

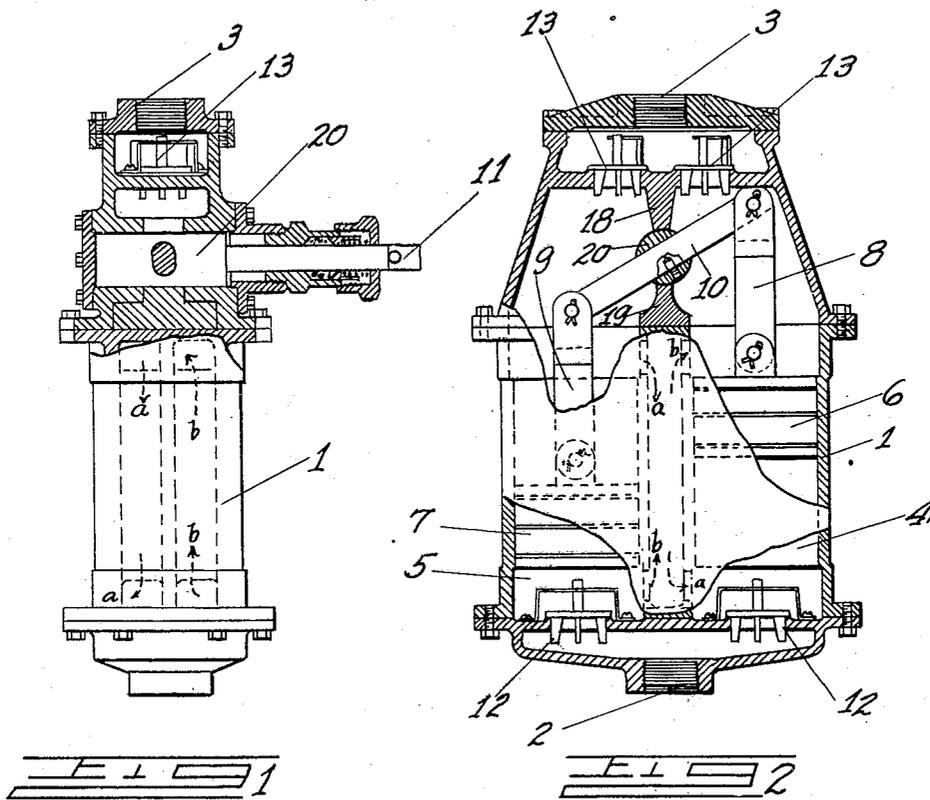
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W. E. SPLAIN

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DUPLEX AND MULTIPLE ACTION PLUNGER PUMP

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INVENTOR.  
*Walter E. Splain*  
BY  
*Allen A. Allen*  
ATTORNEY.

## UNITED STATES PATENT OFFICE

WALTER E. SPLAIN, OF TERRACE PARK, OHIO, ASSIGNOR TO WILLIAM B. GRISCHY, OF CINCINNATI, OHIO

### DUPLEX AND MULTIPLE ACTION PLUNGER PUMP

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My invention relates to multiple cylinder plunger pumps, and particularly to such pumps as are required for the dispensing of motive and lubricating oils.

It is the object of my invention to provide a multiple cylinder, piston type pump having interconnecting ports extending from the discharge side of each cylinder into the suction side of another. I find that with such an arrangement each reciprocating piston stroke appears to exhaust a volume of fluid equal to the cubical capacity of the length of the stroke of the piston, times the area of the respective cylinder in which the piston is operating.

In duplex pumps, for example, in the past there have been two cylinders each with a piston in it, and a rocking lever with means for actuating it. The pistons have been so arranged on the lever that as one descends in one cylinder, the other ascends in the other cylinder. Each cylinder goes through a cycle of operations of intake from the suction line, with the piston ascending in the cylinder, then change through a valve in the piston from one side of the piston to the other, during the descending stroke of the piston, and then discharge from above the cylinder on the next following ascending stroke. In contrast to the usual type of pump constructed accordingly, it is my object to provide a pump in which each cylinder has an intake valve at one end, and an outlet valve at the other, with no valve in the piston, but with a by-pass or port from the suction end of each cylinder to the discharge end of another cylinder so that each reciprocating movement of each piston will cause the displacement of the volume of one intake stroke into the discharge.

Referring to the drawings in which I have illustrated a preferred form of duplex pump embodying my invention:

Figure 1 is a side elevation with the upper part of the pump shown in section.

Figure 2 is a sectional view of the pump taken in a vertical plane at an angle of 90 degrees from that at which the view in Figure 1 was taken.

Generally indicated at 1 is the pump casing which as shown has an intake port 2 in the end shown towards the bottom in the drawing. The discharge port 3 is at the top of the casing. The casing is provided with two bored cylinders 4 and 5, with pistons 6 and 7 which are mounted on piston rods 8 and 9 respectively for moving the pistons through the cylinders. A rocking lever mounting, as indicated at 10, is provided, which may be rocked back and forth by means of an operating arm 11. Each cylinder has an intake valve 12 of desired type at the bottom end, and a discharge valve 13 at the opposite end.

The pistons shown are not provided with piston rings, as I find that the friction due to rings is more of a detriment than the slight loss of liquid through leakage around the pistons. Enclosing the lever arm 10 within a housing eliminates the frictional loss of packing glands which would be required were the rods 8 and 9 to extend through the casing. The top housing is provided with divisional compartment walls, the wall 18 extending down from the top and the wall 19 extending up from the bottom, so that by drilling a hole through the housing in the position indicated a tight joint is formed as soon as the shaft 20 is inserted and as soon as the shaft has a rotatable bearing against the walls 18 and 19. The shaft will have packing glands to prevent leakage along its axial portions where it extends through the housing, but the frictional loss in such a packing gland is much less than would be required were the piston rods to extend through packed glands. The rocking handle 11 with which the pump is operated is mounted directly on the shaft 20.

Extending through the wall separating the pistons I have provided by-passes through

which the liquid being pumped will tend to move, during the compression stroke of the piston on the left, as shown in Figure 2, from above the piston 7 downwardly into the space below the piston 6 along the lines of the arrows *a—*a**. The current along the lines *a—*a** will be scarcely appreciable being caused only by the difference in the height of the liquid above the piston 7 above the height of the liquid below the piston 6. The liquid compressed below the piston 7, however, will be forced under full pressure up through the by-pass extending from below the piston 7 to above the piston 6 along the lines indicated by the arrows *b—*b**.

The operation of my duplex pump is particularly effective for a measuring device, as it provides with each reciprocating stroke the discharge of a quantity from the pump equal to the volume retained in each cylinder. One complete rocking operation of the lever appears to cause the discharge of the entire volume of fluid retained within the cylinders, apparently because the downward stroke of one piston will force that liquid below the piston out through the by-pass and the discharge end of the other cylinder. There appears to be no lost motion in the pump, and for such equipment as oil dispensing apparatus where the requirements are for small pumps, there is economy of manufacturing expense, simplicity of operation, and accuracy of measurement of the volume of liquid discharged.

A similar type of structure may be used for a very effective air compressor. It will be obvious that I have shown a very simple construction, but I do not wish to be limited because of this fact, to the specific example of my invention shown. Mechanical modifications which will readily occur to those skilled in the art, I consider within the scope of my invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. A duplex pump having a casing containing a pair of cylinders and a pair of reciprocating plungers, each cylinder having a piston rod, a lever mounted within the pump casing to which said piston rods are connected, and a rotatable shaft extending through the casing on which shaft said lever is mounted, a housing enclosing said lever forming discharge zones for said cylinders, said housing being divided by a branch wall extending downwardly and a branch wall extending upwardly, which when said rotatable shaft is inserted within the housing provides a sealed barrier between the respective discharge zones of each cylinder, and said cylinders having inter-connecting by-passes extending from the discharge side of each to the suction side of the other.

2. In a piston type pump, a housing, a pair

of cylinders and a pair of pistons without rings reciprocable therein, piston rods for said pistons, and means disposed within the housing for actuating said piston rods, said housing being divided by walls into two discharge compartments with a shaft carrying said piston rod actuating means said walls and shaft forming a barrier between said two compartments, said housing having passages extending from the discharge side of each cylinder to the suction side of the other.

WALTER E. SPLAIN.

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