No. 885,193. PATENTED APR. 21, 1908.

C. O. SOBINSKI.

VALVE MECHANISM FOR PUMPS.

APPLICATION FILED AUG. 3, 1906.

2 SHEETS—SHEET 1.

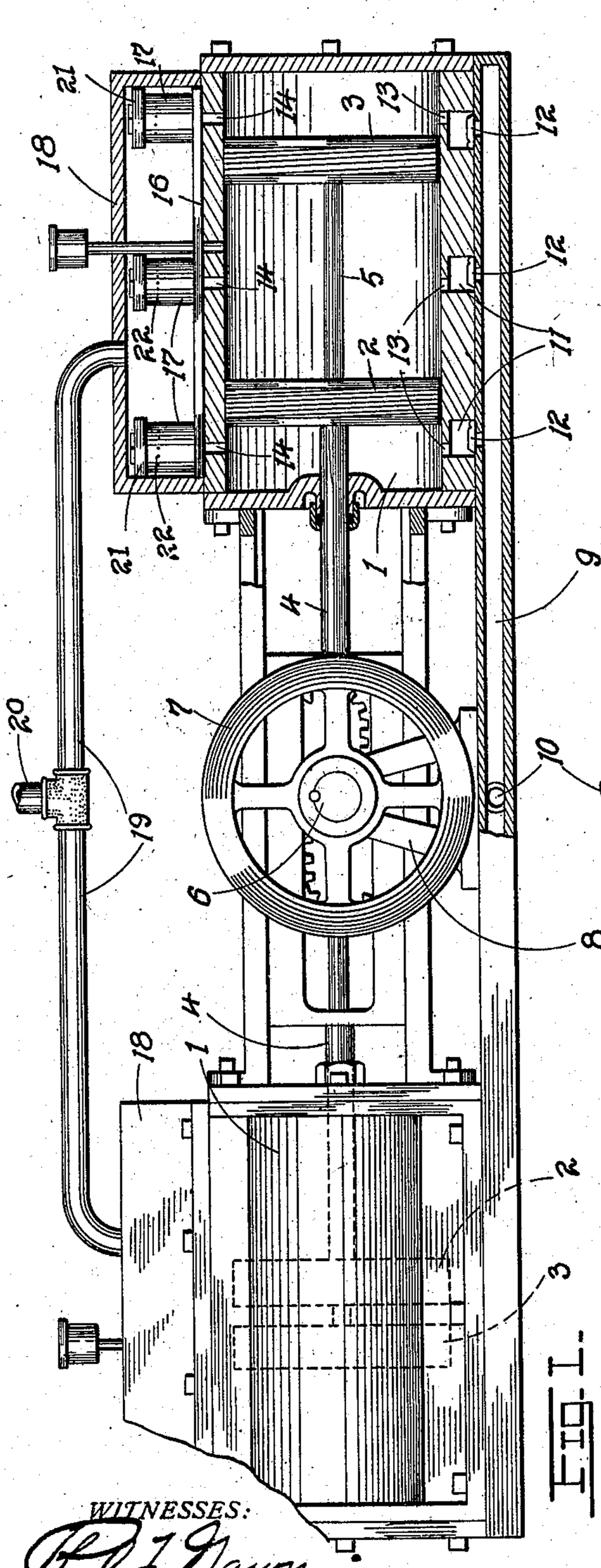

Fig. 1.

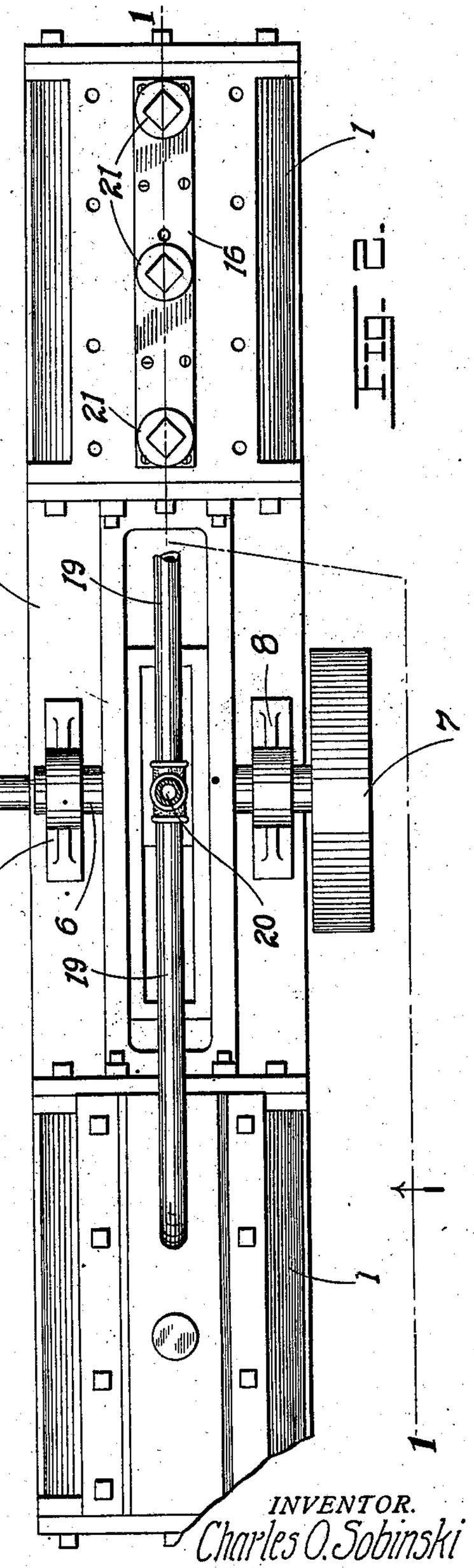

Fig. 2.

WITNESSES:

Chas. J. Mann

Jos. A. Michel

INVENTOR.

Charles O. Sobinski

BY Ernest Stavec

ATTORNEY.

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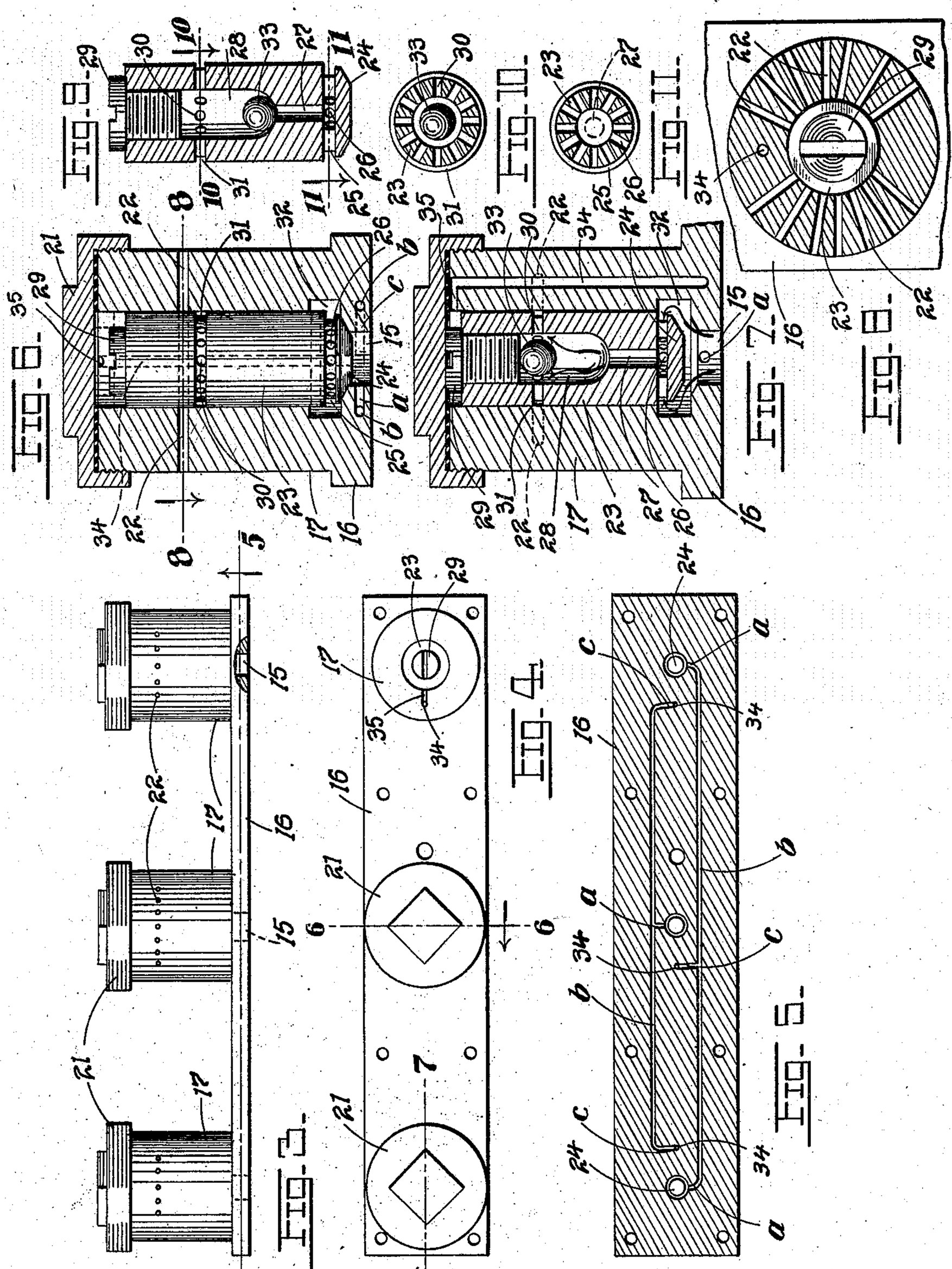

WITNESSES:

Chas. J. Dawn

Josamichel

INVENTOR.

Charles O. Sobinski

BY Emil Storer

ATTORNEY.

UNITED STATES PATENT OFFICE.

CHARLES O. SOBINSKI, OF ST. LOUIS, MISSOURI.

VALVE MECHANISM FOR PUMPS.

No. 885,193. Specification of Letters Patent. Patented April 21, 1908.

Original application filed December 19, 1904, Serial No. 237,538. Divided and this application filed August 3, 1906. Serial No. 329,088.

To all whom it may concern:

Be it known that I, CHARLES O. SOBINSKI, citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Valve Mechanism for Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in valve mechanism for air pumps and compressors, and it consists in the novel arrangement and combination of parts more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a vertical longitudinal section of a pump showing my invention applied thereto, being a section on the broken line 1—1 of Fig. 2; Fig. 2 is a top plan with the cover of one of the air-chambers removed; Fig. 3 is an elevation showing the series of primary check-valves confined in the compressed-air chamber and the plate connecting the same; Fig. 4 is a top plan of Fig. 3, the cap of one of the valve-casings being removed; Fig. 5 is a horizontal section on line 5—5 of Fig. 3; Fig. 6 is a vertical section on line 6—6 of Fig. 4 showing in elevation the normal position of the primary check-valve establishing communication respectively with the pump cylinder and compressed-air chamber; Fig. 7 is a sectional detail at right angles to Fig. 6, being a section on line 7—7 of Fig. 4, and showing the primary and secondary check-valves in their raised positions; Fig. 8 is a cross section on line 8—8 of Fig. 6, the valve being however in top plan; Fig. 9 is a middle vertical section of the primary check-valve; Fig. 10 is a cross section thereof on line 10—10 of Fig. 9; and Fig. 11 is a cross section of the primary check-valve on line 11—11 of Fig. 9.

The present invention is a division of the subject matter of my pending application for air pumps or compressors, filed December 19, 1904, Serial Number 237,538, being restricted to the valve mechanism by which the air (or other fluid operated on) is controlled.

The object of the invention, as stated in the pending application referred to, is to increase to a maximum the efficiency of the pump or compressor into the construction of which the valve mechanism enters, irrespective of the driving means employed for actuating the pump. One form of this driving means forms the subject matter of the pending application; another form is covered by my U. S. Patent 630,525, dated August 8, 1899, and still other forms are possible. The advantages arising out of the present construction of valve mechanism and its specific combination with other parts of the pump will be better apparent from a detailed description of the invention which is as follows:

Referring to the drawings, 1 represents the pump cylinder in which operate the pistons 2 and 3 respectively, the hollow piston-rod 4 of the former receiving the piston-rod 5 of the latter, the piston-rods both extending in the same direction toward the transversely disposed operating or drive-shaft 6 operated by a pulley 7 connected to any suitable source of power (not shown). I herein show, as in my pending application, two sets of cylinders and pistons, the one set being a duplicate of the other, so that a description of one-half of the machine will answer for the corresponding parts of the opposite half. Both pistons are reciprocated by the rotation of the shaft 6, the latter being mounted in suitable bearings 8 projecting from the chambered base of the machine. This base is provided with an air-chamber 9 to which leads the common inlet or air supply-pipe 10.

The mechanism for imparting reciprocation to the pistons confined in the respective cylinders will not be described herein as that forms the subject matter of my pending application, and it will be sufficient for the present purpose to state that the pistons of each pair confined in each cylinder reciprocate to and from each other so that as the pistons of the pair in one cylinder travel apart, the pistons in the opposite cylinder approach each other as fully indicated by the full and dotted positions of the parts in Fig. 1 of the drawings.

To bring a pump of the character here described to the highest state of efficiency, provision is herein made to deliver the air from the pump cylinder into the compressed-air chamber with a minimum amount of friction and resistance. This is accomplished

by the valve-mechanism constituting the subject-matter of the present application. As in my patent and pending application aforesaid, I provide for the cylinder a series of air-inlet compartments 11, controlled by induction valves 12, a port 13, leading therefrom to the cylinder on each side of each piston. The outlet ports or discharge parts or openings 14 however, communicate through ports 15 of the bottom connecting plate 16 with the interior of the valve-casings 17 confined in the compressed-air chamber 18, the chambers on either side being connected by pipes 19 with a common discharge pipe 20 (Fig. 1). The top of each valve-casing 17 is closed by a screw-cap 21. The peripheral walls of the valve-casing 17 are provided with a series of radially disposed cross-sectionally reduced discharge openings or passages 22, through which, as subsequently explained, the air is forced in the form of jets into the chamber 18. Within the casing 17 is a hollow primary eduction or check-valve 23 (Fig. 7) having a conical seat 24 connected to the body of the valve by an annular neck 25 of smaller cross sectional area than the body, said neck being provided with a series of radiating passages or openings 26 (Fig. 9) which communicate with a central longitudinal bore or passage 27 of the valve, the upper end of the passage 27 terminating in an enlarged cavity or chamber 28 closed by a screw-plug 29, said cavity having leading therefrom a series of radially disposed passages or openings 30 which communicate with an annular peripheral groove 31 formed in the valve 23 (Figs. 6, 7, 9). At the base of the valve-casing 17, and beyond the port 15 is an enlarged chamber 32; and at the bottom of the cavity 28 is normally seated a secondary check-valve 33 in the form of a ball or sphere, which closes communication between the passage 27 and cavity 28. As the air is forced by the reciprocations of the pistons through the ports 14 (as already well understood from my patent aforesaid) the force of the current raises the valve 23 off its seat (Fig. 7 and dotted position Fig. 6) the air (as seen by the arrows in Fig. 7) passing through the port 15 into the chamber 32, thence through passages 26 into the central passage 27, the force of the current raising or unseating the check-valve 33, and allowing the air to pass around it through the passages 30 into the annular groove 31, thence through the passages 22 of the valve-casing into the chamber 18.

As the pistons begin to recede from the ports 14 with their return stroke, naturally, provision must be made to prevent the air forced into the chamber 18 by any previous operation of the pistons, from rushing back into the cylinder. This consequence is provided against by the action of the valves 23 and 33 under the circumstances: The first effect such an incipient return of the air has, is to assist gravity in instantly seating the secondary check-valve 33; the second effect is to seat the primary valve 23 as will appear from the following arrangement of ports and air passages: Leading from the side of each port 15 is a port *a* which communicates with a longitudinal passage *b* of the base-plate 16 connecting the several valve-casings 17, the passage *b* leading from the central valve-casing communicating at each end with a port *c* in the base-plate, said port *c* in turn communicating with a vertical passage 34 extending longitudinally of the valve-casing, the upper end of the passage 34 communicating with a discharge port 35 which discharges into the valve-casing 17 above the primary check-valve 23. In like manner (Fig. 5) the passages *b* leading from the ports *a* of the outer or terminal valve-casings 17 jointly communicate with a port *c* leading to a passage 34 of the middle valve-casing, said passage leading to a port 35 similarly discharging above the primary check-valve 23. When therefore (using the right of Fig. 1 as an illustration) the pistons 2, 3, approach one another to force the air through the central port 14, a portion of the current entering the middle valve-casing 17 is shunted, passing through the port *a* and passages *b* leading from said middle valve-casing, into the ports *c* of the terminal valve-casing 17, thence into passages 34 and ports 35 above the primary check-valves 23 of said terminal casings 17, and positively seating said valves to prevent the return of the compressed air in the chamber 18 into the cylinder 1. So too, taking the left-hand portion of Fig. 1 as an illustration, as the pistons (shown dotted) travel toward the opposite ends of the cylinder to pump air through the terminal ports 14, a portion of the air forced into the terminal casings 17 is shunted, the same entering through the terminal ports *a*, *a*, into passages *b*, thence through central port *c*, into passage 34 and port 35 of the central valve-casing, thus positively seating the primary check-valve 23 (of the central casing) which was left raised or unseated by a previous operation.

The specific provision herein made for injecting the air into the compressed-air chamber 18 is important. The pumping or delivery of air from the cylinder 1 into the chamber 18 is necessarily attended with a degree of resistance in proportion to the pressure accumulated in the chamber. The injection of the air from the cylinder into the compressed-air chamber in the form of a single stream issuing from a port such as shown in my patent referred to, is attended

with greater resistance than is the delivery of an equal quantity of air through a series of reduced passages or openings 22, since the diminutive jets of air forced through such passages pierce the main body of air already compressed within the chamber, with a less amount of resistance than would be offered to a single stream issuing from a single port like 14, or from a port such as shown in my patented construction. While I do not herein attempt to account for this result upon any scientific theory, the probable reason therefor is the penetrating power of the individual jets. So that by delivering the air into the compressed-air chamber in the form of reduced jets, the resistance offered thereto by the air within the chamber is reduced to a minimum, thereby not only increasing the efficiency of the present compressor to a maximum, but making it possible to attain a great pressure in a minimum amount of time.

Such features of the present pump which may be illustrated, and to which no specific or general reference is made, are well known and I make no claim thereto. No reference is made to such features since they are well understood in the art and require no detailed description.

I may of course depart in a measure from the details here shown without in any wise affecting the nature or spirit of my invention. The valve mechanism may be used in air, water, or other liquid and fluid pumps.

Having described my invention what I claim is:

1. In a pump, a cylinder, a piston therefor, valve-controlled induction ports for the cylinder, a compressed-air chamber, valve-casings in said chamber, eduction ports leading from the cylinder into said casings, a series of passages formed in the walls of each casing, a primary check-valve having longitudinal movement in said casing, a seat at the bottom of the valve normally closing the eduction port, a reduced annular neck connecting the seat to the body of the valve, an enlarged chamber formed in the casing and surrounding the neck, a central longitudinal passage formed in the valve and terminating at its upper end in an enlarged cavity, a series of passages formed in the neck and in communication with the central valve passage and the surrounding chamber of the casing, an annular peripheral groove formed on the valve in a plane relatively below the inner ends of the passages formed in the walls of the casing, covers for the valve and casing respectively, a secondary spherical valve in the enlarged cavity normally closing the bottom of the latter, a passage formed in the casing and communicating with the space above the primary valve, a port leading to the base of said passage, said port being adapted to receive a portion of the air operating to unseat the primary valve of an adjacent valve-casing, substantially as set forth.

2. In a pump, a cylinder, a piston therefor, valve-controlled induction ports for the cylinder, a compressed-air chamber, valve casings in said chamber, eduction ports leading from the cylinder into said casings, a series of passages formed in the walls of the casing, a hollow primary check-valve having longitudinal movement in the casing and seating over the eduction port, means for permitting influx of air into the valve upon an unseating thereof, passages for establishing intercommunication between the interior of the primary valve and the passages formed in the casing walls, upon an unseating of the valve, and a secondary check valve within the primary valve for controlling the communication between the cylinder and the compressed-air chamber, substantially as set forth.

3. In a pump, a cylinder, a piston therefor, valve-controlled induction ports for the cylinder, a compressed-air chamber, valve-casings in said chamber, eduction ports leading from the cylinder into the casings, a series of passages formed in the walls of the casing, a longitudinally movable hollow primary check-valve in the valve-casing seating over the eduction port, a passage or port formed in the primary valve for conducting air from the cylinder into the chamber of the valve upon unseating of the valve, a gravity secondary check-valve in the primary valve adapted to be unseated by the influx of the air, and ports formed in the walls of the primary valve and discharging into the passages of the valve-casing and into the compressed-air chamber upon the unseating of the respective check-valves, substantially as set forth.

4. In a pump, a cylinder, a piston therefor, valve-controlled induction ports for the cylinder, a compressed-air chamber, valve casings in said chamber, eduction ports leading from the cylinder into the casings, a series of passages formed in the walls of the casing, a longitudinally movable hollow primary check-valve in the valve-casing normally seating over the eduction port, a passage or port formed in the primary valve for conducting air from the cylinder into the chamber of the valve upon unseating of the valve, a ball-valve in the primary valve adapted to be unseated by the influx of air into the primary check-valve with the unseating of the latter, ports formed in the walls of the primary valve and discharging though the passages of the valve-casing into the compressed-air chamber upon the un-

seating of the valves, and means for forcing the ball-valve to its seat in advance of the primary valve at the end of the piston stroke, substantially as set forth.

5. In a pump, a cylinder, a piston therefor, a compressed-air chamber, and primary and secondary check-valves controlling the passage of the air from the cylinder into the chamber, the secondary check-valve closing in advance of the primary valve at the conclusion of a piston stroke, substantially as set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES O. SOBINSKI.

Witnesses:

EMIL STAREK,

JOS. A. MICHEL.