

No. 683,143.

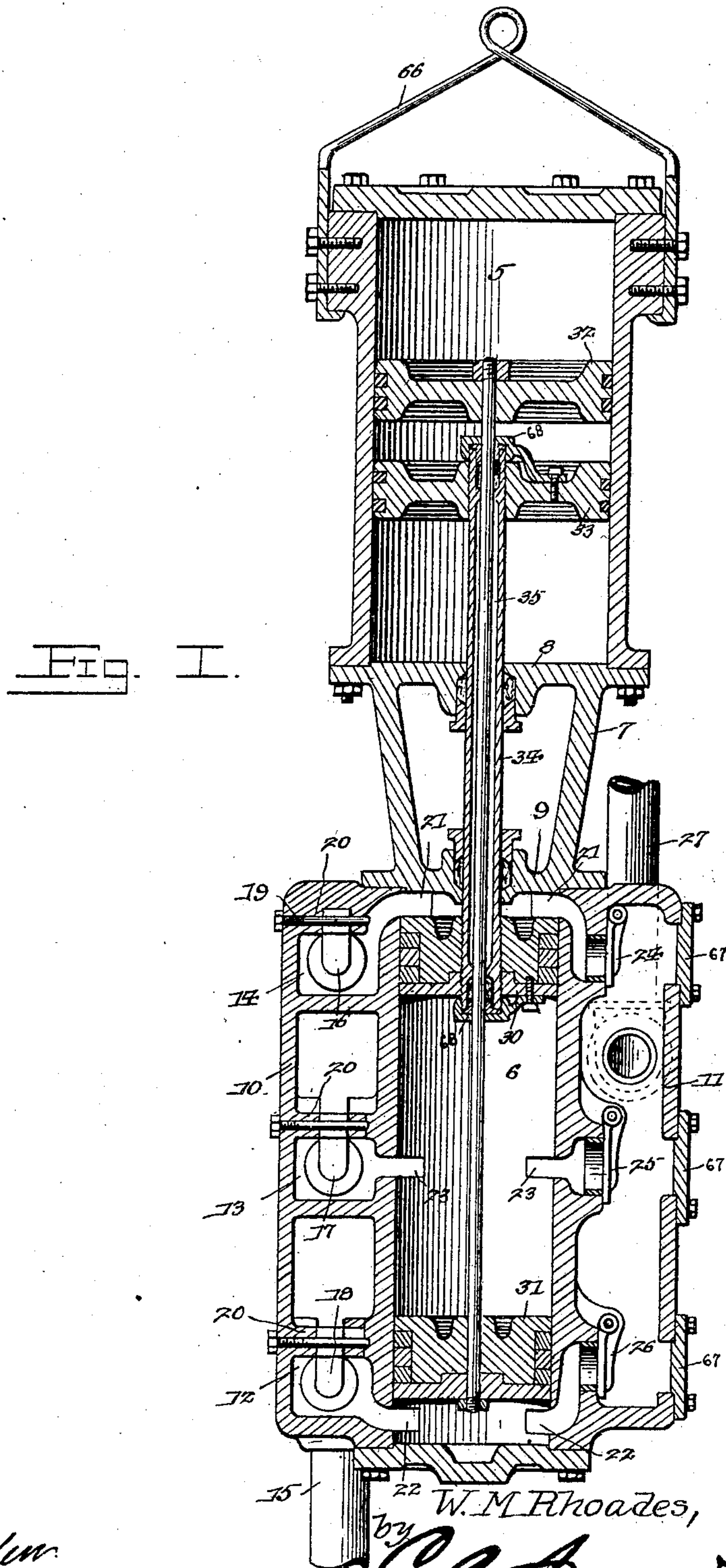
Patented Sept. 24, 1901.

W. M. RHOADES.  
PUMP.

(Application filed Feb. 14, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

Fig. 2.

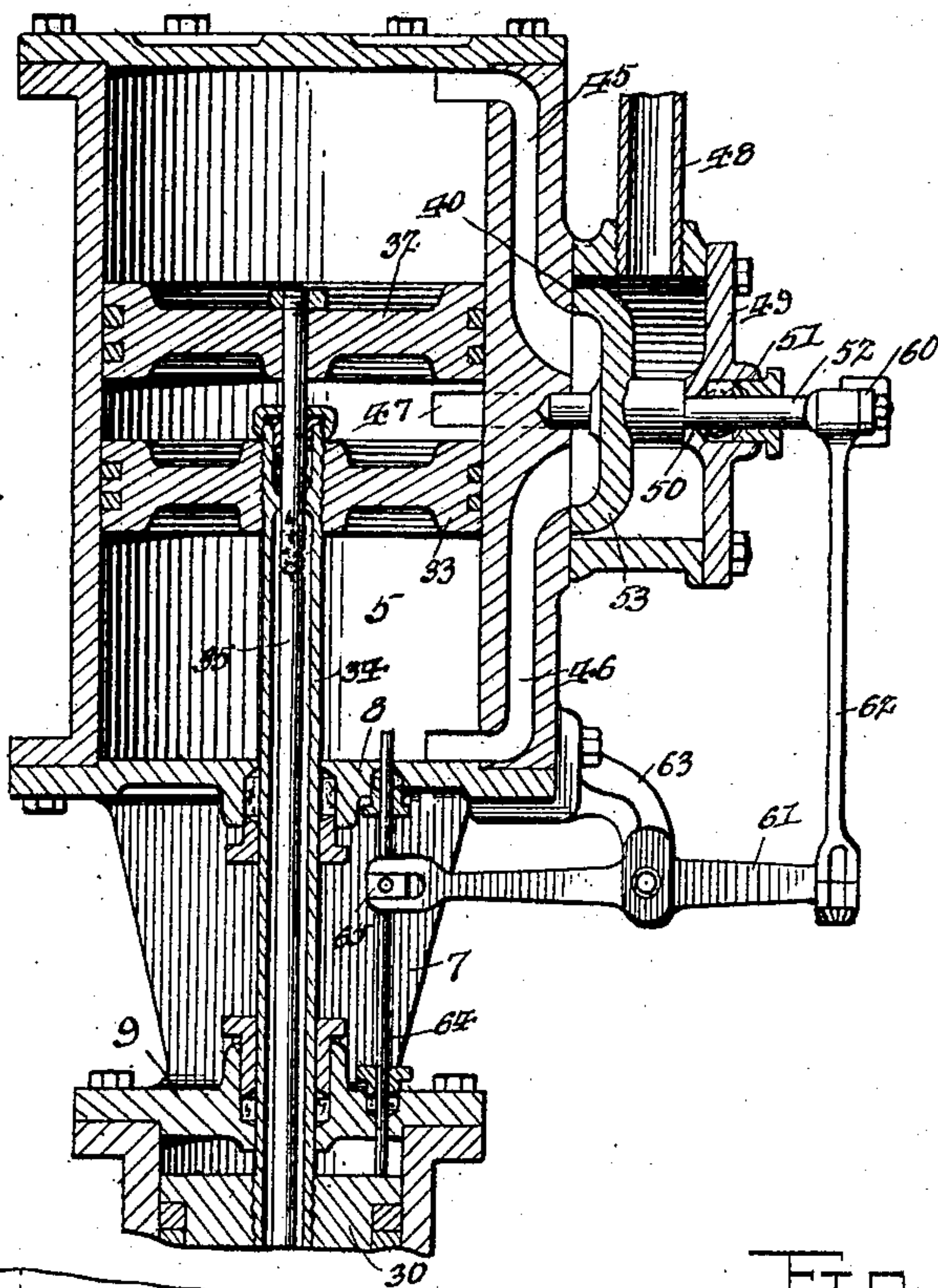


Fig. 3.

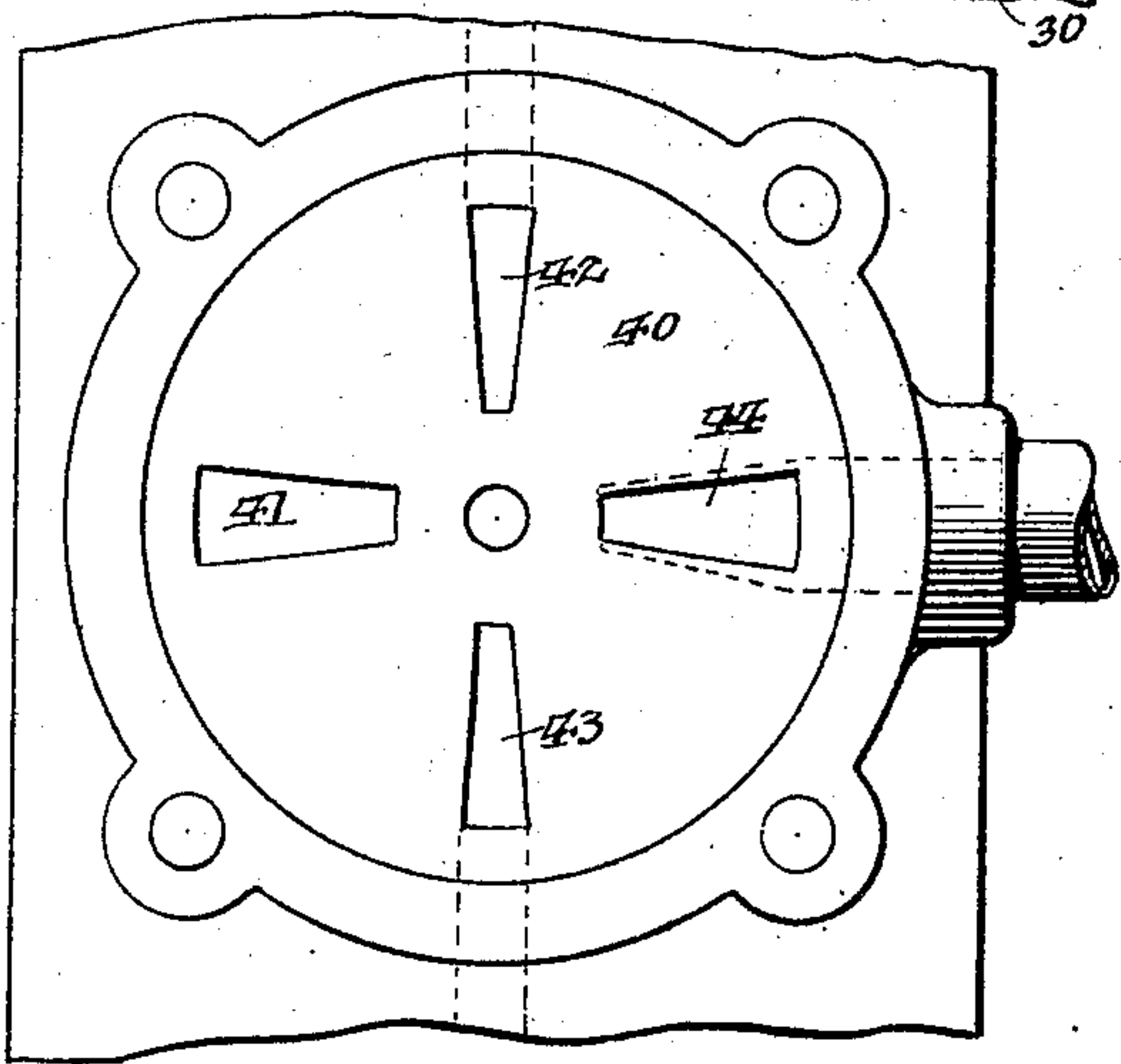
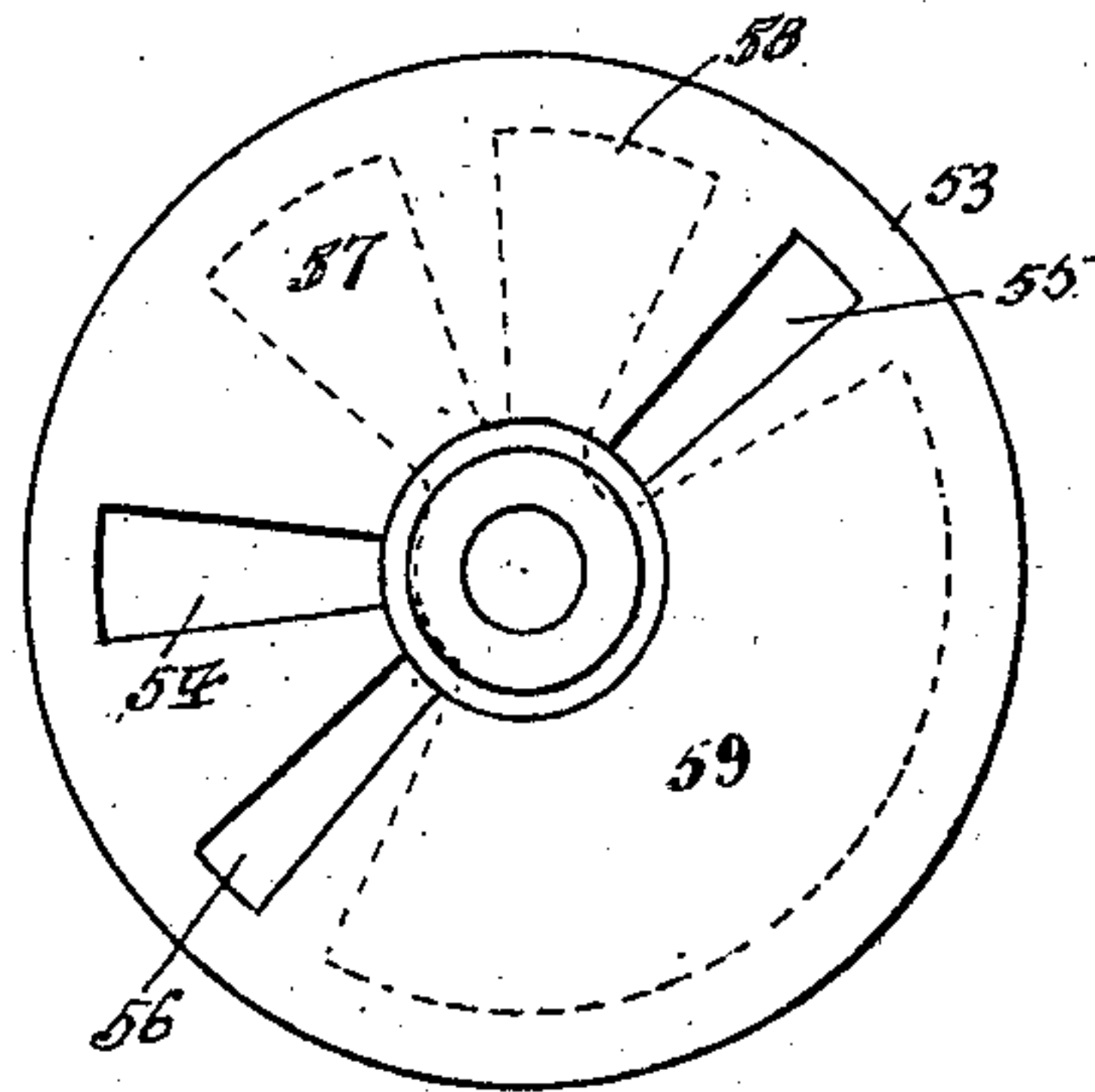


Fig. 4.



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# UNITED STATES PATENT OFFICE.

WESLIE M. RHOADES, OF JOPLIN, MISSOURI.

## PUMP.

SPECIFICATION forming part of Letters Patent No. 683,143, dated September 24, 1901.

Application filed February 14, 1901. Serial No. 47,332. (No model.)

*To all whom it may concern:*

Be it known that I, WESLIE M. RHOADES, a citizen of the United States, residing at Joplin, in the county of Jasper and State of Missouri, have invented a new and useful Pump, of which the following is a specification.

This invention relates to pumps in general, and more particularly to the class of duplex pumps; and it has for its object to provide a construction wherein two cylinders may be made to take the place and to do the work of four cylinders of lesser capacity.

A further object of the invention is to provide a pump particularly adapted for use in minework, being so constructed that it may be hung from a cable in the mine-shaft and will be equally operable in all positions.

Further objects and advantages of the invention will be apparent from the following description.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a longitudinal section taken through both the steam and pump cylinders and including the valve-chambers of the pump-cylinders, the valves being shown in elevation. Fig. 2 is a longitudinal section of the steam-cylinder with the steam-chest and the cut-off valve therein, the section being taken at right angles to that shown in Fig. 1. Fig. 3 is a plan view of the valve-seat in the steam-chest. Fig. 4 is a plan view of the cut-off valve of the steam-chest.

Referring now to the drawings, the present pump comprises a steam-cylinder 5 and a pump-cylinder 6, which are connected in axial alinement by means of a skeleton casting 7, including two end plates 8 and 9, which form the heads for the mutually-adjacent ends of the two cylinders. A description will be first given of the pump-cylinder and its operation and then of the steam-cylinder, with the mechanism that actuates the pumping-pistons.

The pump-cylinder, as shown, has a suction-chamber 10 at one side and an exhaust-chamber 11 at the opposite side, these chambers running longitudinally of the cylinder and throughout its length. The suction-chamber is divided into three compartments 12, 13, and 14, which communicate with a suction-pipe 15, the communicating passages

or ports being controlled by separate inwardly-opening flap-valves 16, 17, and 18, respectively, having stems that are mounted upon pins 19, passed inwardly through the side of the chamber, the stems of the valves being held against displacement longitudinally of the pins by lugs 20 within the several compartments and with which the pins engage. A passage 21 connects the compartment 14 with the adjacent end of the chamber 11 around one end of the cylinder, and this passage communicates with the end of the cylinder. A second passage 22 connects the compartment 12 with the opposite end of the chamber 11 and passes through the adjacent end of cylinder 6. The compartment 13 communicates with cylinder 6 at a point midway of the ends thereof, and at a diametrically opposite point is a passage 23, which communicates with the chamber 11. The passages 21, 22, and 23 at their points of communication with chamber 11 form outlet-ports from the cylinder, and these ports are provided with outlet-valves 24, 25, and 26, respectively. From the chamber 11 leads an exhaust-pipe 27, through which the water from the pump is forced.

In the pump-cylinder 6 are disposed two pumping-pistons 30 and 31, while in the cylinder 5 are two pistons 32 and 33, the pistons 30 and 33 being connected by a hollow piston-rod 34, passing through stuffing-boxes in the heads 8 and 9 of the cylinders, and the piston-rod is of such length that each of the connected pistons may include one-half of its cylinder in its stroke. When piston 33 is at the inner end of its cylinder—that is, the end adjacent to the pump-cylinder—piston 30 lies with its lower end at the passage 23, and when the piston 30 is raised to its limit, as shown in Fig. 1, the upper end of piston 33 is just below the central point of cylinder 5. As the piston 30 moves down it draws water from compartment 14 into the upper end of its cylinder and forces water ahead of it through the passage 23, lifting valve 25 and passing into chamber 11, from which it passes through the exhaust-pipe. When the piston 30 moves upwardly, valve 16 closes, valve 25 closes, and valves 17 and 24 open, so that the water above the piston is forced through the port controlled by valve 24 and into chamber 11, and

water is drawn through valve 17 into the cylinder 6 below the piston.

The piston 31 is connected with the piston 32 by means of a rod 35, which is passed through the hollow rod 34 and through stuffing-boxes in the ends of the hollow rod, and this rod 35 is of such length that when the piston 31 is at the lower end of its cylinder 6 the piston 32 will lie with its lower end just above the center of cylinder 5, and when piston 32 is at the upper end of its movement the piston 31 will lie with its upper end just below the passage 23. Thus if the piston 32 be reciprocated in its cylinder piston 31 will be given corresponding movement and in its upward movement will draw water into the lower portion of cylinder 6 through passage 22 from compartment 12 and will force water from the upper portion of the cylinder through the passage 23 into the chamber 11. The downward movement of piston 31 forces water from the lower end of the cylinder through valved passage 22 into chamber 11, while water is drawn into the cylinder above the piston 31 from compartment 13.

From the above description it will be seen that if pistons 32 and 33 are moved first away from each other and then toward each other pistons 30 and 31 will be moved first toward each other and then away from each other, with the result that water will be forced from the central portion of cylinder 6 while it is being drawn into the end portions thereof and then water will be forced from the end portions while water is being drawn into the central portion. Thus the central body of water when expelled is acted upon at both ends when the pistons move in one direction, while two bodies of water, each of half the bulk of the central body, are acted upon at one end when the pistons are traveling apart. The result is of course the same as if two pump-cylinders were used, each of the same diameter as that shown and with the same stroke of piston. With this construction a single cylinder is used, while the stroke of each piston is no more than if two cylinders were used. To thus actuate the pistons 32 and 33, steam is supplied thereto through a valve mechanism and ports, as follows: Upon the side of the cylinder 5 is a steam-chest having a valve-seat 40, in which are formed four equidistant ports 41, 42, 43, and 44, the ports 42 and 43 communicating with the ends of the cylinder through the passages 45 and 46, while the port 41 communicates with the cylinder at a point intermediate of its ends through passage 47. Port 46 leads to the steam-exhaust pipe 48. The steam-chest has a cap-plate 49, in which is a bearing 50, provided with a stuffing-box 51, and in this bearing is mounted an oscillatory shaft 52, carrying a disk-shaped valve 53, which fits closely upon the valve-seat 40. In the valve 53 are formed three ports 54, 55, and 56, so positioned that when the port 54 is in registry with port 41 ports 55 and 56

will be out of registry with ports 42 and 43, and when ports 55 and 56 are in registry with ports 42 and 43 port 54 will be out of registry with port 41. In the under side of the valve 53 are sector-shaped recesses, indicated by dotted lines as 57, 58, and 59, and these recesses communicate and are so positioned that when ports 54 and 41 are in registration recesses 58 and 59 will communicate with ports 42, 43, and 44, so that the ends of the cylinder will be connected with the exhaust. When the disk is moved to register ports 55 and 56 with 42 and 43, then recess 57 communicates with port 41 and recess 59 with the port 44, so that the central portion of the cylinder exhausts and the end portions are receiving steam. Thus it will be seen that by oscillating the valve 53 steam may be admitted to the adjacent or inner faces of the pistons 32 and 33 and then to the outer faces thereof to move the pistons first away from each other and then toward each other to conversely move the pumping-pistons, with the results above given. To oscillate the valve 53, the shaft 52 is provided with a rocker-arm 60 at its outer end and which is connected with a rocker 61 by means of a connecting-rod 62, this rocker 61 being pivoted to a bracket 63 upon the cylinder 5. A striker-rod 64 is mounted in stuffing-boxes in the adjacent ends of the cylinders 5 and 6 and carries a cross-head 65, with which the end of the rocker 61 is connected in such manner that as the striker-rod is reciprocated the rocker will be operated to oscillate the cut-off valve 53. The ends of the striker-rod lie in the paths of movement of the pistons 33 and 30 for engagement thereby alternately to reciprocate the rod.

To suspend the pump in working position, a bail 66 is connected with the sides of the cylinder 5 and is adapted for attachment of a tackle thereto. Also to facilitate access to the valves 24, 25, and 26 hand-holes 67 are formed in the wall of chamber 11 opposite to the valves and are provided with covers, as shown. Furthermore, it will be noted that the stuffing-boxes upon the pistons 30 and 33 are provided with locking-caps 68, which set down over the adjustable glands of the boxes and prevent rotation, these caps being securely attached to the ends of the pistons.

What is claimed is—

1. A duplex pump comprising steam and water cylinders disposed in axial alinement, an inlet-chamber for the water-cylinder including separate compartments communicating with the center and ends of the cylinder respectively, the compartment at one end communicating around the end of the cylinder, a suction-pipe for the compartments, inwardly-opening valves disposed to control the communications between the compartments and pipe, ports connecting the center and ends of the water-cylinder with the exhaust-chamber, said ports having outwardly-opening valves, pistons in the steam-cylinder, pistons

in the water-cylinder, connections between the corresponding pistons of the cylinders, and means for supplying steam alternately between and at the outer ends of the pistons of the steam-cylinders to reversely move the water-pistons.

2. A duplex pump comprising steam and water cylinders disposed in axial alinement, a piston in each cylinder having a common hollow piston-rod, additional pistons in the cylinders disposed beyond the outer ends of the first pistons and having a common piston-rod passed through the hollow rod, an inlet-chamber having ports communicating with the ends and central portion of the water-cylinder, a suction-pipe having individual connections with the ports, inwardly-opening controlling-valves for the ports, an exhaust-chamber, ports connecting the exhaust-chamber with the end and central portions of the water-cylinder, outwardly-opening controlling-valves for said ports, and a valve mechanism having actuating means disposed for operation by a piston in the water-cylinder for directing steam between and at the outer ends of the steam-pistons alternately.

3. A duplex pump comprising steam and water cylinders disposed in axial alinement, a casting connecting the adjacent ends of the cylinders and including plates forming heads for the cylinders, pistons in the cylinders and having a common hollow piston-rod, additional pistons in the cylinders beyond the first-named pistons and having a common rod passed through the hollow cylinder, inlet and exhaust chambers for the water-cylinder having valved ports communicating with the central portion and ends of the cylinder, a valve

mechanism for the steam-cylinder adapted to direct steam between and at the outer ends of the steam-pistons alternately, a striker-rod having its ends disposed slidably in the adjacent heads of the cylinders for alternate engagement by the innermost pistons, and connections between said rod and cut-off valve for operating the latter.

4. A pump comprising alining steam and water cylinders having pistons therein, a hollow rod connecting the pistons, additional pistons beyond the first-named pistons and having a common rod passed through the hollow rod, inlet and exhaust chambers disposed at opposite sides of the water-cylinder, said inlet-chamber including separate compartments communicating with the central and end portions of the cylinder respectively, a suction-pipe communicating with the separate compartments, controlling-valves between said pipe and compartments, valved ports between the exhaust-chamber and the central and end portions of the water-cylinder respectively, means for directing steam between and at the outer ends of the steam-pistons alternately, said means having actuating mechanism disposed in the path of movement of one of the pistons in the water-cylinder for operation thereby and a suspending-bail connected with the steam-cylinder.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WESLIE M. RHOADES.

Witnesses:

L. L. KING,  
H. T. MCKEE.