No. 616,756. Patented Dec. 27, 1898.

W. C. WILLIAMSON.

HYDRAULIC TRANSMITTER FOR STEERING.

(Application filed Feb. 17, 1898.)

(No Model.) 2 Sheets—Sheet 1.

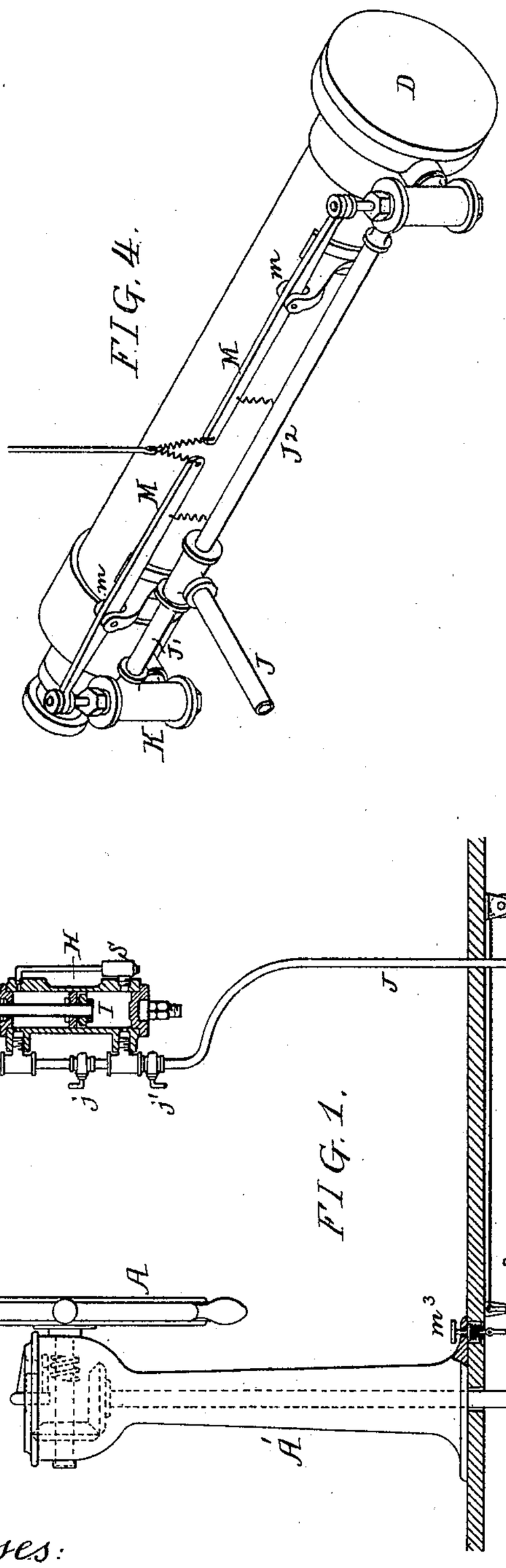

FIG. 4.

FIG. 1.

FIG. 5.

Witnesses:
Wm. A. Barr.
Jos. H. Klein.

Inventor.
William C. Williamson
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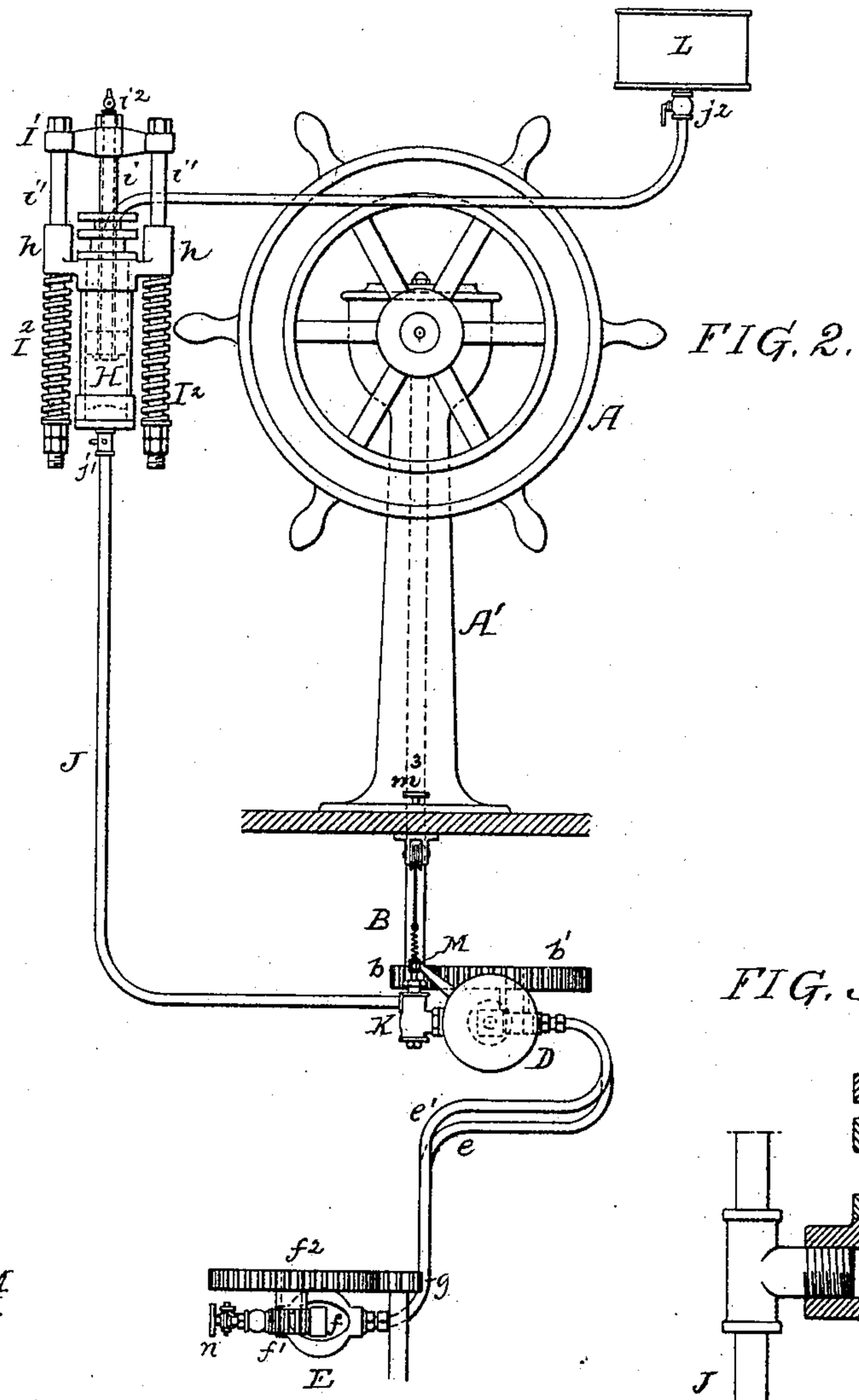

FIG. 2.

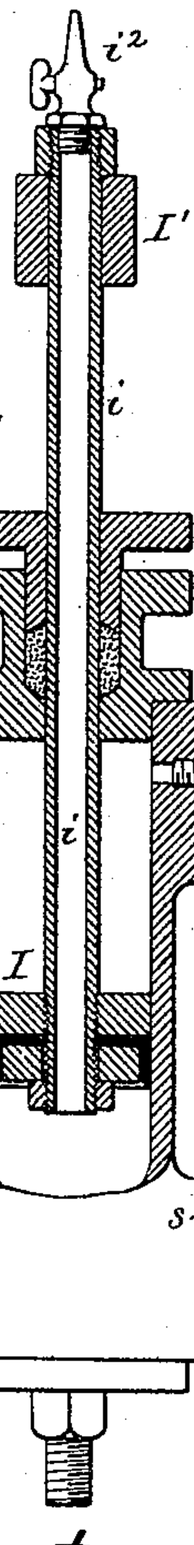

FIG. 3.

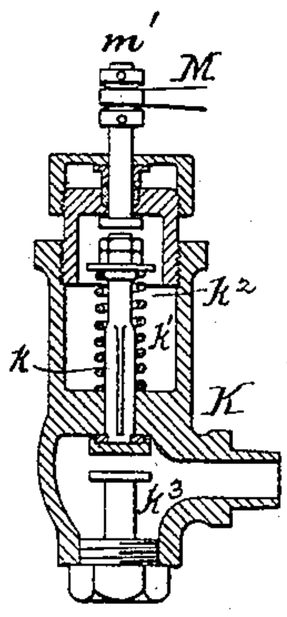

FIG. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM C. WILLIAMSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE WILLIAMSON BROTHERS COMPANY, OF SAME PLACE.

HYDRAULIC TRANSMITTER FOR STEERING.

SPECIFICATION forming part of Letters Patent No. 616,756, dated December 27, 1898.

Application filed February 17, 1898. Serial No. 670,661. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. WILLIAMSON, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Hydraulic Transmitters for Steering, of which the following is a specification.

My invention relates to mechanism for transmitting motion through fluid from one point to another, and especially relates to hydraulic transmitters for steering ships, operating signals, &c.

The object of my invention is to provide means for keeping the operating-cylinders charged with fluid at all times and to center the piston of the transmitting-cylinder, and also to provide a safety-valve for the apparatus, as fully described hereinafter.

In the accompanying drawings, Figure 1 is a view showing a hydraulic steering-gear illustrating my invention. Fig. 2 is a view looking in the direction of the arrow, Fig. 1. Fig. 3 is an enlarged view of the compression-cylinder. Fig. 4 is a perspective view of the transmitting-cylinder. Fig. 5 is a plan view of the controlling-cylinder, and Fig. 6 is a sectional view of one of the check-valves.

A is the ordinary steering-wheel, which is mounted on the stand A′. The shaft of this wheel is geared to a vertical shaft B, having a pinion *b*, which gears with a wheel *b*′ on a shaft or stud, on which is a pinion b^2, gearing into a rack *c* on the rod C′, attached to which is a piston C within the transmitting-cylinder D. On turning the wheel A in one direction or the other the piston will be moved toward one or the other end of the cylinder D.

E is a controlling-cylinder connected to the transmitting-cylinder through pipes *e e*′, so that each end of one cylinder is in communication with the corresponding end of the other cylinder. Within the cylinder E is a piston F, attached to a rod F′, having a rack *f*, which meshes with a pinion *f*′, and attached to the pinion is a gear f^2, which meshes with a pinion *g* on a shaft of the controlling-valve mechanism of a steering-engine. By this arrangement any movement of the steering-wheel A will be transmitted through the two cylinders to the controlling-valve mechanism.

H is a compression-cylinder in which is a piston I, having a hollow rod *i* extending up through the head of the cylinder and attached to a cross-head I′. Extending from the cross-head through bearings *h h* on the cylinder are two rods *i*′, carrying springs I^2, which exert a pressure upon the fluid in the cylinder under the piston. The tension of these springs can be regulated by nuts on the ends of the rods. The lower portion of the cylinder H is connected to both ends of the cylinder D by a pipe J and its two branches J′ J^2. In the passages are check-valves K K′ of a construction clearly shown in Fig. 6. The pipe J is extended to a tank L above the cylinder H and connects also with the upper portion of the cylinder for the purpose of keeping the piston covered with fluid. A valve *j* in the pipe cuts off the flow of fluid from the tank and upper portion of the cylinder H from the lower portion of the cylinder.

Stop-cocks *j*′ j^2 are for the purpose of cutting off the pipe and the tank, respectively, when it is necessary to repair or remove the cylinder H or its valve.

The hollow piston-rod *i* has at its upper end a cock i^2 to allow for the escape of air from the system when being charged with fluid, this being the highest point in the system.

It will be seen that when pressure is applied to the piston I by means of the springs as soon as any fluid escapes from the system the piston I will force the check-valves *k k* in the casings K K′ open, so that the liquid will flow into the cylinder from the pipe J and replace that which escaped, thus keeping at all times both the transmitting and controlling cylinders filled with fluid.

It will be understood that if a vacancy occurs in one end only of the cylinder the check-valve of that end only will be opened.

The check-valves can be opened by the helmsman through the medium of the levers M M, which are pivoted at *m*, one arm of each lever being attached to a short plunger *m*′, which extends through the stuffing-box of the valve-casing K and acts upon the check-valve stem. The opposite end of each lever is attached to an operating cord or rod which extends, in the present instance, to a bell-crank lever m^2, connected to a push-rod m^3 in close

proximity to the steering-wheel A, so that the helmsman can place his foot on the push-rod and so operate the lever as to force the check-valves *k* open against the pressure of their springs *k'*, so that both ends of the transmitting-cylinder D will communicate. He can then so operate the wheel as to center the piston C in the cylinder, after which by removing his foot from the push-rod the valves will automatically close.

In order to charge the system with fluid in the first place, I connect both ends of the cylinder E with a pipe N, having stop-valves *n* *n* at each end and connected to a supply-pipe N', and in this pipe is a stop-valve n^2, so that by coupling a pump to this pipe N' and opening the valves fluid can be forced into the cylinders and pipes of the system.

It will be noticed in referring to Fig. 6 that the check-valve *k* that I prefer to use is so constructed that it will act very quickly and without unnecessary friction. The valve *k* is adapted to its seat and has a long stem k^2 extending up into the upper chamber, and between a flange on this stem and the casing is mounted a spring *k'*, so as to insure the quick closing of the check-valve. It is closed by the pressure of the fluid in the cylinder D. A rod m^2 extends through the cap of the valve-casing and is connected to the operating-lever, as described. This rod has a head on the under side, so as to prevent its being drawn out of the casing. A stop k^3 limits the downward movement of the valve.

The cylinder H and its piston I also act as a safety-valve for preventing any increased pressure that may be created by increase of temperature. If, for instance, the liquid should expand, the piston I will simply move up against the pressure of its springs, and if the fluid contracts the springs will force the piston down, so that it not only acts to keep the system charged with fluid, but also acts as a safety-valve. A weight or weights may be used in some instances in place of the springs I^2; but I prefer the springs.

In some instances I may connect both ends of the compression-cylinder H by means of a by-pass S, having a relief-valve *s*, which is set to a given pressure, so that in the event of the springs of the compression-cylinder being adjusted carelessly to a greater pressure than required fluid under pressure in the lower portion of the cylinder H will open the pressure-valve *s*, causing the fluid to flow to the upper portion of the cylinder, thus relieving the pressure. This will be readily noticed by the person adjusting the nuts on the rods *i'*, who can then readjust them.

In some instances I may dispense with the cylinder H and its piston and use simply the water column in the pipe, so that when the valves of the transmitting-cylinder are opened the water will flow into that end of the cylinder in which there is a vacancy.

I claim as my invention—

1. The combination in a fluid transmitter, of a transmitting-cylinder, a piston therein, means for operating the piston, a controlling-cylinder, a piston therein connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a pipe extending from each end of the transmitting-cylinder, means for creating a pressure in said pipes, a check-valve in each pipe closing against pressure from the cylinder, and means for positively opening said check-valves, substantially as described.

2. The combination in a fluid transmitter, of the transmitting-cylinder, a piston therein, means for operating the piston, a controlling-cylinder, a piston therein connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a passage communicating with both ends of the transmitting-cylinder, two check-valves in the passage closing against pressure from the cylinder, a liquid-supply pipe communicating with said passage between the two valves and means for simultaneously opening the two valves so that both ends of the cylinder will communicate with the fluid-supply, substantially as described.

3. The combination in a fluid transmitter, of a transmitting-cylinder, a piston therein, means for operating the piston, a controlling-cylinder, a piston therein connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a compression-cylinder connected to the system and a weighted piston within the cylinder, substantially as described.

4. The combination of a transmitting-cylinder, a piston therein, means for operating said piston, a controlling-cylinder, a piston therein connected to the mechanism to be operated, tubes coupling the two cylinders together, a pipe connected to the two ends of the transmitting-cylinder, check-valves in said pipes, a compression-cylinder connected to the pipe, a piston having a hollow rod, a stop-cock in the said rod and means for exerting a pressure upon the piston, substantially as described.

5. The combination of a transmitting-cylinder, its piston, means for operating the said piston, a controlling-cylinder, a piston therein connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a pipe connected to each end of the transmitting-cylinder, check-valves in said pipe, a compression-cylinder connected to the pipe, a piston mounted in the compression-cylinder, with means for exerting pressure on the piston and means for opening both check-valves simultaneously so that the piston of the transmitting-cylinder can be centered, substantially as described.

6. The combination of a transmitting-cylinder, its piston, means for operating the pis-

ton, a controlling-cylinder, a piston therein connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a compression-cylinder connected to each end of the transmitting-cylinder, a hollow piston within the cylinder, and means for exerting a pressure thereon, a charging-pipe connected to both ends of the controlling-cylinder and valves in the charging-pipe, substantially as described.

7. The combination of a transmitting-cylinder, its piston, means for operating the piston, a controlling-cylinder, a piston therein connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a compression-cylinder, a pipe leading from the compression-cylinder to each end of the transmitting-cylinder and coupled to both ends of the compression-cylinder and to a tank, a piston within the cylinder, a hollow rod for the piston having a stop-cock at its upper end, a spring for exerting a pressure upon the piston and a stop-cock in the connection between the lower portion of the cylinder and the tank, substantially as described.

8. The combination in a fluid transmitter, of the transmitting-cylinder, a piston therein, means for operating said piston, a controlling-cylinder, a piston therein connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a by-pass pipe communicating with both ends of the transmitting-cylinder, a supply-pipe communicating with the cylinder, a combined positive-opening and check valve in each end of the by-pass, and means for operating the valves so that communication can be established between the two ends of the cylinder to the center the piston therein to agree with the piston of the controlling-cylinder, substantially as described.

9. The combination of a hydraulic transmitter, the two connected cylinders, a compression-cylinder connected to the system, a piston in the cylinder under pressure, means for adjusting the said piston, with a by-pass connected to both ends of the cylinder, and a relief-valve in said by-pass, substantially as described.

10. The combination in a fluid transmitter, of a transmitting-cylinder, a piston therein, means for operating the piston, a controlling-cylinder, a piston therein, connected to the mechanism to be operated, pipes leading from the ends of the transmitting-cylinder to the ends of the controlling-cylinder, a by-pass communicating with both ends of the transmitting-cylinder, a spring check-valve at each end of the by-pass closing against pressure from the cylinder, a supply-pipe communicating with the by-pass between the two valves, a rod mounted above the stem of each check-valve, a lever connected to each rod, means for operating the levers in unison so as to force the rods down into the stem of each check-valve and open the valve against the pressure of the springs, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM C. WILLIAMSON.

Witnesses:
WILL. A. BARR,
JOS. H. KLEIN.