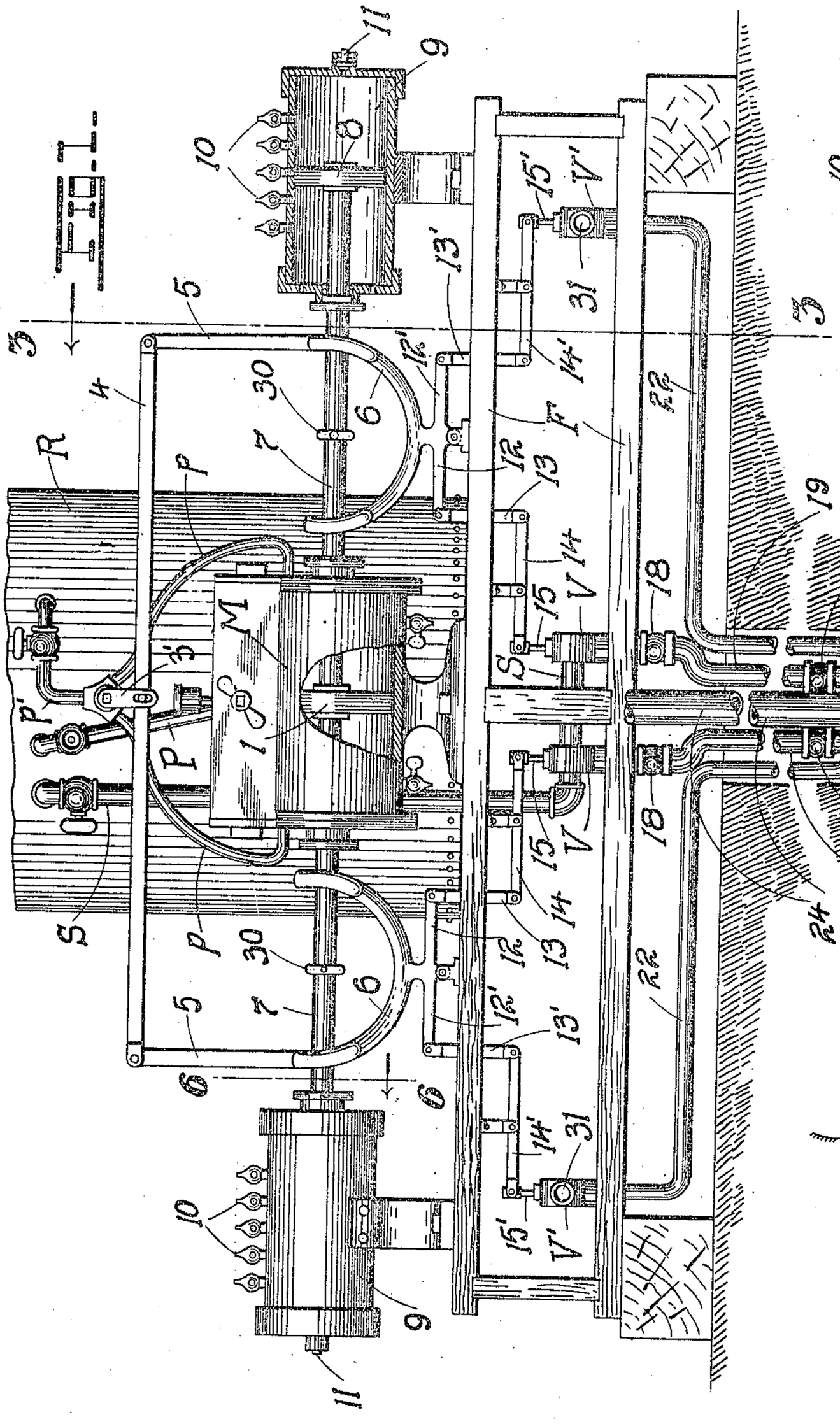
No. 847,358. PATENTED MAR. 19, 1907.

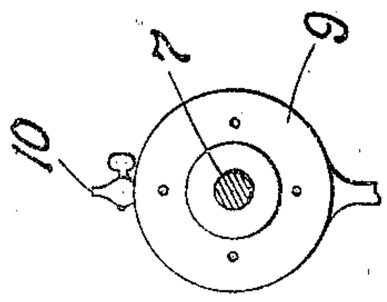
B. OBEAR & S. C. MARTIN.

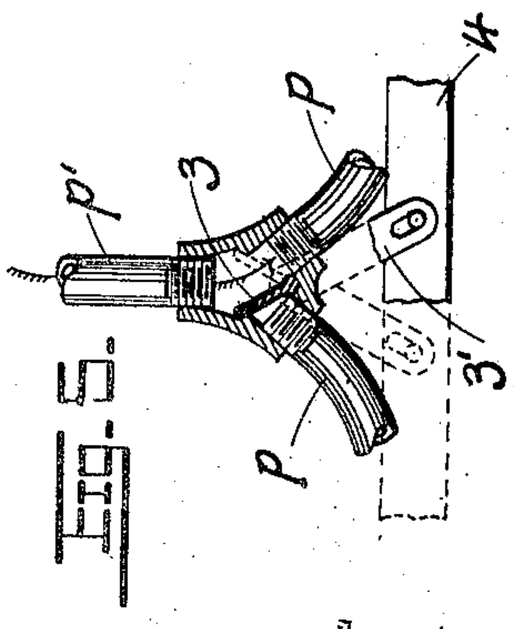
REGULATOR FOR FLUID OPERATED PUMPS AND MOTORS.

APPLICATION FILED OCT. 21, 1905.

2 SHEETS—SHEET 1.







Witnesses
E. J. Mann
M. D. Whitcomb

Inventors
Bryan Obear and
Silas C. Martin
By
Emil Forsen
Attorney

No. 847,358. PATENTED MAR. 19, 1907.

B. OBEAR & S. C. MARTIN.

REGULATOR FOR FLUID OPERATED PUMPS AND MOTORS.

APPLICATION FILED OCT. 21, 1905.

2 SHEETS—SHEET 2.

Fig. 1.

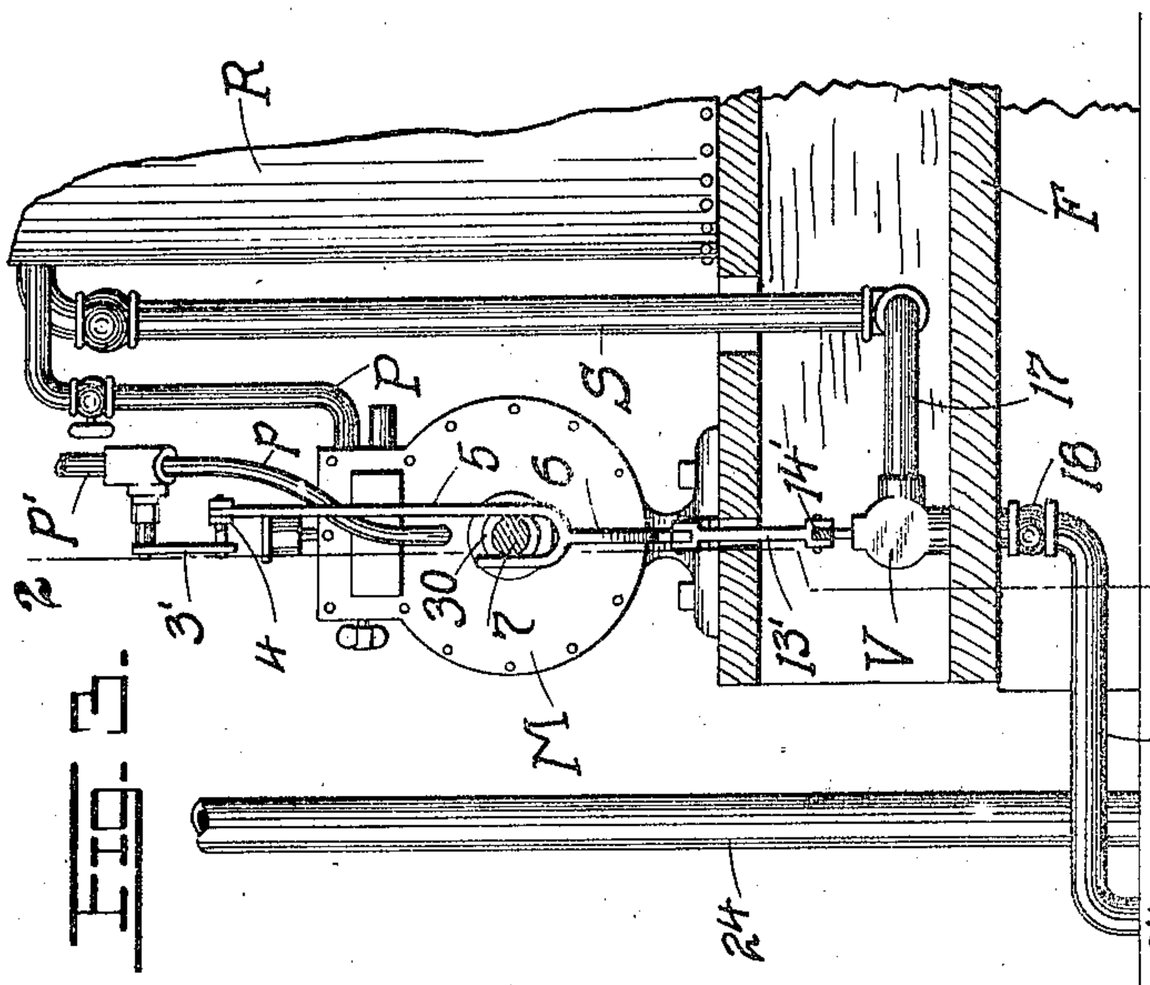


Fig. 3.

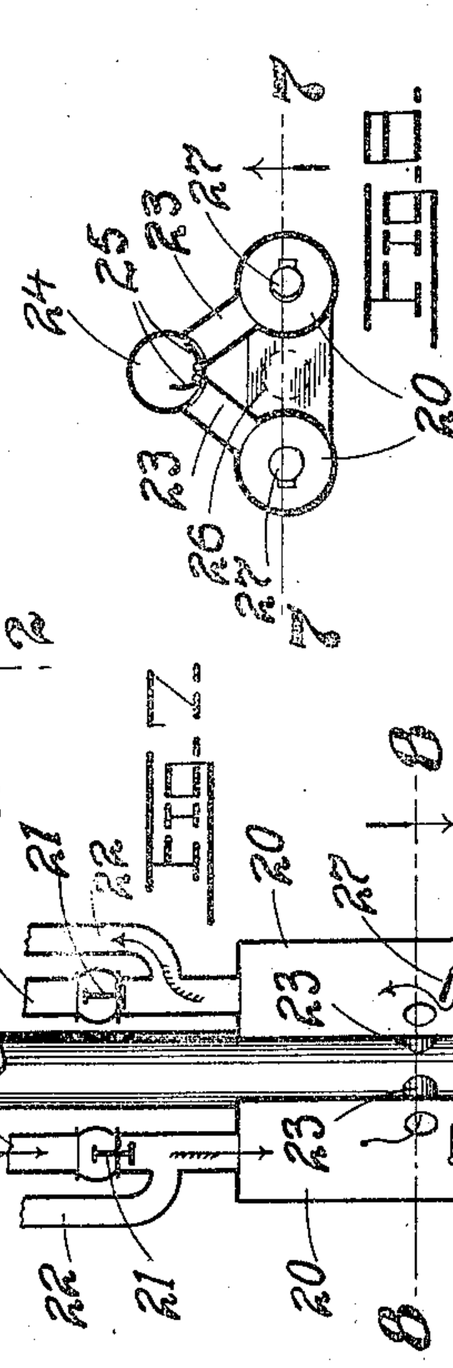


Fig. 2.

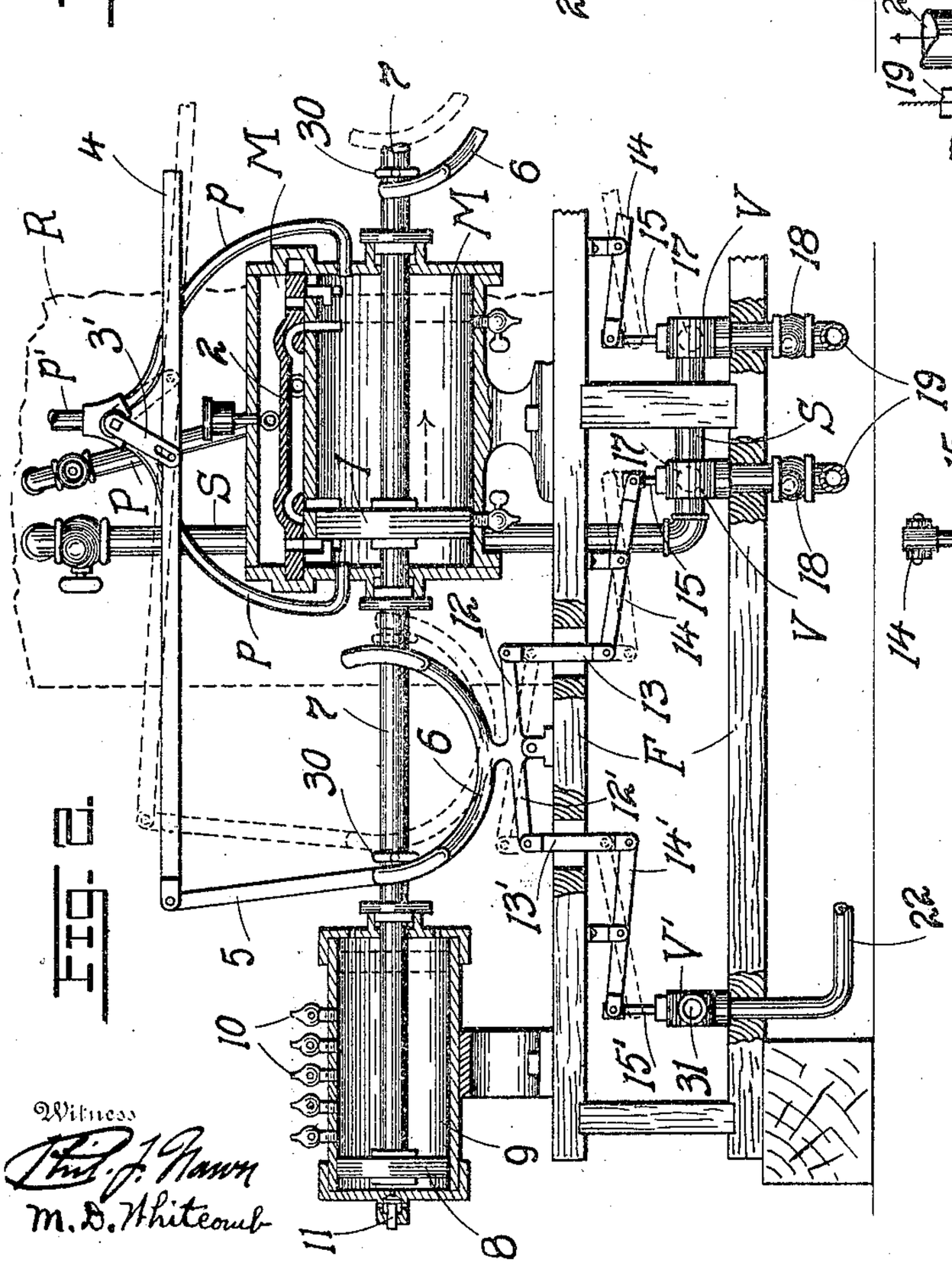
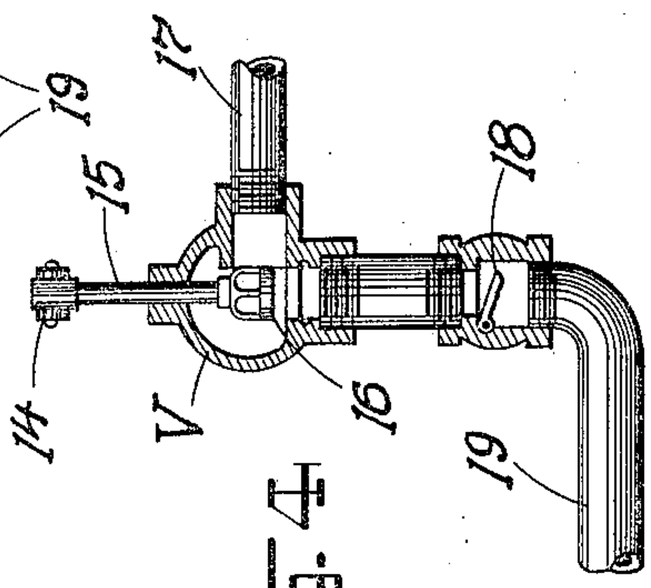


Fig. 4.



Witness
Phil. J. Mann
M. D. Whitcomb

Inventors
Bryan Obear and
Silas C. Martin
By
Emil Starer
Attorney

UNITED STATES PATENT OFFICE.

BRYAN OBEAR AND SILAS C. MARTIN, OF ST. LOUIS, MISSOURI, ASSIGNORS TO MONTAGUE COMPRESSED AIR COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

REGULATOR FOR FLUID-OPERATED PUMPS AND MOTORS.

No. 847,358. Specification of Letters Patent. Patented March 19, 1907.

Application filed October 21, 1905. Serial No. 283,862.

To all whom it may concern:

Be it known that we, BRYAN OBEAR and SILAS C. MARTIN, citizens of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Regulators for Fluid-Operated Pumps and Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention has relation to improvements in regulators for fluid-operated pumps and motors; and it consists in the novel construction and arrangement of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a front elevation of our regulator as applied to a water-pump for pumping water from cellars, wells, and the like, the regulator-pistons being at half-stroke. Fig. 2 is a vertical longitudinal section on the line 2 2 of Fig. 3 of one end of the regulator, the piston being at the limit of its outward stroke. Fig. 3 is a transverse vertical section on line 3 3 of Fig. 1. Fig. 4 is an enlarged sectional elevaton of one of the controlling-valves for the pump. Fig. 5 is a sectional elevation of the Y-valve leading from the compressed-air reservoir. Fig. 6 is a sectional detail on line 6 6 of Fig. 1. Fig. 7 is a diagramnatic vertical section on line 7 7 of Fig. 8, showing the construction of the pump; and Fig. 8 is a horizontal section on line 8 8 of Fig. 7.

The object of our invention is to provide fluid-operated pumps (and motors) with a regulator which will properly and positively control the timely admission of the dynamic fluid into the pump (or motor) with a view of its utilization at a moment favorable to the production of a maximum efficiency in said pump.

A further object is to provide a regulator which shall be simple, easy of operation, one adapted to be driven by the same fluid which operates the pump or motor to which it is applied, and one possessing further and other advantages better apparent from a detailed description of the invention, which is as follows:

Referring to the drawings, R represents a compressed-air reservoir or tank to which the air is supplied from any available source. (Not shown.) Leading from the same is the main valve-controlled feed-pipe P, which may be used to feed the compressed air to the air-motor M, which latter is preferably of the tappet type of motor of any design and requires no detailed description herein. The motor may be operated, and under ordinary circumstances (where low fluid-pressure is sufficient for the purpose, as in pumping water from deep places when rapid pumping is prohibitive) the same is operated by compressed air supplied thereto by the branch pipes *p p*, to which the fluid is alternately supplied through the pipe connection *p'*, the fluid thus supplied forcing the piston 1 of the motor first in one direction and then the other, suitable provision being made to exhaust through ports in the slide-valve 2, as best seen in Fig. 2. As before stated, we make no claim to the motor, and that here shown is a conventional form for which any other may be substituted, and while that herein shown is a compressed-air motor a steam, gas, or electric motor may be substituted therefor.

The admission of the driving fluid first to one side of the piston 1 and then the other is accomplished by the timely actuation of the hinged Y-valve 3, located at the junction of the pipes *p p*, Fig. 5, the outer arm 3' of the valve being loosely coupled to the pitman or rod 4, from whose opposite ends depend links 5 5, forming rigid extensions of one of the members of the outer forked arms of the yokes 6, said forks loosely embracing the piston-rod 7. The opposite ends of the piston-rod 7 are provided with pistons 8, operating in cylinders 9, provided with petcocks 10 along their peripheral walls and with check-valves 11 in the heads. The base of each yoke 6 is pivoted to the framework F, so as to oscillate or rock in a vertical plane, each yoke being provided adjacent to the pivotal point with horizontal arms 12 12', respectively, the arms 12 being coupled to links 13 13, which in turn connect with levers 14, connected to the stems 15 of the main controlling-valves 16, which supply the compressed air or fluid to the pumps, as presently to be seen, and the arms 12' being coupled to links 13', which in turn connect with levers 14',

coupled to the stems 15′ of similar valves, which control the exhaust of the fluid by which the pumps were operated. The valve-casings V of the main controlling-valves are coupled to the branches or shunts 17, leading from the base of the main air-supply pipe S, suitable check-valves 18, Fig. 4, being interposed between the controlling-valves 16 and the air-pipes 19 leading to the pump-cylinders, (presently to be referred to.)

The pipes 19 19 lead to the top of the pump-cylinders 20, the base of each pipe being provided with a pressure-valve 21, Fig. 7, below which there leads from the pipe 19 the exhaust-pipe 22, the pipes 22 terminating in the valve-casings V′ V′ of the exhaust-valves whose stems 15′ are coupled to the levers 14′. The exhaust-valves are identical with the valves 16, Fig. 4, and hence an illustration of one will suffice for both. The bases of the peripheral walls of the pump-cylinders are connected by the pipes 23 to the water-discharge pipe 24, the discharge ends of the pipes 23 being provided with check-valves 25, Fig. 8. The lower heads of the cylinders 20 communicate with a common chamber 26 through openings controlled by check-valves 27, a suction-pipe 28, whose delivery end is controlled by a check-valve 29, leading from this chamber to the well or cellar from which the water is to be pumped. The pipe 28 is preferably perforated peripherally, as shown, Fig. 1. The pump composed of the cylinders 20 20, chamber 26, pipe 24, and their coöperating parts is not herein claimed, as the same is of a well-known patented type and forms no part of the present invention.

The operation of the device is as follows: Secured to the piston-rod 7, between the forked ends of each yoke 6, is a ring or collar 30. As the piston 1 reaches the end, say, of its left-hand stroke, Fig. 2, the collars or tappets 30 impinge against the adjacent ends of the yokes, simultaneously rocking the same about their pivots and depressing the ends impinged by the tappets. This depression draws or pulls the pitman 4 in a corresponding direction, rocking the arm 3′ of the Y-valve to its extreme position and permitting the motor fluid to pass into the proper pipe *p* for driving the piston 1 in the opposite direction. Of course when the piston 1 has reached the end of its opposite stroke the reverse of the operations just described takes place, the piston returning to its original position. The dotted position of the parts in Fig. 2 illustrates the device for the opposite stroke. Of course both ends of the apparatus being alike the illustration of one end suffices. In its reciprocations the piston-rod 7 drives the pistons 8 back and forth in the regulator-cylinders 9. The petcocks 10 or any one or more of them may be left open. Of course as the piston 8 begins to move to begin a new stroke it leaves a vacuum between it and the adjacent head of the cylinder, this vacuum continuing until the said piston 8 has passed by one of the open petcocks, in which event the air will rush into the vacuum, thus equalizing the pressure on opposite sides of the piston and easing the load or resistance which the piston must overcome. Referring to Fig. 1, right-hand side, if we assume the fourth petcock 10 to be the open, one then the moment the piston 8 has passed it the inrush of air will at once ease the movement of the parts, permitting the regulator to suddenly complete its stroke in that direction (to the left) and instantly cause the tappets 30 to impinge against the yokes and begin the reverse stroke for the motor. With the rocking of the yokes 6 in one direction or the other the following takes place: The arms 12 12′ become tilted sufficiently to open one of the controlling-valves 16 and close the other and at the same time open the exhaust-valve leading from the pump-cylinder 20 of the closed valve and close the exhaust-valve leading from the pump-cylinder of the open valve, Fig. 2. By the open valve 16 the air will rush into its corresponding air-pipe 19, past the pressure-valve 21, into the pump-cylinder 20, forcing the water before it past the check-valve 25 into the discharge-pipe 24 and out. The other cylinder 20 (whose controlling-valve 16 is closed) will be permitted to exhaust its air contents directly through pipe 22, past the open valve, and through the nozzle 31 of the exhaust-valve casing V′. (See arrows in Fig. 7 for the courses of the currents.) When the parts have reached the end of their opposite strokes, of course the same results follow, except that the second pump-cylinder is now called into requisition, its contents being forced into the pipe 24 while the first cylinder is filling with water. Of course each cylinder 20 fills or, more properly speaking, is permitted to fill as fast as the air from such cylinder exhausts or is permitted to escape through the pipe 22 and valve V′. It follows, therefore, that with each reciprocation of the piston 1 one pump-cylinder is filling with water while the contents of the other is forced out by air-pressure from the reservoir R through the pipe 24, the timely reversal of the operations or the reciprocations of the motor-piston 1 being accomplished by the actuation of the yokes 6, which in turn actuate the valve 3, by which the admission of the motor fluid to opposite sides of the piston is controlled. Of course the frequency and suddenness of these reciprocations in a measure depend on which particular petcock 10 happens to be opened for the purpose of destroying the vacuum formed behind the pistons 8 of the air-cylinders 9. This frequency of reversal, of course, is controlled both by the depth of the well and quantity of water to be pumped

and is a matter which may be left to the judgment of the engineer in charge.

The regulator can of course be used in connection with pumps or motors, be the same air or steam or any fluid whatsoever.

Having described our invention, what we claim is—

1. In a regulator, a reservoir or source of fluid-pressure supply, a motor-cylinder, a piston therein, a piston-rod projecting from the piston-cylinder at each end thereof, tappets on the rod, yokes pivoted in proximity to the projecting ends of the piston-rod, valve-controlled fluid-supply pipes leading from the source of supply to opposite ends of the motor-cylinder, a pitman coupled at an intermediate point to the valve of the fluid-supply pipes, means for pivotally coupling the yokes to the pitman, suitable controlling and exhaust valves, link connections between the yokes and said valves, and fluid-pressure supply and exhaust pipes leading from the valve-casings, substantially as set forth.

2. In a regulator, a reservoir or source of fluid-pressure supply, a motor-cylinder, a piston therein, a piston-rod projecting from the piston-cylinder at each end thereof, tappets on the rod, yokes pivoted in proximity to the projecting ends of the piston-rod, fluid-supply pipes leading from the source of supply to opposite ends of the motor-cylinder, a valve at the meeting ends of said pipes, a pitman coupled at an intermediate point to said valve, and having its opposite ends pivotally secured to the outer ends of the yokes, suitable controlling and exhaust valves, link connections between the bases of the yokes and the said valves, and fluid-pressure supply and exhaust pipes leading from the valve-casings, substantially as set forth.

3. In a regulator, a motor-cylinder, a piston reciprocating therein, a piston-rod projecting from the piston-cylinder, a tappet on said rod, a source of fluid-pressure supply, a pipe having branches leading to opposite ends of the piston-cylinder, a valve at the meeting point of said branches, an oscillating yoke pivoted in proximity to the piston-rod and actuated by the tappet, a regulator-cylinder, a series of petcocks disposed along the walls thereof, a piston on the piston-rod operating in said regulator-cylinder, link connections between the yoke and the valve for the branch pipes aforesaid, suitable fluid-pressure controlling and exhaust valves actuated by the oscillations of the yoke, a supply-pipe leading from the source of supply to the controlling-valve, and fluid-pressure and exhaust pipes leading from the controlling and exhaust valves respectively to a common pump or equivalent motor, substantially as set forth.

4. In combination with a pump, a regulator, a source of fluid-pressure supply, a motor comprising a cylinder and piston reciprocating therein, a fluid-pressure pipe having branches leading to opposite ends of the cylinder, a controlling-valve, a supply-pipe connecting the casing of said valve with the source of fluid-pressure supply, an exhaust-valve, fluid-pressure and exhaust pipes leading respectively from the pump-cylinder to the controlling and exhaust valves aforesaid, an oscillating yoke pivoted in proximity to the piston-rod of the piston, a tappet on the rod for actuating the yoke, a valve for admitting fluid under pressure to the respective branches aforesaid, a pitman or link connecting said valve with the yoke, a regulator-cylinder having a piston therein coupled to the piston-rod aforesaid, and intermediate link connections between the yoke and the controlling and exhaust valves aforesaid, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

BRYAN OBEAR.
SILAS C. MARTIN.

Witnesses:
EMIL STAREK,
MARY D. WHITCOMB.