(No Model.) 2 Sheets—Sheet 1.

# L. S. WRIGHT.

## APPARATUS FOR ACTUATING AND CONTROLLING THE VALVES OF HYDRAULIC CYLINDERS, &c.

No. 451,100. Patented Apr. 28, 1891.

FIG. 1.

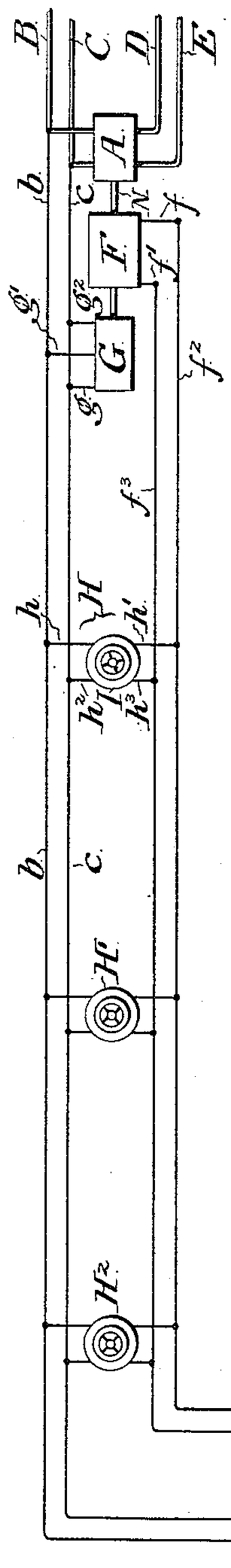



FIG. 4.

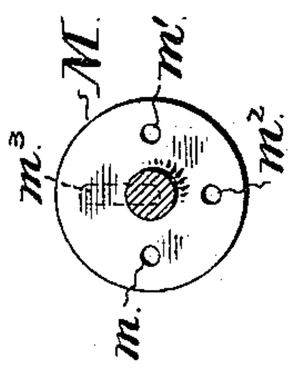
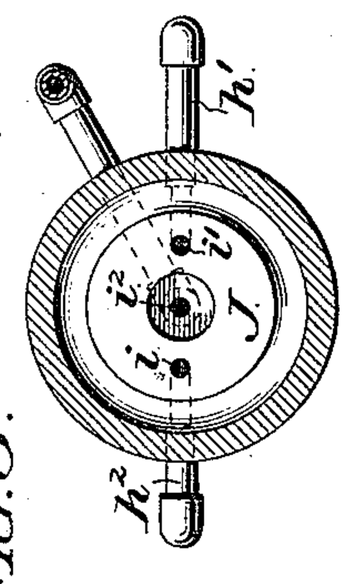



FIG. 3.

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(No Model.) 2 Sheets—Sheet 2.

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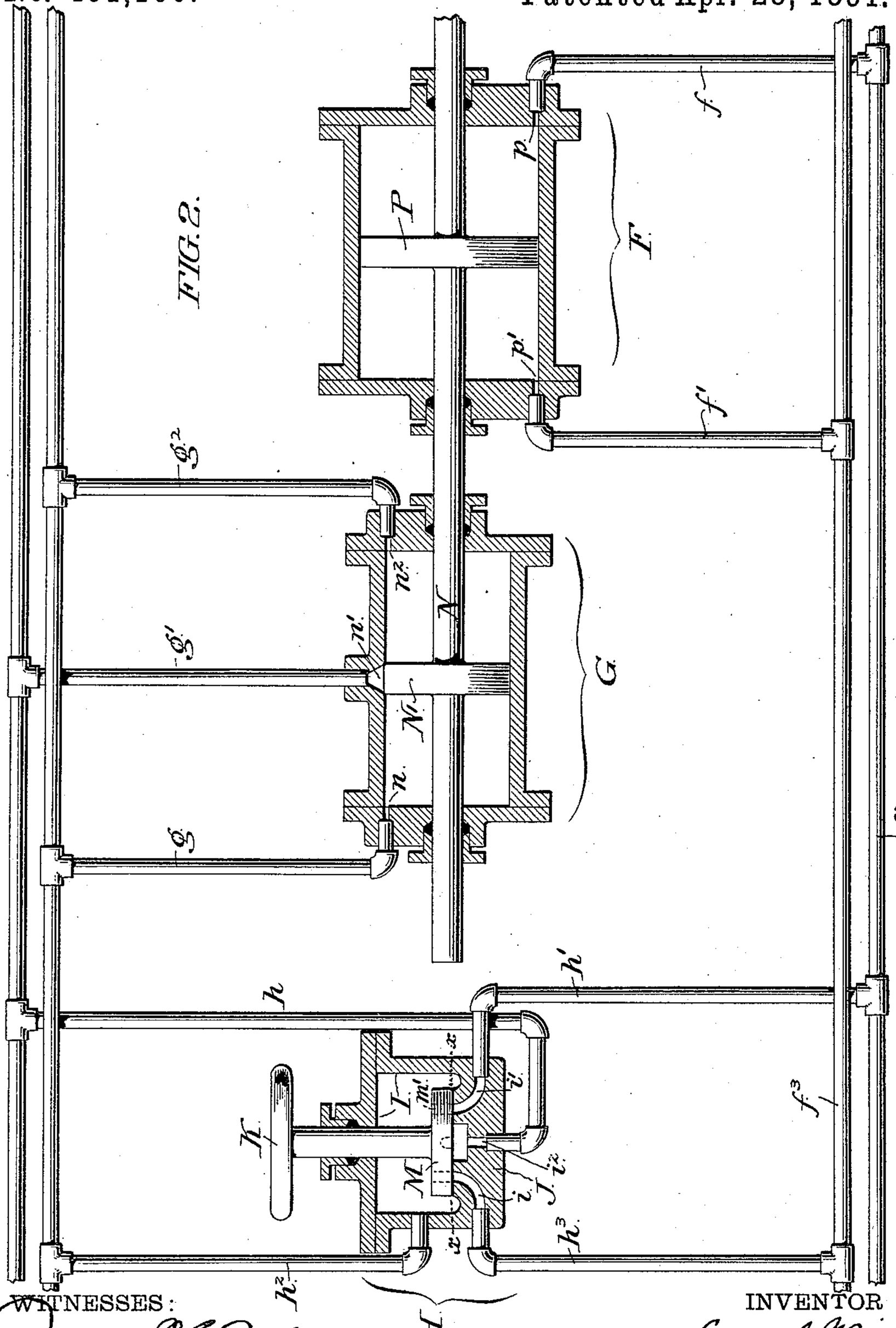
## APPARATUS FOR ACTUATING AND CONTROLLING THE VALVES OF HYDRAULIC CYLINDERS, &c.

No. 451,100. Patented Apr. 28, 1891.

FIG. 2.

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LOUIS S. WRIGHT, OF PHILADELPHIA, PENNSYLVANIA.

## APPARATUS FOR ACTUATING AND CONTROLLING THE VALVES OF HYDRAULIC CYLINDERS, &c.

SPECIFICATION forming part of Letters Patent No. 451,100, dated April 28, 1891.

Application filed February 3, 1891. Serial No. 380,083. (No model.)

*To all whom it may concern:*

Be it known that I, LOUIS S. WRIGHT, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Actuating and Controlling the Valves of Hydraulic Cylinders and Similar Mechanism.

The following is a specification of my said improvements, reference being had to the accompanying drawings, wherein—

Figure 1 represents a general view of a system embodying my invention, said system being so arranged as to provide for a plurality of points, from which control over the apparatus may be had. Fig. 2 is a longitudinal section, on a much enlarged scale, through the actuating and controlling cylinders of the system and through one of the plurality of valves by which it is in turn controlled. Fig. 3 represents a horizontal section through said valve on the line $x\,x$ of Fig. 2, and Fig. 4 is a top or plan view of the disk of said valve.

The object of my improvements is to provide a system whereby actuating-valves—such as the main inlet and outlet valves of hydraulic cylinders, and which I term the "primary valves"—may be actuated in one direction or the other by means of a secondary cylinder and piston adjacent thereto and operated from a source of pressure preferably the same as that from which the piston of the main hydraulic cylinders themselves are actuated, said secondary valve being susceptible of control from a series of points at different distances therefrom, and being provided with a device which normally tends to shift the actuating device of the primary valves to a neutral position corresponding to inaction of the main hydraulic cylinder. Thus when leakage or other defective action occurs the tendency of this device, which I term the "centralizer," is to always restore the parts to a position of safety.

In the drawings, A (see Fig. 1) represents the primary valve apparatus of a main hydraulic cylinder, (not shown,) the piston of said hydraulic cylinder being actuated from any proper source of hydraulic pressure.

C represents the pressure-pipe, which communicates between said source of pressure and the primary valves at A.

B represents the exhaust-pipe of the system, also communicating with said valves.

D and E are the pipes leading from the valves at A to the main hydraulic cylinder, the communication being controlled in any of the well-known modes by means of said valves, so as to actuate the plunger of the cylinder in one direction or the other by alternate communication either with the pressure-pipe or the exhaust-pipe.

N represents an actuating-rod by whose longitudinal movement in one direction or the other the valve at A is shifted to produce the desired result.

F represents a secondary hydraulic cylinder through which the rod N extends longitudinally, a piston P being mounted upon said rod within the cylinder F in such relation thereto that when the piston is in the central position (indicated in Fig. 2) the main valve A is neutral, and consequently the plunger within the main hydraulic cylinder or cylinders held at rest.

Control over the piston P is effected by means of pipes $f\,f'$, communicating with the cylinder F at $p\,p'$, respectively. The pipes $f$ and $f'$ communicate, respectively, with pipes $f^2\,f^3$, which extend throughout the range within which points of control are to be situated. In the instance shown these points of control are respectively represented by H, H′, H², H³, and H⁴, and said pipes $f^2\,f^3$ are represented as running along two sides of a rectangular inclosure or building. Movement of the piston P in one direction or the other is effected by bringing the pipe $f'$ into communication with a source of hydraulic pressure and bringing the pipe $f^3$ into communication with an exhaust, or vice versa. To accomplish this result I prefer to construct the system as follows: At a convenient location in the line of the main pressure-pipe C and main exhaust-pipe B, I connect therewith secondary pressure and exhaust pipes $c\ b$, respectively, of small bore, which extend throughout the range from which control is to be effected and in adjacency to the pipes $f^2\,f^3$. At suitable intervals the controlling devices H H′, &c., are connected on the one hand with the pipes $c\ b$, and on the other hand with the pipes $f^2\,f^3$. One of these groups will now be described in

detail, the others being similarly constructed and arranged.

A closed valve-chamber I is provided with a disk-valve M, capable of being rotated by the vertical stem and hand-wheel K. The under surface of said disk fits closely upon a seat J in the bottom of the chamber I, said seat being provided with a central opening $i^2$, and two lateral openings $i\,i'$, respectively, arranged diametrically to one another. The openings $i\,i'$, respectively, are continued outward through the bottom of the chamber I, and communicate with pipes $h^3$ $h'$, respectively, which pipes lead to the pipes $f^3\,f^2$, respectively. The central opening $i^2$ communicates with a pipe $h$, which in turn communicates with the exhaust-pipe $b$. A pipe $h^2$ leads from the pressure-pipe $c$ to the interior of the chamber I, above the valve-disk M. Three holes $m\,m'\,m^2$, respectively, extend entirely through said disk M, being arranged in Fig. 4 in quadrants throughout half of its area, and upon the under side of said disk a groove $m^3$ leads from the center radially outward to a point diametrically opposite to the hole $m^2$, and at a similar distance from the center.

It is obvious that by rotation of the disk M upon its seat either one of the openings $i$ or $i'$, or both thereof, can be thrown into communication with the interior of the chamber I, and consequently with the source of pressure acting through the pipes $c\,h^2$, and that when only one of said openings $i$ or $i'$ is in communication with the interior of the chamber I the other one will be, by means of the groove $m^3$, thrown into communication with the opening $i^2$, and through it with the exhaust-pipes $h\,b$. Thus by suitable regulations of the valve-disk M pressure can be thrown onto both the pipes $f^2\,f^3$ or onto one of them alone, and in this latter case the other one will be in communication with the exhaust. Hence by means of this valve system the piston P within the cylinder F can be shifted toward either end or can be positively held in a given position, and through such movement of the piston the main valve A of the hydraulic cylinder proper can be controlled.

A similar device to that just described is placed at each of the other points of control $h'$ $h^2$, &c.

As thus far described the apparatus, though capable of actuating and controlling the valve system of the main hydraulic cylinder from a plurality of points, lacks any safety device, and in the case of leakage or other defective operation is liable to accidentally continue the actuation of the main hydraulic plunger or fail to arrest its movement with dangerous results. To avoid this I provide the centralizer above referred to, and which in the present instance consists of a second cylinder G, arranged in proximity to the cylinder F, and through which, also, the rod N extends longitudinally. Said cylinder is provided with inlet-pipes $n\,n^2$ at each end, which communicate by means of the pipes $g\,g^2$, respectively, with the pressure-pipe $c$. The cylinder is also provided with a centrally-placed exit-orifice $n'$, communicating by means of a pipe $g'$ with the exhaust-pipe $b$. A piston N′ is mounted upon the rod N in such relation to the cylinder and to the other piston P upon said rod that when the piston P is in its central position corresponding to neutral or inaction of the valve which controls the main hydraulic cylinder the piston N′ shall also be in a similar central position within the cylinder G. The piston N′ is of such thickness that when in its central position it completely closes the orifice $n'$, and as the diameter of the piston N′ is very considerably less than that of the piston P, when the latter is under active pressure it will readily shift the piston N′ under pressure from the same source; but when the piston P is not under active pressure its inertia can readily be overcome by the piston N′.

The operation of the device as a whole is as follows: When it is desired to shift the valve at A of the main hydraulic plunger, the hand-wheel K is turned—for instance, to such an extent as to bring the hole $m^2$ over the opening $i$. This same movement brings one end of the groove $m^3$ over the opening $i'$. The interior of the chamber I being in constant communication with the pressure-pipe by means of the pipe $h^2$, this shifting of the valve M opens communication between the source of pressure and the left-hand end of the cylinder F through the passage $i$ and the pipes $h^2$, $h^3$, $f^3$, and $f'$. At the same time the exhaust-pipe is thrown into communication with the other end of the cylinder F, the circuit being through the pipes $f$, $f^2$, and $f'$, the opening $i'$, the groove $m^3$, the central opening $i^2$, and the pipe $h$. The piston P will thereupon be shifted toward the right-hand end of the cylinder F and produce the desired movement of the main valve at A. This movement of the piston P will throw the centralizer-piston N out of its normal position and toward the right-hand end of the cylinder G, thus opening communication between the pipe $g$, connected with the source of pressure, and the pipe $g'$, connected with the exhaust. The relatively small diameter of the piston N′ permits it to be shifted against the pressure, which is maintained upon one side of it by means of the pipe $g^2$, and so long as there is active pressure upon the piston P the piston N′ will be thus held out of its central position, but should any leakage occur, tending to relieve the opposing pressure upon the piston P, the pressure through the pipe $g^2$, not being compensated upon the other side of the piston N′, will cause the latter to move toward the center of the cylinder G. As soon, however, as it reaches the center it closes the outlet $n'$, whereupon the pressure through the pipe $g$ equalizes that upon the other side, and the piston N′ is held at rest in its central position, corresponding to a normal position of the piston P and the inactive position of

the valve at A. Thus the tendency of the centralizer is always to restore the parts to a position corresponding with safety, and said tendency becomes effective the moment that any abnormal release of pressure occurs at the piston P. The control of the piston P from any one of the points H′ H², &c., is effected in a similar manner to that just described, and is attended with the same action on the part of the centralizer.

Having thus described my invention as applied to the actuation of the valves of hydraulic cylinders, I wish it to be understood that I do not limit my claim to such particular application, nor to the use of hydraulic pressure in the controlling system; but I claim—

In a controlling system for valves, the combination, with the main valve and its operating-rod, of the following parts arranged in the described relation, viz: a pressure-pipe, an exhaust-pipe, a cylinder having a piston in operative connection with the operating-rod of said main valve, a valve-controlled system of pipes communicating, respectively, with said pressure and exhaust pipes and with said secondary cylinder, a centralizer-cylinder communicating at each end with the pressure-pipes and intermediately with the exhaust-pipe, a centralizer-piston of less diameter than the piston of the other cylinder, but mounted in operative connection with the piston-rod thereof, said centralizer-piston being of such thickness as to close the opening leading to the exhaust when in a position corresponding to the normal position of the valve-operating piston during inaction of the main valve.

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