No. 812,444. PATENTED FEB. 13, 1906.

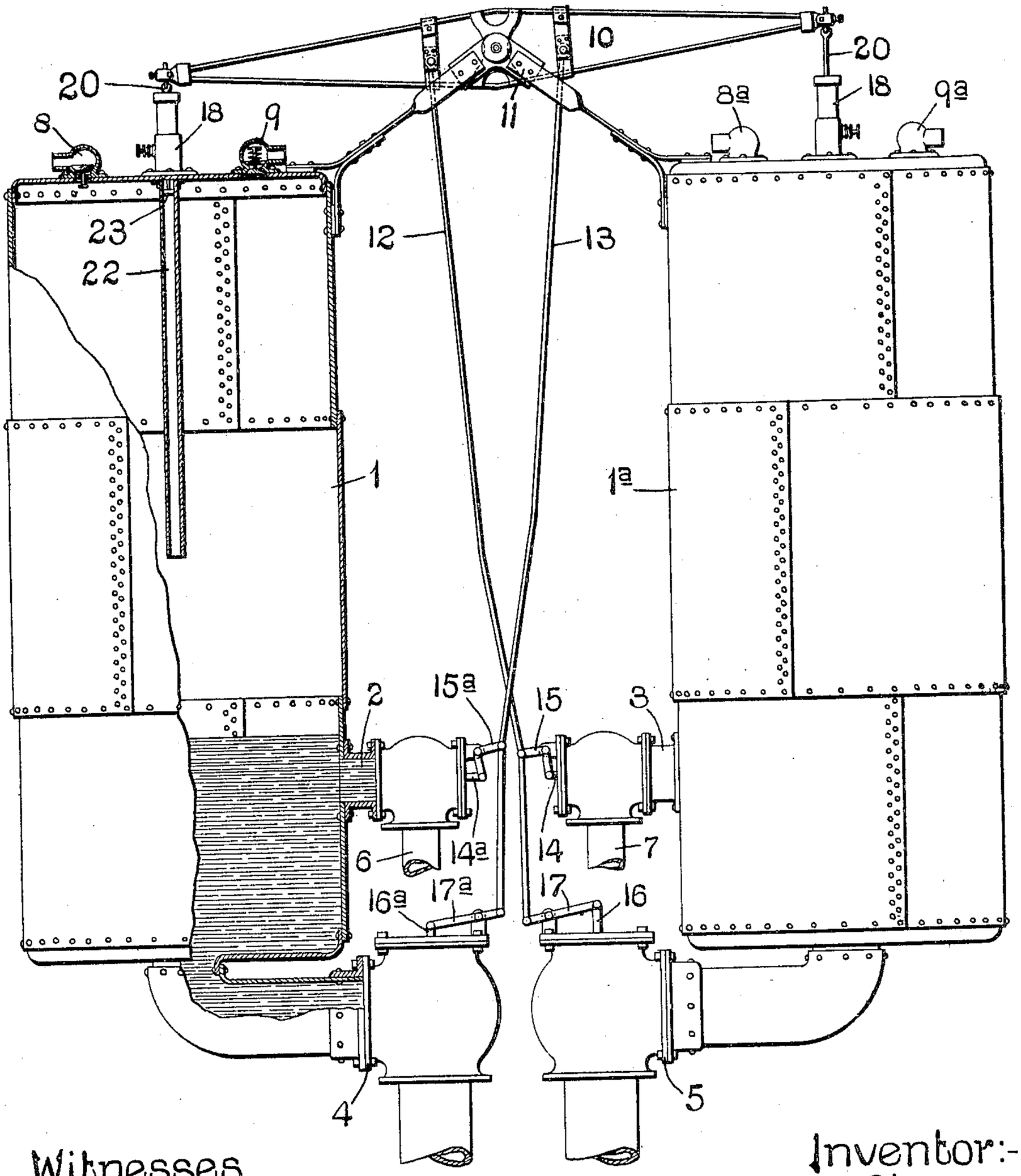
B. OBEAR.

VALVE OPERATING MEANS FOR HYDRAULIC PUMPS.

APPLICATION FILED APR. 1, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

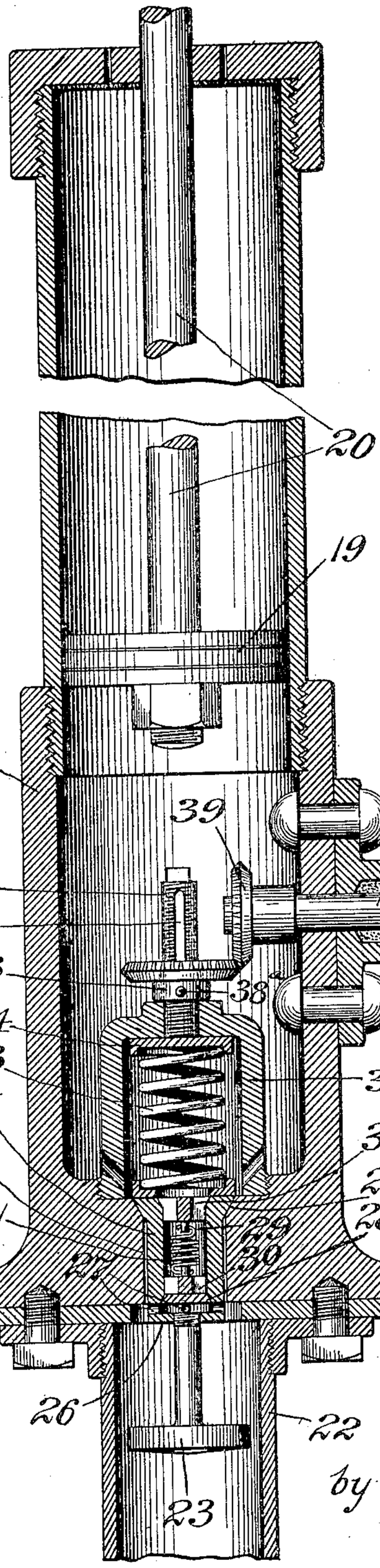


Fig. 3.

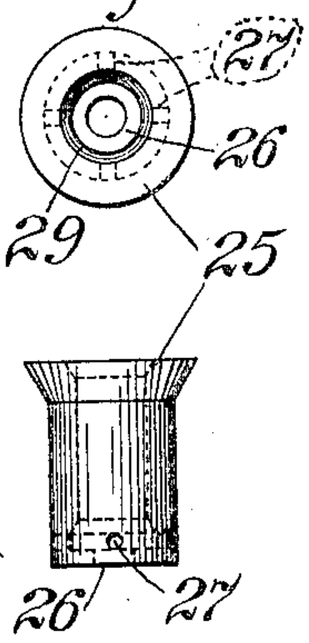
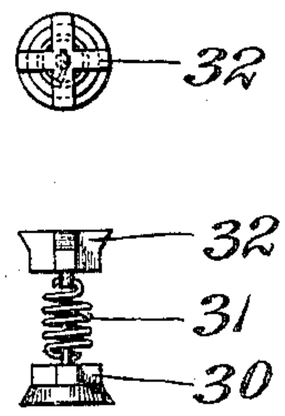


Fig. 4.



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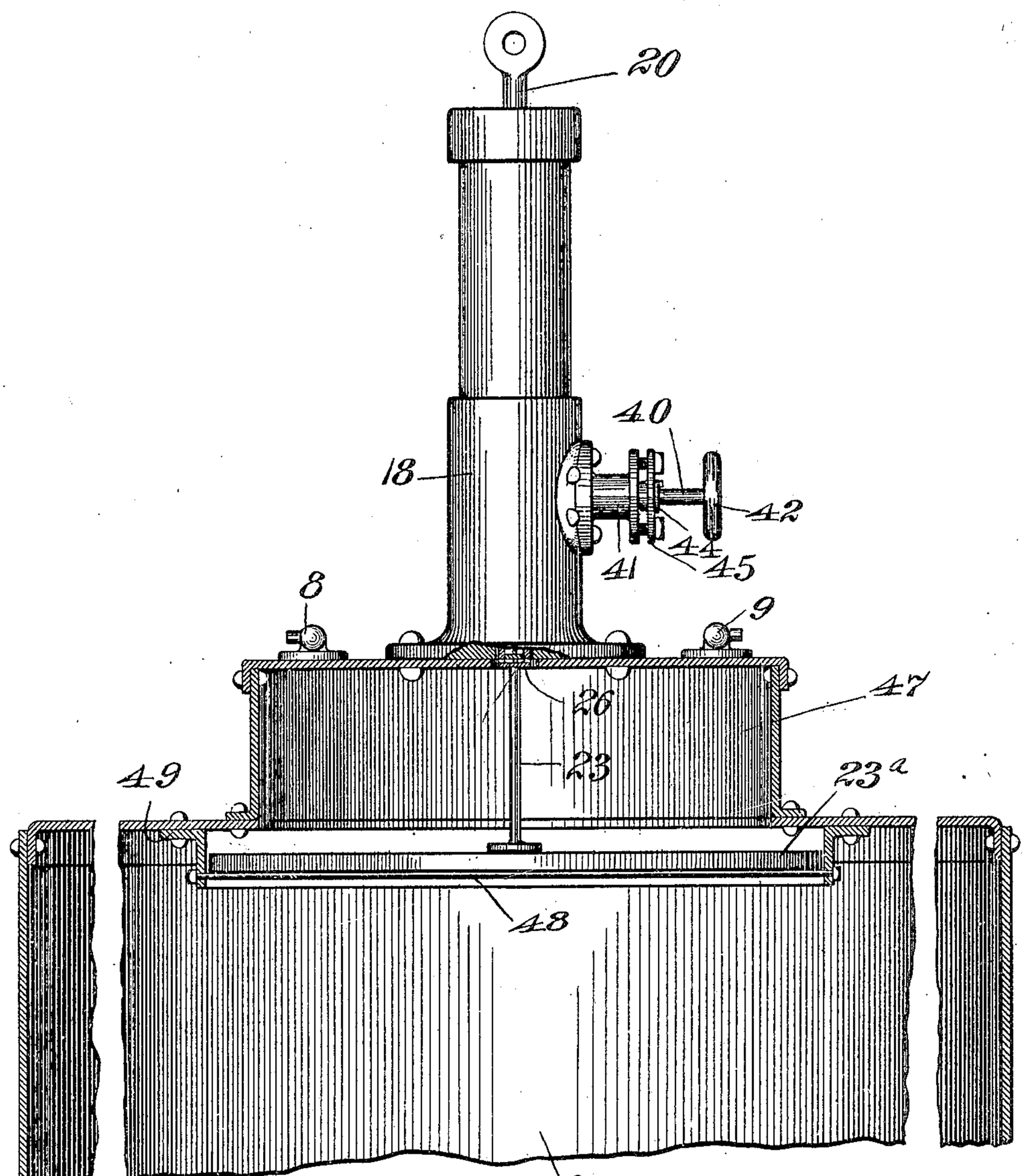
3 SHEETS—SHEET 3.

Fig. 5.



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UNITED STATES PATENT OFFICE.

BRYAN OBEAR, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE MONTAGUE COMPRESSED AIR COMPANY OF MISSOURI, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

VALVE-OPERATING MEANS FOR HYDRAULIC PUMPS.

No. 812,444. Specification of Letters Patent. Patented Feb. 13, 1906.

Application filed April 1, 1904. Serial No. 201,100.

To all whom it may concern:

Be it known that I, BRYAN OBEAR, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Valve-Operating Means for Hydraulic Pumps, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a view, partly in elevation and partly in section, of an air-compressor with my invention applied. Fig. 2 is an enlarged vertical sectional view of a fluid-controlling valve mechanism constructed in accordance with my invention. Fig. 3 illustrates, respectively, the top and side of the relief-valve. Fig. 4 illustrates, respectively, the top plan and side elevation of a check-valve and its support; and Fig. 5 is a view, partly in elevation and partly in section, of a tank, illustrating a modified form of the fluid-pressure-actuating mechanism.

This invention relates to a valve-operating means for hydraulic pumps, and it is particularly designed for use in connection with air-compressors for storing compressed air.

One of the objects of the invention is to provide means whereby the valve can be set to permit the device to which it is attached to be actuated at a given pressure.

Another object of the invention is to provide means whereby the compression of the fluid will be continuous, and to this end I prefer to employ two tanks having inlet and outlet ports permitting entrance to and egress from the tank of sufficient quantities of liquid to compress the air and refill the respective tanks alternately.

Another object is to provide mechanism whereby entrance of the liquid to one tank will be permitted while the egress-port is cut off, which mechanism is so disposed that the entrance-port of the coöperating tank is cut off while the egress-port is open.

Another object is to provide means whereby the alternate opening and closing of the respective ports may be automatically and instantaneously effected.

Other objects and advantages, as well as the novel details of construction of this invention, will be referred to hereinafter, it being understood that changes in form, proportion, and in minor details of construction can be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

In the form illustrated in Fig. 1 two tanks 1 and 1ª are employed, the respective tanks having valve-controlled inlet-ports 2 and 3 and valve-controlled outlet-ports 4 and 5. The pipes 6 and 7, communicating with the inlet-ports of the respective tanks, are preferably connected to a suitable water-main, so that by opening either of the inlet-ports 2 or 3 the tanks can be filled, it being understood that when one of the tanks is filling the outlet-port thereto is closed, so that the air in the tank will be compressed toward the top and a part thereof will be permitted to pass out through the check-valve escape-opening, which, as applied to the tank 1, is designated by the reference-numeral 8. When the water recedes on account of opening one of the egress-ports and closing the inlet-port, a partial vacuum will be created in the tank, and this vacuum will be sufficient to draw in air through the inlet-port 9, which is also provided with a check-valve movable in a direction opposite to the check-valve in the port 8. The respective ports 8ª and 9ª on the tank 1ª correspond to the ports 8 and 9 on the tank 1 and operate in practically the same manner. It is intended that when the port 2 is open the port 4 will close and the port 3 will be closed while the port 5 is open, the positions of the several valves being determined by the position of the walking-beam 10, fulcrumed on the support 11, carried by the respective tanks. When the inlet-port 3 is opened, the outlet-port 5 will be closed, the inlet-port 2 will be closed, and the outlet-port 4 will be opened. Thus the inlet-port to one tank will be open while the other is closed and the outlet-ports in the tanks alternately opened and closed in the same manner. In order that the opening and closing of the several valves can be effected simultaneously, they are connected to the walking-beam 10 by suitable mechanism, which, in Fig. 1, is illustrated as comprising pitmans 12 and 13. The pitman 12 is connected to the valve-stem 14 by a bell-crank lever 15 and to the valve 16 by a lever 17. A bell-crank lever 15ª is connected to the

valve-stem 14ª and to the pitman 13, and the valve-stem 16ª is connected to the pitman 13 by a lever 17ª. Thus it will be apparent that the rocking of the walking-beam 10 will alternately move the pitmans 12 and 13 in opposite directions, so as to alternately open and close the respective valves. The walking beam is controlled by suitable mechanism, which is clearly illustrated in Fig. 2. One form of controlling mechanism consists of a tubular shell 18, which is bolted to the top of one of the tanks and carries therein a reciprocating piston 19, having a stem or rod 20, which is connected to one end of the walking-beam. The lower end of the cylinder 18 is provided with an opening 21, communicating with the interior of the tank, and surrounding this opening 21 is a depending tube 22, which projects into the tank and forms a suitable guide for a float or plunger 23, movable therein. The cylinder 18 is provided with a seat 24, in which rests a hollow valve 25, having a closed end 26, in which is screwed the plunger 23. This valve 24 is provided with side ports 27, above which is a valve-seat 28, formed at the bottom of the longitudinal bore 29 of the valve 24, and in this seat is a check-valve 30, normally seated by means of a spring 31, which is connected to a spider 32 in the top of the valve.

In order that the valve can be operated only under a determined pressure, I have provided means for governing the resisting power of the valve, which is a tension device illustrated as a spring 33. This spring is seated upon the top of the valve, its opposite end bearing against a flanged disk 34, having a threaded stem 35, provided with a longitudinally-disposed slot 36. The stem is supported within the cylinder 18 by a suitable support 37, in which the stem is threaded. A longitudinally-movable gear 38 is mounted on the stem and meshes with a gear 39 on a shaft 40, projecting through a suitable stuffing-box 41 and carrying a hand-wheel 42. By turning the hand-wheel 42 a rotative movement will be imparted to the gear 39, which being communicated to the gear 38 will impart a rotative movement to the stem 35. As the gear 38 is provided with a pin 38ª, engaging the slot 36, the rotation of the stem 35 will permit it to move longitudinally of the cylinder and compress the spring or permit it to expand, according to the direction in which the gear 38 is rotated. Thus it will be apparent that the tension of the spring 33 can be regulated, so that the valve 24 can only be actuated under a given pressure. After the tension device is properly set it can be held in that position by means of a set-screw 43, carried by the collar 44 on the stem 40, which set-screw is capable of engaging one face of the stuffing-box 45. Of course it will be understood that each tank is provided with a fluid-controlled mechanism similar to the one illustrated in Fig. 2 and that each piston-rod 20 is connected to one end of the walking-beam 10. Suppose the parts are all assembled and the valve mechanism has been set to operate at a pressure between fifty and seventy pounds. It may be necessary to move the walking-beam 10 at one limit of its stroke, so as to open the inlet-valve to one tank and close the inlet-valve to the other tank, which operation would automatically close the outlet-opening to the first tank and open the outlet-opening to the second tank. If the parts, for example, were in the position illustrated in Fig. 1, the water from the main or other source of supply would enter through the pipe 6 and the opening 2 and fill the tank 1. As soon as the water-level reached its determined height and a sufficient pressure existed in the tank 1 the plunger 23 would be moved upward, so as to raise the valve 24, of which it froms a part, the air would be permitted to pass through the opening 21 in the cylinder 18, so as to impart an upward impulse to the piston 19, causing the end to which the stem 20 was attached to move in an upward direction and depressing the opposite end of the walking-beam. This movement of the walking-beam would instantaneously close the valve-opening 2 and open the valve-opening 4. At the same time the valve-port 3 would be opened and the valve-port 5 would be closed. This would permit the water to recede from the tank 1, and at the same time the tank 1ª would start to be filled, the water compressing the air therein to be discharged through the outlet-port 8ª, it being understood, of course, that during the filling of the tank 1 part of the air passed through the port 8 into the compressed-air reservoir. As the water recedes in one of the tanks the check-valve in the outlet-ports 8 or 8ª is actuated to close its port, while the ports 9 or 9ª are opened to permit the tanks to be again filled with air. After the mechanism is properly set in operation it will be automatic and will continue to operate without any attention as long as the pipes 6 or 7 are in communication with a proper source of supply. I have found under certain conditions that there is not a uniform pressure from water-mains, and in order to provide for a variable pressure I construct a tank as illustrated in Fig. 5, the mechanism in which will operate under a variable pressure.

In the form illustrated in Fig. 5, 46 designates a tank provided with a dome 47, communicating with the top of which is a cylinder 18, constructed in accordance with the cylinder illustrated in Fig. 2 and having all of the appurtenances thereto with the exception that the stem leading from the bottom of the valve 24 is somewhat longer than the stem to the float or plunger 23, and this stem is connected to a float 23ª, the downward

movement of which is limited by cross bars or supports 48, carried by a flanged ring 49. The valves and other accessories are similar to those illustrated in Fig. 1. Of course the inrush of the water into the tank 46 will cause air to be stored in the dome 47, and as soon as the water reaches a level in the same plane with the float 23[a] the valve 24 will be raised and the accumulated air in the dome 47 will operate the piston in the cylinder 18 to actuate the piston-rod 20 and thereby operate the walking-beam and the coöperating mechanism in a manner similar to that heretofore described. When one end of the walking-beam begins to descend, a downward movement will be imparted to the piston 19, compressing a sufficient amount of air in the cylinder 18 to unseat the valve 28, so that the pressure in the cylinder 18 between the piston and the floor of the cylinder will be relieved, and no resistance will be offered to the opposing piston carried by the other tank.

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

1. In a device of the class described, the combination with a casing having an opening at one end, a valve in the opening, a passage from the casing through the valve, a check-valve for the same passage carried by said valve and movable in a direction opposite to the opening movement of the first-named valve, a valve-actuating device carried by the first-named valve, a tension device on the first-named valve, and a piston to receive a fluid impulse when the first-named valve is unseated; substantially as described.

2. In a device of the class described, the combination with a casing having an opening at one end, a valve in the opening, a passage from the casing through the valve, a check-valve for the same passage, a spring bearing upon the first-named valve, a tube surrounding the opening and projecting into the casing to which the first-named casing is attached, a valve-actuating device in the tube and capable of moving the valve under pressure, said valve-actuating device comprising a plunger and rigid with the said valve; substantially as described.

3. A device of the class described, comprising a casing having an opening at one end, a valve in the opening, a passage from the casing through the valve, said valve having a central channel with radial ports adapted to communicate therewith, a check-valve for the same passage and for closing communication between the ports and the central channel, means for seating the first-named valve, and a plunger carried by the first-named valve for unseating it; substantially as described.

4. In a device of the class described, the combination with a casing having an opening, a valve in the opening, an auxiliary valve carried by the first-named valve and capable of opening and closing the ports therein, a spring on the first-named valve, a support above the spring, a stem carried by the support and threaded therein, means on the stem bearing against the spring, a gear carried by the stem and slidable thereon, a gear meshing with the first-named gear, and means for actuating the last-named gear to cause compression or expansion of the spring through the medium of the stem; substantially as described.

5. In a device of the class described, the combination with a casing having an opening, a ported valve in the opening, an auxiliary valve carried by the first-named valve and capable of opening and closing the ports therein, a spring on the first-named valve, a removable support above the spring, a stem carried by the support and threaded therein, a flanged disk on the stem and bearing against the spring, a gear carried by the stem and slidable thereon, a gear meshing with the first-named gear, and means for actuating the last-named gear to cause compression or expansion of the spring; substantially as described.

6. In a device of the class described, a casing having a hollow valve at one end, a cylinder surrounding the hollow valve and communicating therewith, a yielding means within the cylinder for normally retaining the valve upon its seat, a check-valve within the first-named valve and positioned above radial ports in said valve, a resilient means for normally holding the second valve seated, a depending tube adapted to communicate with the cylinder when the first-named valve is unseated, and a plunger rigid with the first-named valve and movable in said tube; substantially as described.

7. In a device of the class described, a casing having an opening at one end, a valve in the opening, a passage from the casing through the valve, a yielding means for normally retaining the valve upon its seat, a check-valve for the same passage and carried by said valve, said check-valve being within the first-named valve and positioned above radial ports therein, a tension device for the first-named valve, and means for regulating the tension device including a stem having a rotative and a reciprocatory movement; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 30th day of March, 1904.

BRYAN OBEAR.

Witnesses:
B. F. FUNK,
GEORGE BAKEWELL.