No. 822,850. PATENTED JUNE 5, 1906.

W. B. MASON.

PRESSURE VARIATING DEVICE.

APPLICATION FILED MAR. 30, 1904. RENEWED SEPT. 27, 1905.

2 SHEETS—SHEET 1.

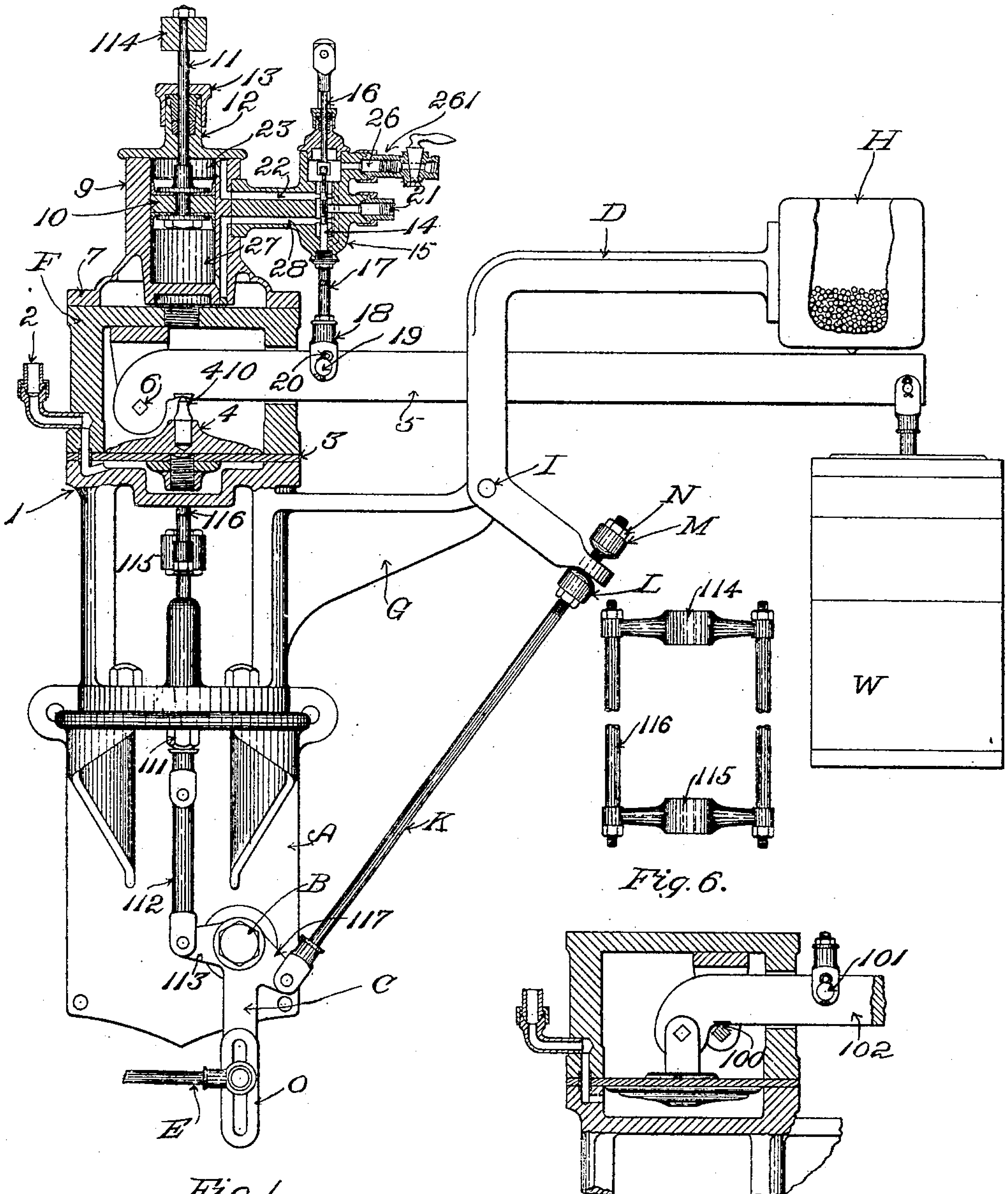


Fig. 1.

Fig. 6.

Fig. 3.

Witnesses:
J. Henry Parker
Oscar F. Hill

Inventor:
William B. Mason
by Macleod, Calver & Randall.
Attorneys.

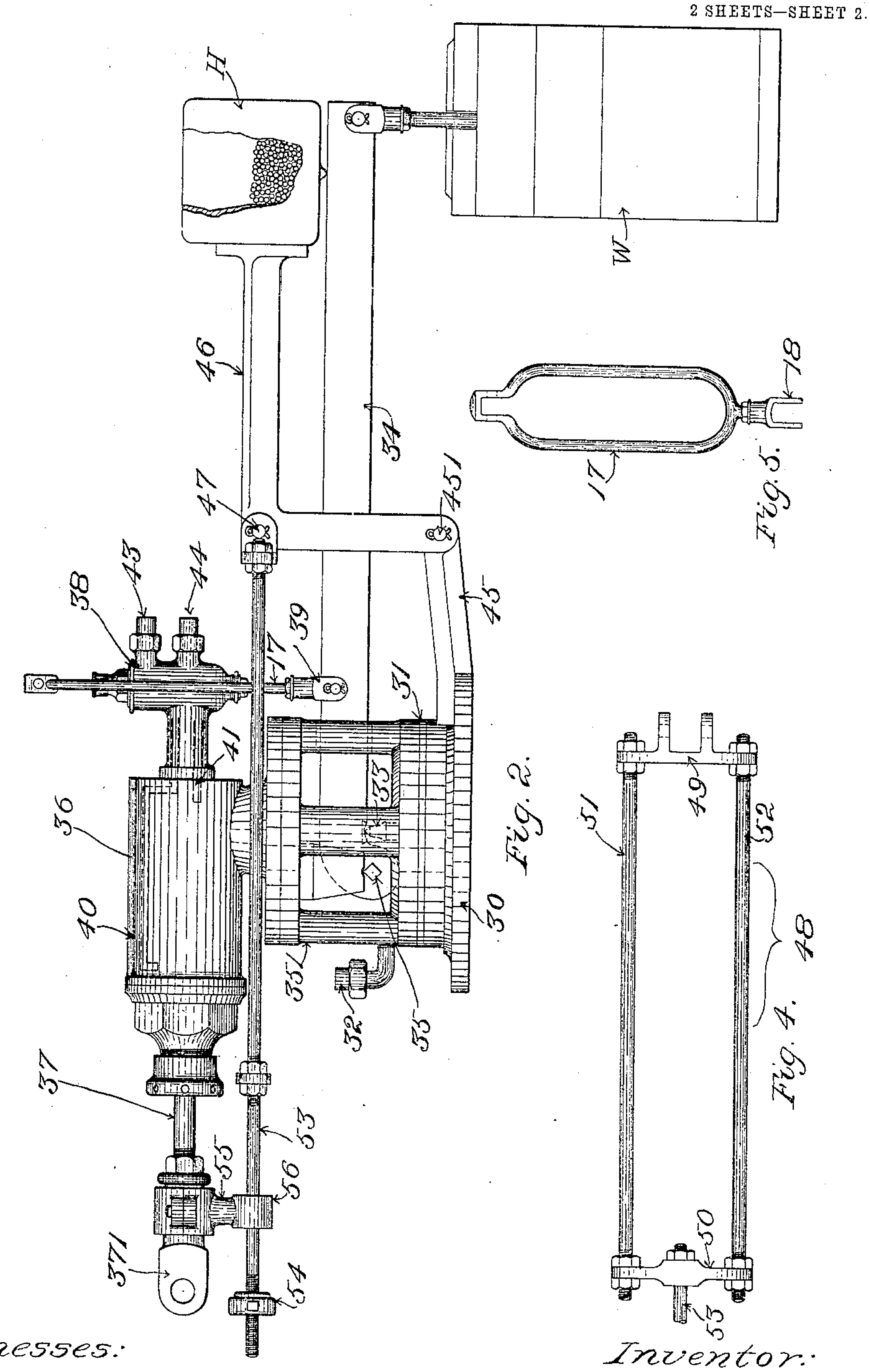
No. 822,850. PATENTED JUNE 5, 1906.

W. B. MASON.

PRESSURE VARIATING DEVICE.

APPLICATION FILED MAR. 30, 1904. RENEWED SEPT. 27, 1905.

2 SHEETS—SHEET 2.



Witnesses:
J. Henry Parker
Oscar F. Hill

Inventor:
William B. Mason
by Macleod, Calver & Randall
Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM B. MASON, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE MASON REGULATOR COMPANY, OF SACO, MAINE, A CORPORATION OF MAINE.

PRESSURE-VARIATING DEVICE.

No. 822,850. Specification of Letters Patent. Patented June 5, 1906.

Application filed March 30, 1904. Renewed September 27, 1905. Serial No. 280,345.

To all whom it may concern:

Be it known that I, William B. Mason, a citizen of the United States, residing at Boston, in the county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Pressure-Variating Devices, of which the following is a specification, reference being had therein to the accompanying drawings.

It is frequently desirable that pressure tanks or containers containing fluid under pressure, the contents of which is drawn upon continuously or periodically for the performance of work, should have the flow to them automatically regulated. For example, a tank containing water under pressure, which is drawn upon as required for the performance of certain work and which is kept supplied by a pump, requires that the pump shall be stopped when the pressure has reached a predetermined amount—say one hundred pounds—and shall be again started when the pressure has fallen below that point or some lower predetermined point—say fifty pounds. In the supposed case the pump would be cut out when the pressure in the tank reached one hundred pounds and would remain cut out until the pressure in the tank had dropped to fifty pounds, when it would again be cut in and the operation repeated, thus insuring a constant fluid-supply for the tank under a pressure of not more than one hundred pounds and not less than fifty pounds. My device is particularly applicable and valuable where the pressure-tank is supplied by a large pump, which should be started and stopped as seldom as possible. It is evident from the foregoing that by the use of my device the pump may be allowed to stand still a large part of the time.

My invention has for its object an automatic pressure-controller by means of which the pressure control above indicated may be obtained.

The invention will be fully understood from the following description, taken in connection with the accompanying drawings, and the novel features thereof are pointed out and clearly defined in the claims at the end of this specification.

In the drawings and in the specification I have shown and described two embodiments of my invention, one of which operates the belt-shifter of a belt-driven pump, while the other is adapted to operate the rheostat of an electrically-driven pump, the pump being used to supply a tank the pressure in which is allowed to fall through a considerable range between the stopping and starting of the pump. I have also shown my invention as adapted to control a pump used to produce a vacuum, a slight modification only being required to meet these conditions.

My invention is not limited to the particular embodiments here shown, but, as will be clear, may be employed to control various forms of pumps or pressure or vacuum producing devices, however actuated.

In the drawings, Figure 1 is an elevation, partly in section, of a device embodying my invention and adapted to operate the rheostat of an electrically-driven pump. Fig. 2 is a similar view of another embodiment of my invention adapted to operate the belt-shifter of a belt-driven pump. Fig. 3 shows the necessary modifications when the invention is to be used with a vacuum-producing pump. Figs. 4, 5, and 6 are details of certain parts of the pump.

Referring to the drawings, I will first describe my invention in the form adapted for use in connection with an electrically-driven pump and adapted to operate the arm of a rheostat controlling the flow of electricity to the motor of the pump.

A is a base which may be supported in any convenient way, (not necessary to be shown,) to which is pivoted at B the three-arm lever C. The lower end of this three-arm lever terminates in a slotted connection O, to which is attached the rheostat connection E. By means of the slot in the arm O the throw given to the rheostat connection E may be varied by moving the point of engagement upward or downward in the said slot.

The base A has a diaphragm-chamber 1, which is connected, by means of the inlet 2, with a tank (not shown) the pressure of which is to be controlled. The diaphragm 3, preferably of rubber or similar flexible material, rests upon the fluid in the chamber 1 and is provided on its upper side with a button or plate 4 of usual construction. The button 4 supports a knife-edge 410, upon which rests a lever-arm 5, which is fulcrumed at 6 within the open or pillared supporting portion F and which is weighted at its free end, as shown at W. Upon the part F rests a cap or plate 7, supporting a cylinder 9. Within the cylinder 9 is a piston 10, having a rod or stem 11. 12 is a stuffing-box through which said rod 11 passes, and 13 is the stuffing-box nut. The said piston 10 within the cylinder 9 is adapted to be operated in both directions by water under pressure admitted through the valve 14. The said valve 14 is housed in a casing 15, secured to the cylinder 9, as shown. The upper end of the stem 16 of the valve 14 is pivotally connected with a branched or yoke-shaped connection 17, (see Fig. 5, where this yoke-shaped connection is shown in detail,) which passes downwardly on each side of the valve-casing and is provided at its lower end with a bifurcated terminal 18, which straddles the upper edge of the lever 5 and is pivoted thereto by means of the pin 19, which is secured in place by the cotter 20. When the valve 14 is raised by the upward movement of the lever-arm 5, the inlet 21 is connected with the port 22 and water or other fluid under pressure is admitted to the upper end 23 of the cylinder 9, causing the piston 10 to move downward and carrying with it the stem or rod 11. The upper end of the rod 11 is provided with a yoke-shaped connection, by means of which it is attached to the vertical rod 111, which in turn is guided in the frame A and is provided at its lower end with another connection 112, attached to the arm 113 of the three-arm lever C. This yoke-shaped connection consists of two cross-heads 114 and 115 and a pair of vertical rods, one of which, 116, is shown behind the rest of the apparatus in Fig. 1. The construction of this yoke-shaped connection is to be seen by reference to Fig. 6. The above-described connections between the piston 10 and the three-arm lever C cause the rheostat-connecting arm E to be moved to correspond with the movement of the piston 10. The upward movement of valve 14 above referred to also opens the drip 26, which allows the end 27 of the cylinder 9 to exhaust through the port 28, the passage 221, (shown in dotted lines in Fig. 1,) and the drip 26. The movement of the valve 14 in the downward or opposite direction opens the end 23 of the cylinder 9 to the exhaust 26 and connects the inlet 21 with the end 27 of the cylinder through port 28, thus admitting water under pressure to the lower end of the cylinder 9, reversing the movement of the piston 10, and moving the rheostat-connecting arm E and stopping the pump.

It will be clear that the device thus far described will cut the pump out when the tank-pressure has risen above a predetermined point and as soon as it has fallen below said point will immediately cut it in again. This method of operation is sometimes desirable; but, as previously stated, my invention is particularly devised to prevent the frequent stopping and starting of the pump, which subjects it to undue wear and tear. It is therefore generally preferable that the pump be cut out when the maximum pressure desired is reached—say one hundred pounds—and remain cut out until the pressure has fallen to a predetermined minimum—say fifty pounds—when it is again cut in and allowed to work until the pressure has again risen to the maximum. In this way the pump is given alternate periods of work and rest.

To effect the cutting in of the pump at a pressure lower than that at which it is cut out, I provide the following mechanism: Projecting from the frame A is a fixed arm G, to which I pivot at I the angle-lever D, which is provided at its free end with a weight H. This weight H may be hollow and adapted to carry a greater or less quantity of shot or other material for the purpose of increasing or diminishing its weight, as may be desired. When this weight H is allowed to rest on the pressure-weighing arm 5, it will be clear that the weight thereon will be increased and that a greater pressure will be required on the fluid in the tank before the arm 5 will be raised thereby. If the combined weights W and H are sufficient to counterbalance a pressure of one hundred pounds in the tank, the pump will be cut out when the tank-pressure has reached one hundred pounds. If now the weight H be lifted from the lever 5, the lever will remain in its raised position until the tank-pressure has dropped an amount equal to that which will counterbalance the said weight H. To keep the pump cut out therefore, the weight H must be lifted from the lever 5 as soon as the maximum pressure is reached and the pump cut out and must be held off said lever 5 while the pressure in the tank is falling to its minimum, said minimum being the pressure which will counterbalance the weight W.

To raise the weight H and lever D when the maximum tank-pressure has been reached and the pump cut out, I provide a connection K, attached at its lower end to the arm 117 of the three-arm lever C and passing through a hole in the downwardly-projecting portion of the angle-lever D. At the upper end of this rod K is a movable tappet or stop L, against which the downwardly-projecting portion of the lever D may rest. To prevent the parts becoming separated, I also provide the extreme upper end of the connecting-rod K with another tappet M, held in place by a nut N. This tappet M serves only to prevent the parts becoming displaced and performs no operative function in the embodiment of the machine. The operation of this form of my device is as follows: When the tank-pressure has reached a point above that counterbalanced by the two weights H and W, the pressure which is transmitted through the pipe 2 to the under side of the diaphragm 3 raises the diaphragm and its attached knife-edge 410 and pushes upwardly the pressure-weighing arm 5 and the two weights W and H, supported thereon. At the same time the attached valve-spindle 14 is moved upwardly, and water or other fluid under pressure is admitted through the inlet 21 and the port 22 to the upper side of the piston 10, thereby causing the said piston 10 to move downwardly. By the downward movement of the piston the attached yoke-shaped connection is also moved downwardly, thereby causing the three-arm lever C to move about its pivot B and causing a corresponding movement of the angle-lever D, upon the end of which is supported the weight H. At the same time the rheostat-connecting arm E is moved toward the right, cutting off the power from the pump. It is therefore clear that when the maximum pressure is reached the two weights W and H are moved upward nearly simultaneously and that the weight H will be held at the highest point of its movement so long as water under pressure remains in the upper end 23 of the cylinder 9. When the pressure beneath the diaphragm 3 falls below the predetermined minimum which corresponds to the pressure counterbalanced by the weight W, the pressure-weighing arm 5 drops back to the lowest point of its movement, carrying down with it the stem of the valve 14. When the valve-stem 14 has moved down far enough, water under pressure is admitted through the inlet 21 to the port 28, connecting with the lower end of the cylinder 9, thus giving the piston 10 an upward movement, which in turn lifts the yoke-shaped connection and moves the three-arm lever C about its pivot B. By the movement of the three-arm lever C the weight H is lowered until it rests again upon the pressure-weighing arm 5. At the same time the rheostat-connecting arm E is moved to the left, thus cutting the pump in again. I find it convenient frequently to place a stop-cock 261 upon the drip 26 in order that the flow of fluid from the end of the cylinder which is being exhausted may not be too rapid and thus cause injury to some of the connected parts. By partially closing this stop-cock I am enabled to regulate the movement of the piston with great accuracy.

I have found that for moving a switch or rheostat which controls an electrically-driven pump the just-described embodiment of my invention is preferable, and its peculiar shape makes it well adapted for installation in many locations.

I will now describe my invention as I arrange it for use in connection with a pump driven by a belt, the device embodying my invention operating to shift the belt from a tight to a loose pulley, or vice versa, in the well-known manner. Referring now to Fig. 2, I provide a base 30, having therein a chamber similar to the one shown in Fig. 1, a diaphragm 31, and a connection 32 to the tank. On the upper side of this diaphragm is a knife-edge 33, upon which rests the pressure-weighing arm 34, which is pivoted at another knife-edge 35. At the end of the pressure-weighing arm 34 is attached a weight W. Resting upon the base 30 is a pillared supporting-frame 351, which supports a horizontal cylinder 36, similar in construction to the cylinder 9, Fig. 1, and having within it a piston and rod, one end of which, 371, is arranged for attachment to a belt-shipper. (Not necessary to be shown.) At the other end of the cylinder 36 is a valve 38, exactly similar in construction to the valve described in connection with Fig. 1. This valve is operated by a yoke-shaped connection 39, attached at its lower end to the pressure-weighing arm 34. The valve 38 controls the flow of fluid through the passages 40 and 41 to the two ends of the cylinder 36. The inlet of the valve is designated 43 and the drip or exhaust at 44. Extending from one side of the base 30 is an arm 45, at one end of which is pivoted at 451 an angle-lever 46, having at its other extremity the weight W. Attached at 47 to the knee of the angle-lever 46 is a yoke-shaped connection 48, (see Fig. 4,) made up of two cross-heads 49 and 50 and two side rods 51 and 52, the whole being arranged to extend about the valve-yoke 17 and the supporting-frame 351. This yoke-shaped connection 48 terminates in a rod 53, having at its outer end an adjustable tappet 54. The piston-rod 37 carries a projection 55, which terminates in a collar 56, through which the rod 53 slides. This collar 56 comes in contact with the tappet 54 near the end of the stroke of the piston and pulls the yoke-shaped connection 48 to the left, moving the angle-lever 46 about its pivot 451 and thus raising the auxiliary weight H. The operation of this embodiment of my invention is similar to that described in connection with Fig. 1. When the pressure in the tank has reached its maximum, the pressure-weighing arm 34 is lifted and carries with it the weights W and H. At the same time the valve 38 is moved upwardly, admitting the fluid under pressure through the inlet 43 to the right-hand end of the cylinder 36 and causing the piston and its attached belt-shifter to move to the right. Near the end of the stroke of the piston the collar 56 engages the tappet 54 and lifts the weight H from the pressure-weighing arm 34. When the pressure in the tank falls to the minimum, (said minimum being the pressure counterbalanced by the weight W,) the weight W falls, opens the exhaust 44, and admits water to the other end of the piston, thus causing the belt-shifter to be moved to the right and the weight H to be replaced upon the pressure-weighing arm 34.

In Fig. 3 I have shown my invention as arranged for use in connection with a pump which it is desired shall maintain a constant vacuum in a tank. In this case it is only necessary to change the fulcrum-point of the pressure-weighing lever. The changes required are indicated in Fig. 3, in which the fulcrum is designated 100 and the point at which the power is applied to raise the lever 101. What I term the "pressure-weighing lever" is designated 102. If considerable power is required and the vacuum to be maintained is a small one, it may be desirable to increase the size of the diaphragm in order that ample power may be obtained to move the lever 102 with its weights.

As will be clear, the piston movement of my device may not only be employed for shifting a belt or moving an electric switch or rheostat, as in the embodiments herein shown and described, but may with equal facility be employed to open or close a valve in the supply-pipe of a pump driven by steam, compressed air, or the like, and I do not, therefore, wish to limit myself to the embodiments of my invention herein set forth, as there are many modifications which may be made, all within the spirit of my invention.

I claim as my invention—

1. In an automatic pressure-variating device for the purposes mentioned, a pressure-weighing arm movable in response to changes in pressure, a weight therefor, a motor device, a valve therefor, operative connections between the pressure-weighing arm and the said valve, an auxiliary weight for the said pressure-weighing arm and connections between the said auxiliary weight and the movable part of the said motor device whereby the auxiliary weight is lifted from the said pressure-weighing arm after one stroke of said arm and is replaced upon the arm after the reverse stroke thereof.

2. In an automatic pressure-variating device for the purposes mentioned, a pressure-weighing arm movable in response to changes in pressure, a weight therefor, a hydraulic-motor device comprising a cylinder with a piston movable therein, a valve for the said motor device, operative connections between the pressure-weighing arm and the said valve, an auxiliary weight for the said pressure-weighing arm and connections between the said auxiliary weight and the piston of the motor device, whereby the said auxiliary weight is lifted from the said pressure-weighing arm after one movement of the said arm and is replaced upon the said arm after the reverse movement thereof.

3. In an automatic pressure-variating device for the purposes mentioned, a pressure-weighing arm movable in response to changes in pressure, a weight therefor, a hydraulic-motor device comprising a cylinder with a piston movable therein, a valve for the said motor device, operative connections between the pressure-weighing arm and the said valve, an auxiliary weight for the said pressure-weighing arm, a pivoted supporting-arm for the said auxiliary weight, and a sliding connection operated by the piston-rod and engaging the pivoted supporting-arm at the end of the stroke of the piston.

4. In an automatic pressure-variating device for the purposes mentioned, a pressure-weighing arm movable upwardly in response to changes in pressure, a weight therefor, a hydraulic-motor device comprising a cylinder with a piston movable therein, a valve for the said motor device, operative connections between the pressure-weighing arm and the said valve, an auxiliary weight for the said pressure-weighing arm and a pivoted supporting-arm for the said auxiliary weight, a connecting-rod attached thereto and having a stop fast thereto, and a sliding connection between the said piston-rod and the auxiliary-weight-supporting arm whereby the pivoted lever is caused to lift said auxiliary weight from the pressure-weighing arm at the end of its upward stroke and thereafter to replace the same upon the said pressure-weighing arm.

5. In an automatic pressure-variating device a pressure-weighing arm movable in response to changes in pressure, a motor device controlled by the movement of said pressure-weighing arm, connections intermediate said motor device and said arm whereby the former is controlled by the movement of the latter, an auxiliary weight for the said pressure-weighing arm, and connections between the said auxiliary weight and the movable part of the said motor device whereby the auxiliary weight is lifted from the said pressure-weighing arm after one stroke of said arm and is replaced upon the arm after the reverse stroke thereof.

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

WILLIAM B. MASON.

Witnesses:

WM. A. MACLEOD,
C. A. DEPUY,
W. J. KENNEDY.