

(No Model.)

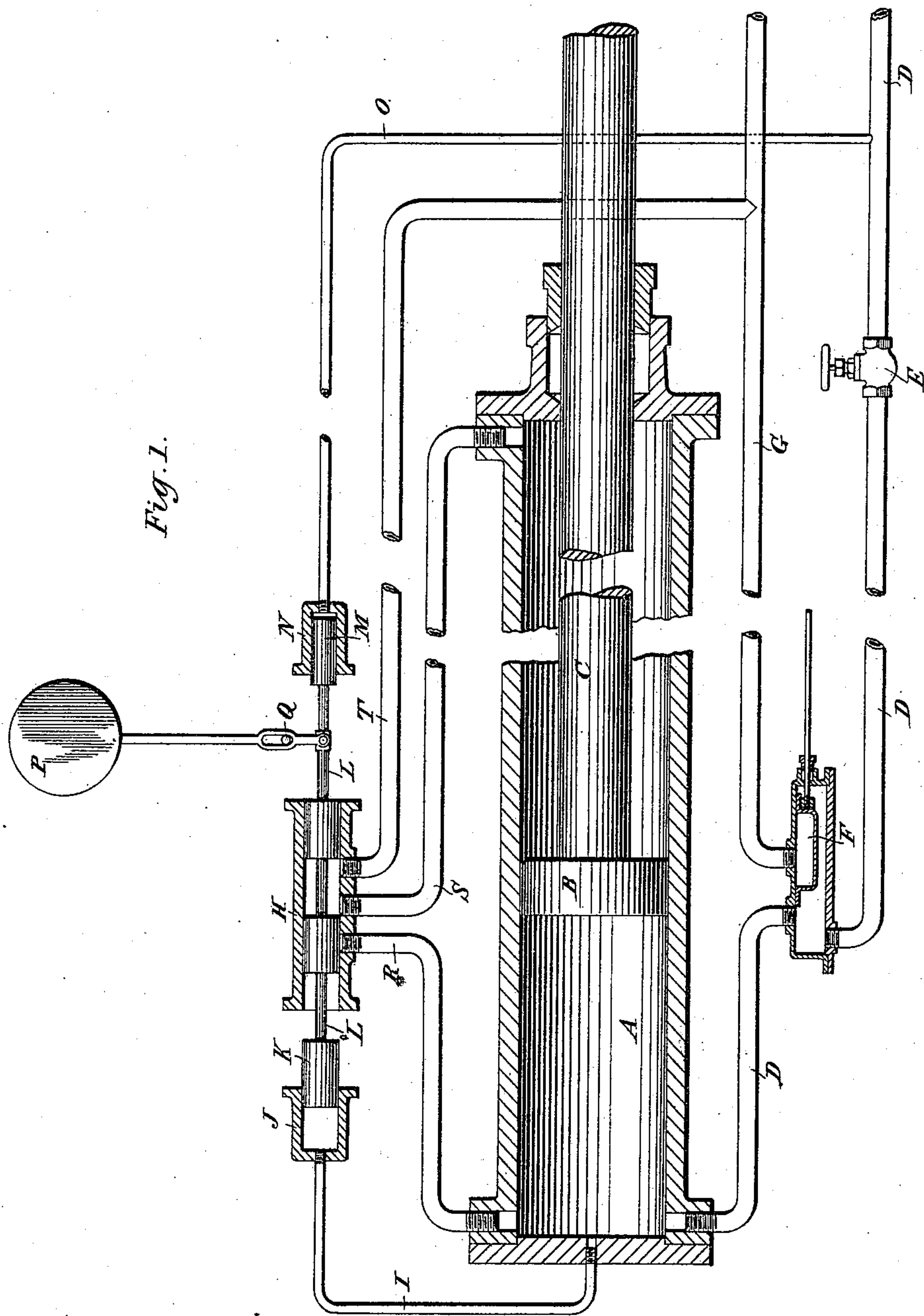
2 Sheets—Sheet 1.

R. H. THORPE.

APPARATUS FOR REGULATING HYDRAULIC POWER.

No. 429,664.

Patented June 10, 1890.



Witnesses.  
John Smith  
Geo Blair

Inventor.  
Robert Henry Thorpe

(No Model.)

2 Sheets—Sheet 2.

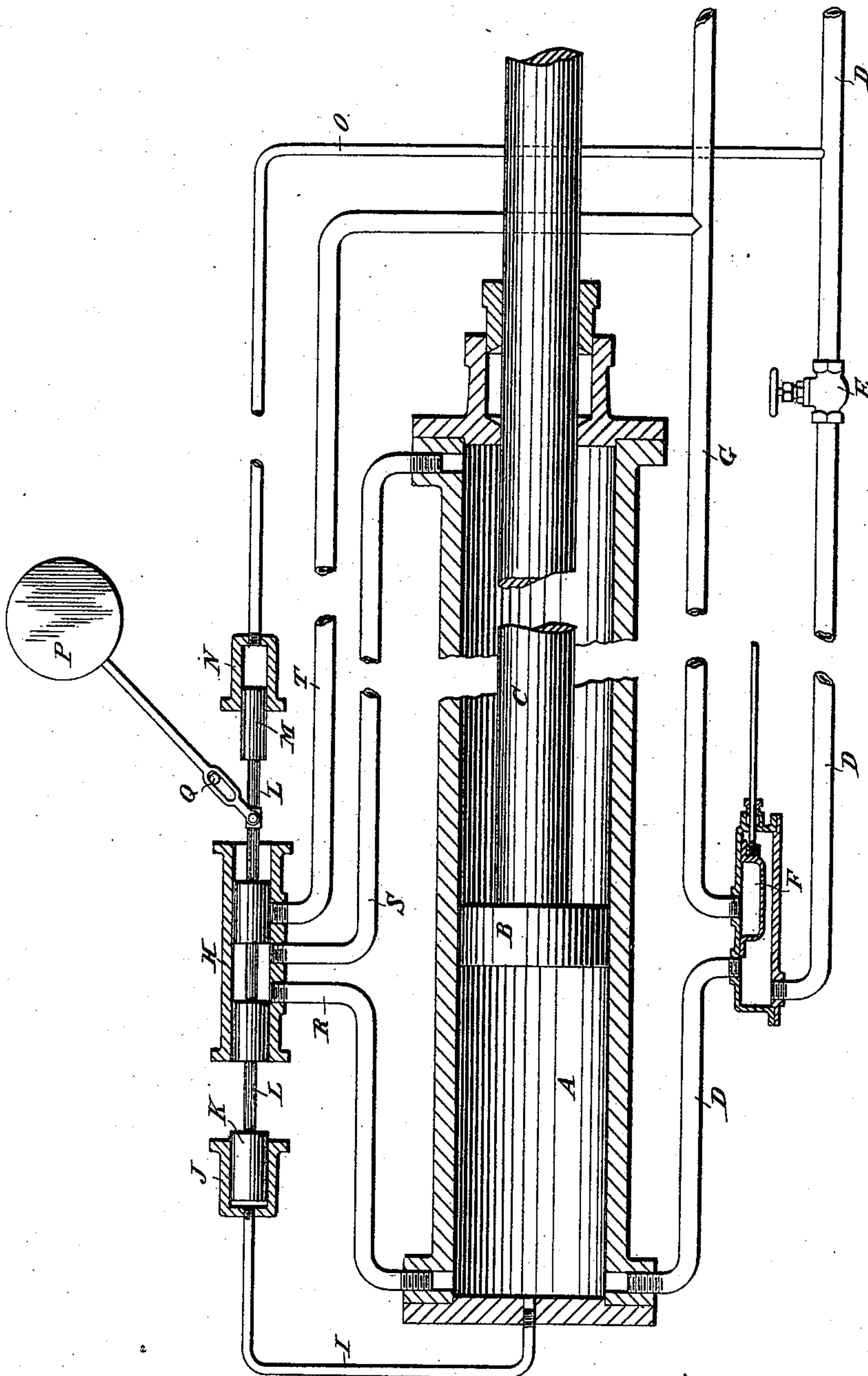
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Fig. 2.



Witnesses.

John Smith  
W. M. Blair

Inventor.

Robert Henry Thorpe



# UNITED STATES PATENT OFFICE.

ROBERT HENRY THORPE, OF LONDON, ENGLAND.

## APPARATUS FOR REGULATING HYDRAULIC POWER.

SPECIFICATION forming part of Letters Patent No. 429,664, dated June 10, 1890.

Application filed November 23, 1889. Serial No. 331,340. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT HENRY THORPE, a subject of Her Majesty the Queen of Great Britain, residing at 27 Buckland Crescent, Belsize Park, London, England; have invented a new and useful Improved Apparatus for Regulating Hydraulic Power, of which the following is a specification.

This invention relates to that class of apparatus designed for the purpose of regulating the power and, to a certain extent, the quantity of liquid employed for effecting varying quantities of work, or, in other words, for enabling the same apparatus to work at a higher or lower power, depending upon the work it is called upon to perform, the supply or pressure from the main being constant throughout. I accomplish this result by varying the effective area of the piston within the motor-cylinder, as will hereinafter be explained.

In order that my invention may be clearly understood, reference is made to the accompanying drawings, which illustrate my invention as applied to a double-power motor-cylinder A, containing a piston B and ram or piston-rod C, all of ordinary construction, the balanced valve being shown in Figure 1 in position for full power to be applied, and in Fig. 2 for reduced power, with decreased consumption of water.

One end of the cylinder A is connected to the main or supply-pipe D, the inflow being governed by the hand-valve E and slide-valve F, the latter also governing the direct exhaust through pipe G from this end of the cylinder. A branch pipe I connects the pressure end of the cylinder A with cylinder J, the piston K of which forms one end of the rod L, which carries the balanced piston-valve H, the other end of said rod being attached to a similar piston M, working in cylinder N, connected by pipe O to the main or other source of supply D at a point beyond valves E F, in order that the full main pressure may always be exerted therein.

Attached to rod L is a weighted lever P, pivoted at Q, the action of which will be hereinafter described.

The valve H is connected through ports or pipes R and S with the respective ends of cylinder A, and by pipe T with the exhaust G.

When the parts are in the position shown in Fig. 1, the full pressure entering through D is exerted behind the piston B, the other end of the cylinder A being open to exhaust G through valves H by pipes S T, initial pressure also being exerted on piston K and full main pressure on M. The piston B having completed the desired stroke, the valve F is moved, shutting off the supply through D and opening the direct exhaust from behind B to G. The pressure on K being relieved, the direct pressure on M overcomes the friction of valve H, which is moved in direction of least resistance over to the position shown in Fig. 2, this movement being assisted by weight P so soon as it leaves its central or vertical position.

With the parts in the position shown in Fig. 2 the apparatus is adapted to work at a lower power with a decreased consumption of water. As the piston is open to pressure on both sides, the power exerted is proportionate to the difference in area of piston B on opposite sides. So long as the work to be done by C can be effected at the lower power so long will the pressure on M plus the leverage pressure of P be sufficient to hold valve H in the position shown as against the pressure on K, which, as is well known, will vary in proportion to the resistance of piston B or of the work to be done. The areas of pistons K and M and the leverage exerted by P can be proportioned so that full power shall only be put on piston B when the resistance or work to be done calls for a pressure above a certain number of pounds to the square inch.

For the purpose of illustration let it be assumed that with the parts in the position shown in Fig. 2 it will take a pressure of five hundred pounds to the square inch on K to overcome the pressure on M plus the resistance of weight P, (which latter offers a gradually-reduced resistance as it more nearly approaches its perpendicular position, at which point it exerts no pressure in either direction,) while if the pressure on K be only two hundred and fifty pounds per square inch, or less, the pressure on M will be sufficient to start the valve, and weight P will then assist and cause valve H to be carried rapidly home to the position shown in Fig. 2. This arrange-



ment will cause the valve to remain stationary until a considerable difference of pressure takes place over that at which it was thrown over, and when it does move it will rapidly attain the desired position. By the action of the weight and the application of the initial pressure of the motor-cylinder in opposition to the constant pressure in the main the motion and position of the valve H are automatically adjusted to meet the work required to be done by giving the power best suited to it, the lower power being always on unless the higher is required.

It will of course be evident that any uniform or given resistance—such as a spring—may be substituted for cylinder N and piston M, and that a spring or other device may be substituted for the weight P; but I prefer to use the parts as shown. It will be also evident that the valve or double or triple cylinder motors may be operated in any analogous manner.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with a motor-cylinder and piston, channels connecting the piston-rod end of the cylinder with the working end and with the exhaust, and a valve for controlling communication through said channels, of two pistons for reciprocating the valve, one piston receiving pressure from the motor-cylinder and the other a constant pressure, as from the main, substantially as described.

2. In combination with a motor-cylinder and piston, channels connecting the piston-rod end of the cylinder with the working end and with the exhaust, an automatically-operated valve for controlling communication through said channels, and a supply and exhaust port communicating with the working

end of the cylinder, substantially as described.

3. The combination, with the cylinder, piston, and piston-rod, of a channel outside the piston connecting the opposite ends of the cylinder, a valve and means for automatically operating it constructed to complete said channel when in one position and also when shifted to open communication between the exhaust and the piston-rod end of the cylinder, and an inlet-port communicating with the opposite end of the cylinder, substantially as described.

4. In combination, a motor-cylinder and piston, channels connecting the piston-rod end of the cylinder with the working end and with the exhaust, a valve for controlling said channels, pistons of different sizes for operating the valve, and a weighted lever connected to the valve and opposing its movement by the larger piston, substantially as described.

5. In combination with a motor-cylinder and piston, passages communicating with opposite ends of said cylinder and an exhaust-passage, a valve controlling said passages, a piston K within said cylinder J, for moving the valve in one direction, and a piston M within cylinder N, for moving said valve in the opposite direction, said cylinders communicating, respectively, with the motor-cylinder and supply-main, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ROBERT HENRY THORPE.

Witnesses:

JOHN SMITH,  
WM. BLAIR.