

No. 768,939.

PATENTED AUG. 30, 1904.

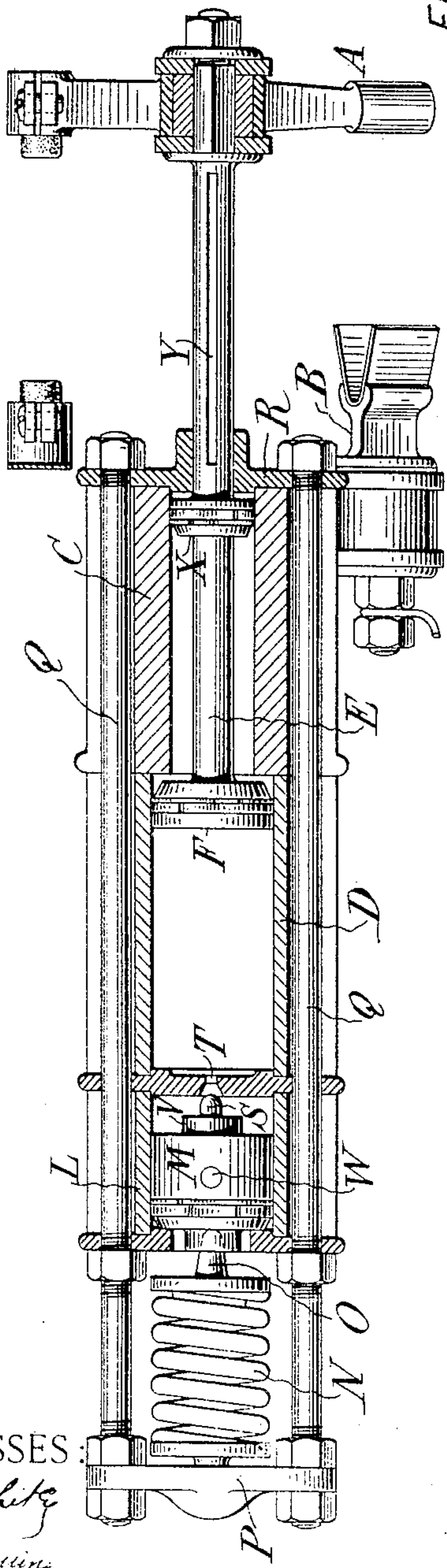
M. W. HALL.

AUTOMATIC GOVERNOR FOR AIR COMPRESSORS OR SIMILAR DEVICES.

APPLICATION FILED APR. 2, 1903.

NO MODEL.

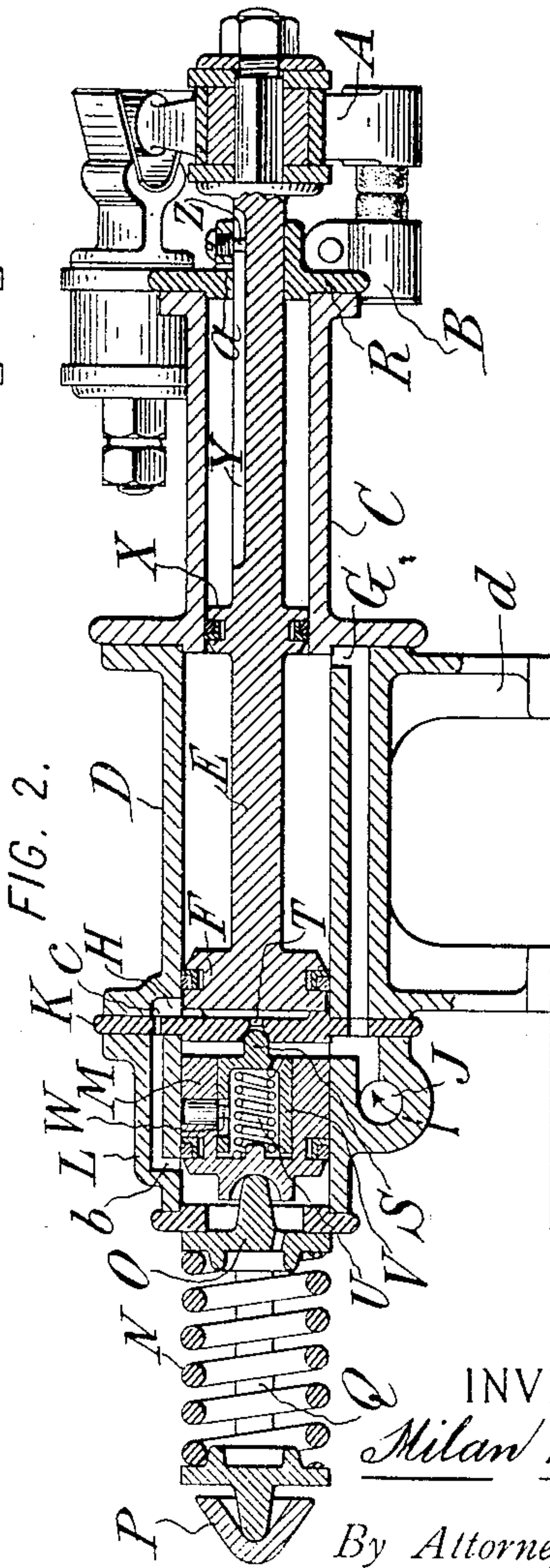
2 SHEETS—SHEET 1.



WITNESSES

Red White  
Rene' Pruning

FIG. 2.



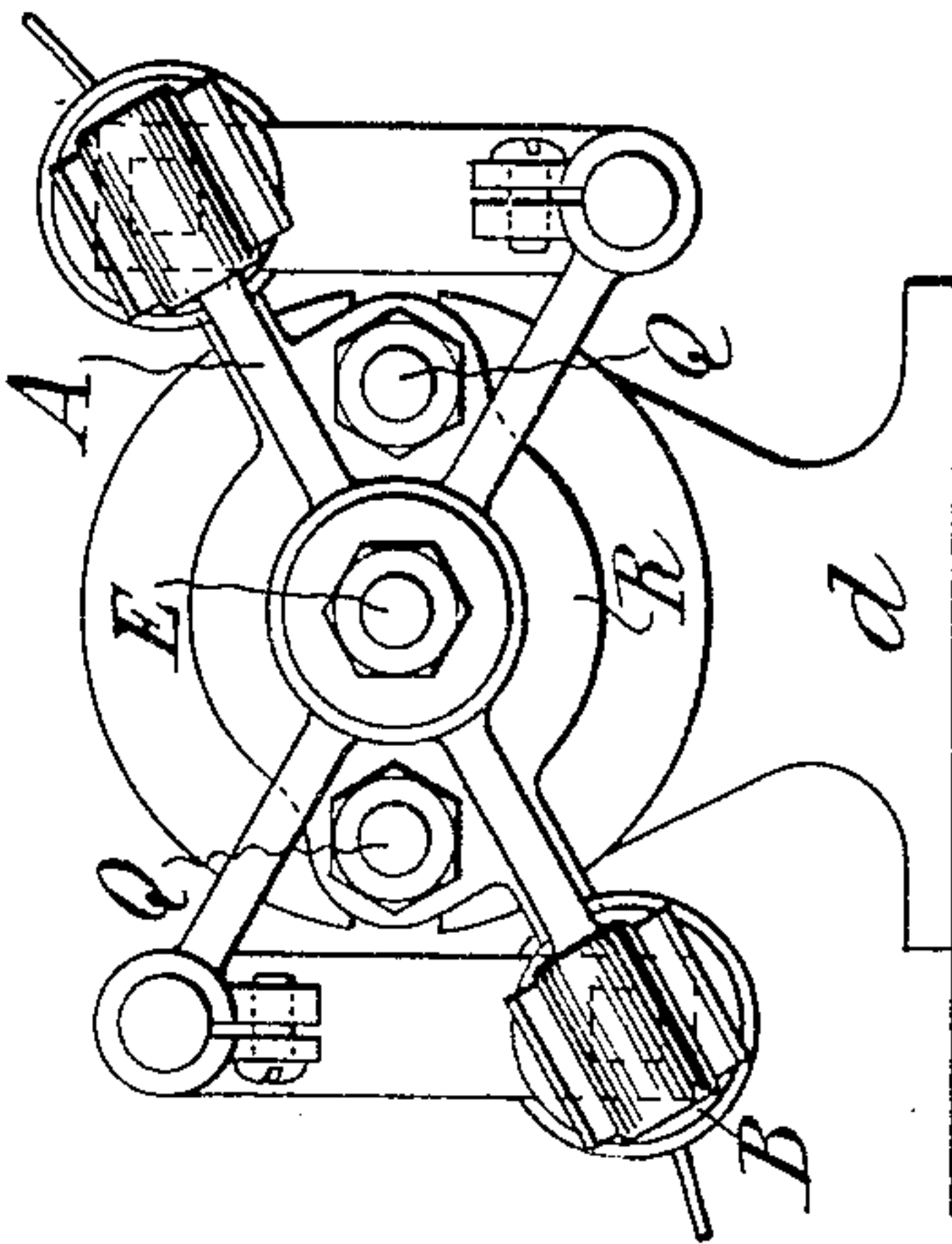
INVENTOR:

Milan W. Hall,

*By Attorneys,*

Arthur C. Over

FIG. 3.



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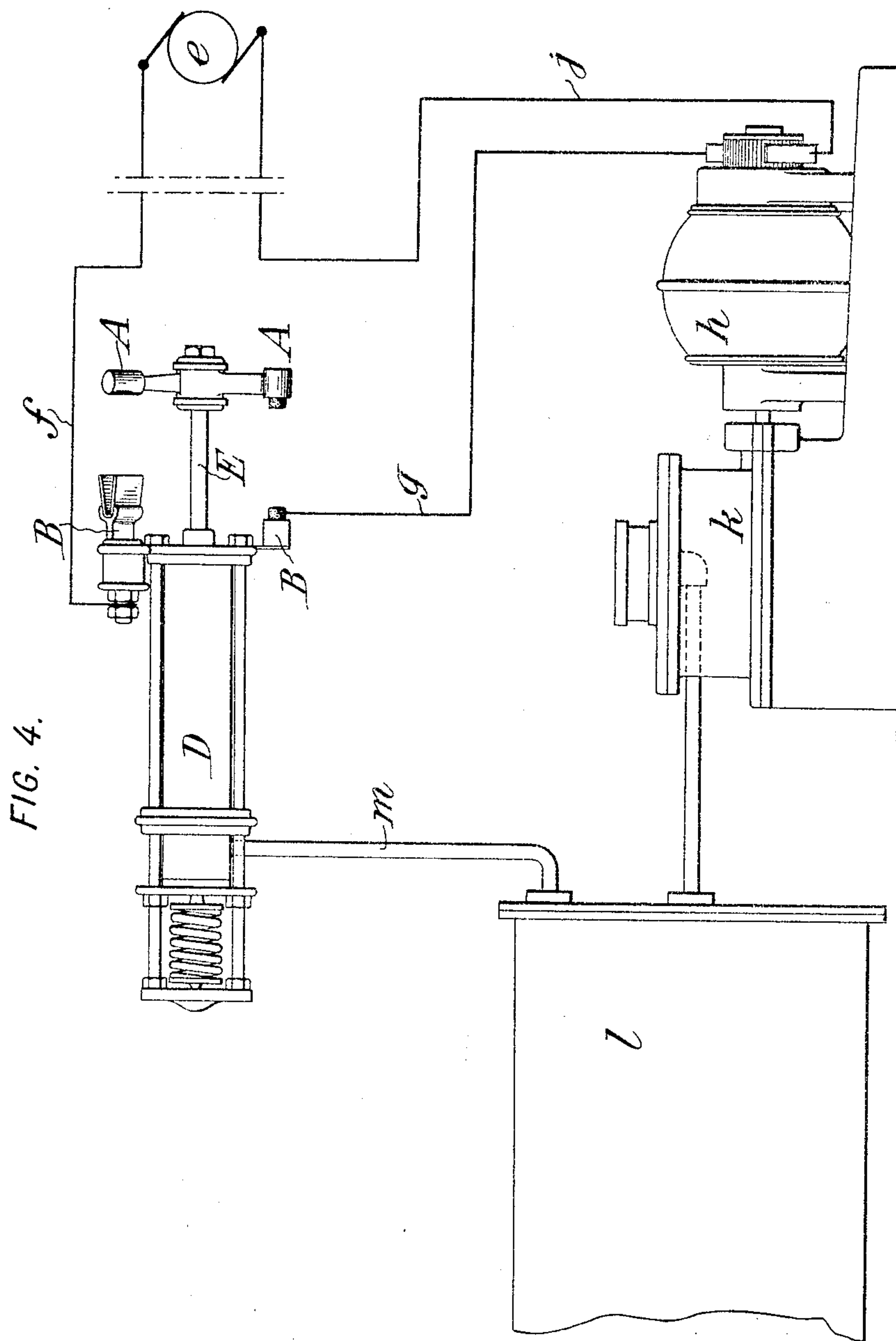
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NO MODEL.

2 SHEETS—SHEET 2.



WITNESSES:

*Ired White*  
*Thomas Wallace*

INVENTOR:

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# UNITED STATES PATENT OFFICE.

MILAN W. HALL, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO NOISELESS COMPRESSOR AND AIR BRAKE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

AUTOMATIC GOVERNOR FOR AIR-COMPRESSORS OR SIMILAR DEVICES.

SPECIFICATION forming part of Letters Patent No. 768,939, dated August 30, 1904.

Application filed April 2, 1903. Serial No. 150,745. (No model.)

*To all whom it may concern:*

Be it known that I, MILAN W. HALL, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Automatic Governors for Air-Compressors or Similar Devices, of which the following is a specification.

My invention aims to provide certain improvements in automatic governors for air-compressors or similar devices, such as electric pumps for air or other fluid, which maintain a fluid-pressure in a reservoir from which the pressure is drawn at intervals as needed—such, for example, as the pumping systems for compressed air for railway-brakes. My invention provides such a governor in which a cylinder and piston are used to operate the electric switch and are operated in both directions—that is to say, both to open and close the switch by means of fluid-pressure—the switch being opened when the pressure in the reservoir rises above a determined amount and being closed when the pressure falls below a determined amount, as is usual.

The governor of my invention is extremely simple and cheap and by reason of its simplicity is very sensitive, opening and closing the switch upon a very slight variation above or below the standard pressure. Its simplicity also makes it very durable.

Various other advantages are recited in detail hereinafter.

The accompanying drawings illustrate an embodiment of the invention, of which—

Figures 1 and 2 are longitudinal sections at right angles to each other, the former representing the switch opened and the latter the switch closed. Fig. 3 is an end view. Fig. 4 is a diagrammatic view of the electric and pneumatic circuit in which the governor is included.

Referring to the embodiment illustrated in the drawings, the switch comprises the two relatively movable members or sets of switch members A B, of any usual or suitable construction, the latter of which is attached to a tubular extension C of a cylinder D and the

other of which is attached to the outer end of a piston-rod E of a piston F, reciprocating in the cylinder D. The cylinder is provided with an inlet-port G and an outlet-port H. The inlet-port G is connected by the passage shown with a main inlet J, connected to a source of fluid-pressure, preferably the reservoir. Beyond the head K of the cylinder D is an extension L, constituting a second cylinder, in which slides a piston M. The latter is normally held in the position of Fig. 2 by means of a spring N bearing on the piston M through the intermediation of the plate O and reacting at its outer end against a cross-head P, carried on rods Q, running, preferably, to the head R at the opposite end of the extension C. Carried by the piston M is a valve S for opening and closing a port T in the head of the cylinder D. In the normal position of the parts the valve S is ordinarily held down on its seat by means of pressure or by pressure and a spring U, reacting against the piston M and inclosed in a tubular extension V of the valve S. A certain amount of play is permitted between the tubular extension V of the valve and the piston M by means of a pin W, carried by the piston and projecting into a slot in the tubular extension of the valve. The tubular extension C is of smaller diameter than the cylinder D. The rod E carries a second piston X, fitting the tubular extension C. A groove Y is formed in the rod E beyond the piston X and coöperates with a pin Z in preventing angular movement of the piston-rod, and consequently of the switch member A. A small aperture *a* is provided in the head R of the extension, through which the piston-rod passes.

In operation there is always a fluid-pressure between the two pistons F and X, and as the former is of greater area this pressure is always pressing in the direction to close the switch. The movement is accomplished by exhausting the pressure from the exhaust end of the cylinder as long as the pressure in the reservoir or other source is at or below normal. Consequently the parts normally stand in the position of Fig. 2, with the piston



moved to the exhaust end of the cylinder. When the pressure in the reservoir rises above the normal, the exhaust-passage is closed and a fluid-pressure is introduced on the exhaust  
 5 side of the piston F, which pressure is in excess of the differential pressure on its admission side, and therefore forces it in the direction to open the switch. There is therefore a constant fluid-pressure on one side and alternate withdrawal of and greater pressure  
 10 on the opposite side of the piston as the pressure in the reservoir goes below or above the normal. The introduction of the pressure at the exhaust end of the cylinder is accomplished by withdrawing the valve S and closing  
 15 the exhaust-passage at the port *b*. The pressure on the exhaust side of the piston F being applied upon the entire area of the piston is in excess of that on the opposite side, which is only proportional to the difference  
 20 between the areas of F and X. The opening of the valve S is accomplished as follows: When the pressure on the pressure-face of the piston M becomes great enough to overcome the pressure of the spring N, the piston moves  
 25 backward. First it covers the port *b*, cutting off the exhaust. Next the pin W strikes the rear of the slot in the tube V and draws back the valve S from its seat. At this time the pressure of the spring U is comparatively slight, and as soon as the face of the valve S is exposed its area is added to the effective area of the piston M, and thereby and coincidentally by relieving the piston M of  
 30 the unbalanced condition of the valve S while seated the effective pressure of the piston M against the spring N is suddenly increased sufficiently to enable the piston M to instantly compress the spring N sufficiently to insure a full and quick opening of the valve S. The  
 40 port T is made of such a size that the admission of pressure is very rapid and the switch-contacts are separated quickly. As the piston X moves through the tubular extension C the air is forced out of the latter through the groove Y and the port *a* until the inner end of this groove passes the inner face of the head R. After that the air is imprisoned in the extension C and serves as a buffer. As  
 50 long as the high pressure is maintained the switch is kept open. As soon as it falls sufficiently the pressure of the spring N (which may be adjusted as desired by means of the nuts illustrated at the ends of the rods Q) forces the piston M inward. The first effect is to close the port T. The second effect is to uncover the port *b*, which releases the pressure behind the piston. Immediately the differential pressure between the piston F and  
 60 X moves these pistons and the switch back to the position of Fig. 2. To prevent too sudden movement, a portion of the exhaust-passage is constricted—as, for example, by the introduction of a very small passage *c* in the

cylinder-head K, through which the exhaust 65 must pass.

The apparatus is mechanically well balanced by the two extensions at the opposite ends of the cylinder, and the latter may be provided with supporting pedestals or hang- 70 ers *d* for supporting the entire apparatus.

The arrangement of the circuit in which the governor is included is indicated in Fig. 4. Various other arrangements may be provided without departing from the invention. The 75 electric circuit of the generator *e* passes by wire *f* to one of the terminals B and from the opposite terminal B by wire *g* to one of the brushes of the motor *h*. From the other brush of the motor a wire *j* passes directly to 80 the line-wire and thence to the generator. The motor *h* drives an air-pump *k* of any suitable design, which compresses air in the reservoir *l*, the reservoir being connected by a pipe *m* with the inlet J of the governor- 85 cylinder D. In the position of the parts shown the air-pressure in the reservoir *l* has accumulated so as to force outward the bridge carrying the terminals A, and thus break the circuit and stop the motor and pump. As the 90 air is taken from the reservoir to the brake-cylinders by connections (not shown) the pressure in the reservoir falls and the terminals A are drawn inward to bridge the terminals B and close the circuit, which starts the motor 95 *h* and the pump *k*, which operation continues until the desired pressure is renewed in the reservoir, when the switch is automatically opened again.

Though I have described with great par- 100 ticularity of detail an apparatus embodying my invention, yet it is to be understood that the invention is not limited to the specific apparatus disclosed. Various modifications thereof in details and in the arrangement and 105 combination of the parts are possible to those skilled in the art without departure from the invention.

What I claim is—

1. In an automatic governor for air-com- 110 pressors and similar devices, the combination of a switch, a cylinder and piston for operating said switch and connected to a source of fluid-pressure, a tubular extension C of said cylinder, a piston X traveling in said exten- 115 sion, a head on said extension having a port *a*, the rod of said piston having a groove Y therein registering with the port *a* and terminating short of the piston X whereby an air-cushion is formed in said extension near the 120 end of the stroke.

2. In an automatic governor for air-com- pressors and similar devices, the combination of a cylinder, an extension at one end of said cylinder carrying a valve, an extension at the 125 opposite end of said cylinder carrying a switch, and a supporting-pedestal carried at the sides of said cylinder.



3. In automatic switches and the like, the combination with two members, one movable relatively to the other, of a cylinder connected to a source of fluid-pressure, a piston 5 in said cylinder, one of said parts connected to said movable member for moving it, means for admitting pressure to said cylinder, means for releasing such pressure, and means providing a fluid-pressure cushion for arresting 10 motion of said parts while said movable member is moving away from the other member.

4. The combination with a cylinder having an inlet-port and an outlet-port, and a piston in said cylinder, of a second cylinder having 15 an inlet-port connected to a source of fluid-pressure, a second piston in said second cylinder, a valve carried by said second piston controlling flow from said second cylinder to said first cylinder, operated by said second 20 piston, and having a limited movement relatively thereto, a valve-seat for said valve permitting discharge from the said second cylinder to said first cylinder, and a spring moving said second piston in the direction to seat 25 said valve, said second piston compressing said spring and moving back independently of said valve as pressure increases in said second cylinder, and at a predetermined pressure unseating said valve and moving it back to 30 permit pressure to flow into said first cylinder, whereby at the unseating of said valve its area is added to the effective area of said

second piston, thereby increasing the effective back pressure of the latter sufficiently to enable said second piston to quickly further 35 compress said spring to insure a full and immediate opening of said valve.

5. The combination with a cylinder having inlet and exhaust ports, and a piston therein, of a second cylinder having an inlet connected 40 with a source of fluid-pressure, a second piston in said second cylinder, moved in one direction by fluid-pressure, a spring moving said second piston in the other direction, said second piston closing the outlet from said first piston, 45 and opening the inlet thereto when moving in one direction, and closing said inlet, and opening said outlet when moved in the other direction, and a valve seating on the inlet to said first cylinder, and carried by and having a 50 limited movement relative to said second piston, said valve disposed to seat while said second piston is moving toward the position for opening said outlet, and prior to the opening thereof, whereby upon the seating of said 55 valve it closes the inlet to said first cylinder before the outlet therefrom is opened.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

MILAN W. HALL.

Witnesses:

GEORGE H. FRASER,  
FRED WHITE.