reciprocation of the pistons for moving said valve when the pistons are stopped and only when the pistons are stopped, the valve moving from position to position at the end of each stroke to connect all of the chambers to the fluid supply passages just before the pistons move to effect suction and said valve moving to connect all of the fluid output passages to said chambers just before the pistons move to effect discharge strokes.

10. A pump comprising means forming a plurality of pumping chambers in parallel relationship, a transfer port for each pumping chamber said transfer ports having their centers at their outlets located in a straight line, a plurality of fluid supply ports on one side of said straight line and a plurality of fluid outlet ports on the other side of said straight line, a rectilinearly movable slide valve having a plurality of two sets of ports one set in one position connecting all of the fluid supply ports to the transfer ports respectively and the other set in the other position of the slide valve connecting all of the outlet ports to the transfer ports respectively, whereby a short movement of the slide valve will suffice to change the connection of the transfer ports from supply to outlet and from outlet to supply, a piston in each of said chambers, each piston being connected to all of the other pistons, mechanism to move all of the pistons in unison to suck fluid into the chambers through the transfer ports while the slide valve is connecting transfer ports to the fluid supply ports, said mechanism then causing all of the pistons to stop, means moving said slide valve to connect all of the transfer ports to the outlet ports respectively while said pistons are stopped, said mechanism then moving all of said pistons to eject fluid through the outlet ports and then stopping all of said pistons, said means then moving the slide valve back to the position where it connects the fluid supply ports to the transfer ports.

11. A pump as set forth in claim 10 wherein the means for moving the slide valve is selectively adjustable to maintain said valve in a position connecting all of the transfer ports to the fluid supply ports so that reciprocation of the pistons may be continued for agitating purposes without pumping.

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