E. J. ROHRBACHER.

AUTOMATIC GOVERNOR FOR FLUID COMPRESSORS.

APPLICATION FILED FEB. 15, 1908.

898,606. Patented Sept. 15, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

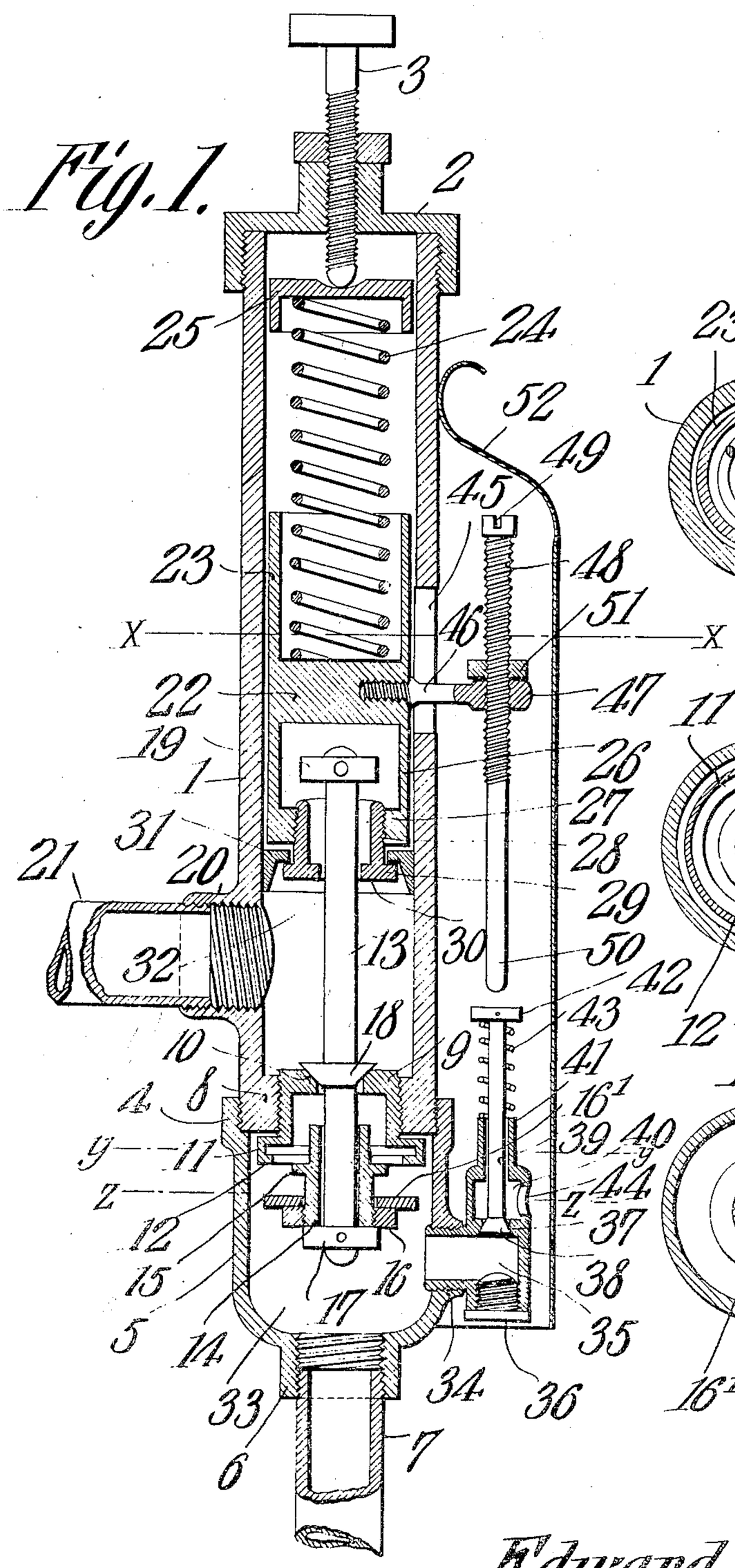


Fig. 2.

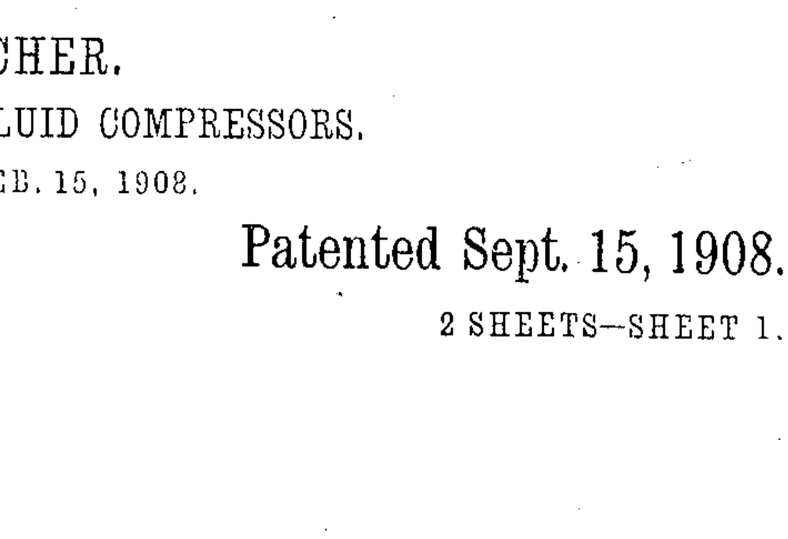


Fig. 3.

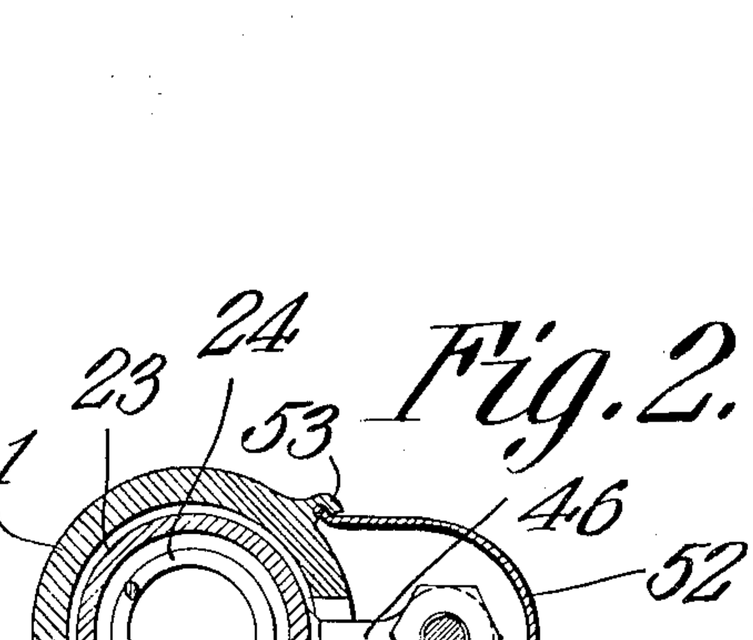
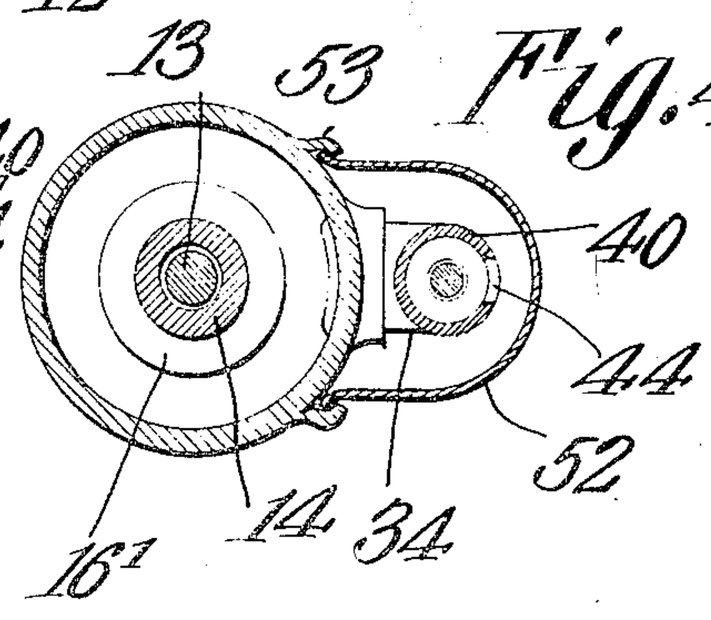


Fig. 4.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 5.

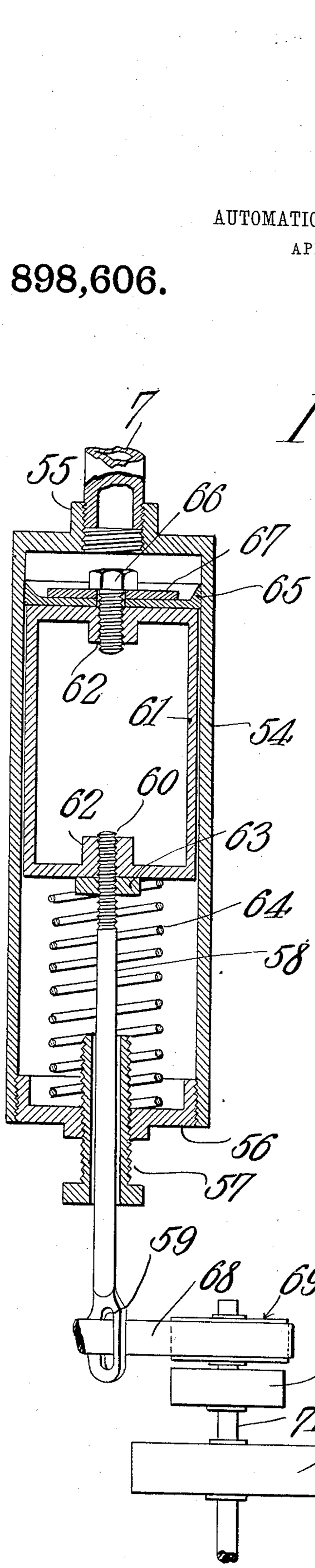
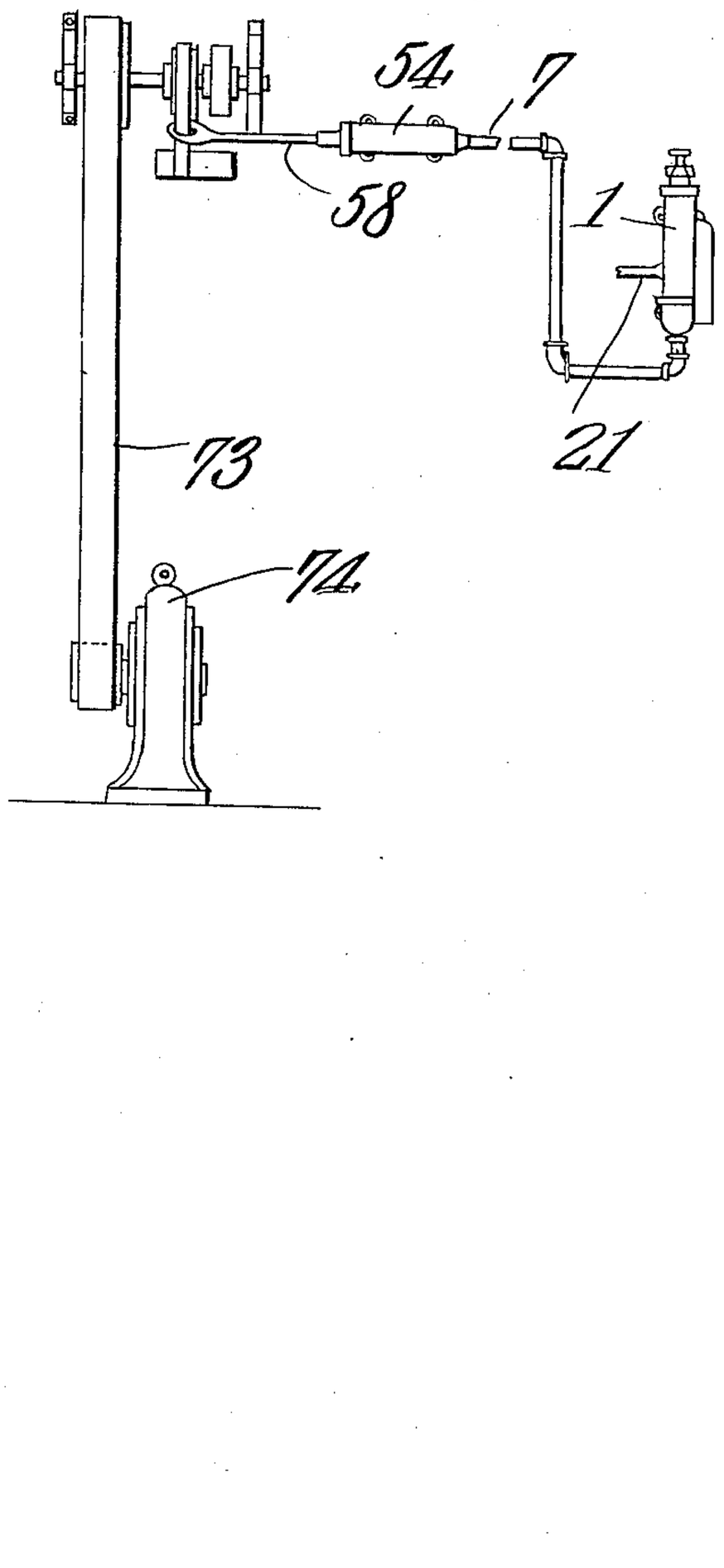


Fig. 6.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC GOVERNOR FOR FLUID-COMPRESSORS.

No. 898,606. Specification of Letters Patent. Patented Sept. 15, 1908.

Application filed February 15, 1908. Serial No. 416,091.

To all whom it may concern:

Be it known that I, EDWARD J. ROHRBACHER, a citizen of the United States, residing at Blaine, in the county of Whatcom and State of Washington, have invented a new and useful Automatic Governor for Fluid-Compressors, of which the following is a specification.

This invention has reference to improvements in automatic governors for fluid compressors, and its object is to provide means for governing the action of the compressing mechanism so as to throw the same out of action when a predetermined pressure has been reached and to again throw the compressor into action after a predetermined reduction of pressure.

The governor is adapted for use with compressors for any kind of compressible fluids, but for the sake of simplicity in the following description, the compressor will be considered as an air compressor only, with the understanding, however, that this limitation is for descriptive purposes only.

The invention comprises a valve structure yieldable to a predetermined air pressure to admit the compressed air, after the predetermined pressure has been reached, to a mechanism operated by the compressed air in such manner as to throw the compressing mechanism out of action and at the same time communication between the source of compressed air and the cut off mechanism is cut off so that the air pressure serving to move the cut-out mechanism to the active position is maintained irrespective of a reduction of pressure in the reservoir or other supply of air, and this air pressure which maintains the cut-out mechanism in its active condition is relieved only after a predetermined reduction in the initial pressure.

The invention will be best understood by a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings—

Figure 1 is a longitudinal section through the governor valve mechanism. Fig. 2 is a cross section on the line *x*—*x* of Fig. 1. Fig. 3 is a cross section on the line *y*—*y* of Fig. 1. Fig. 4 is a cross section on the line *z*—*z* of Fig. 1. Fig. 5 is a similar view of another type of cut-out mechanism. Fig. 6 is a view showing an application of the invention.

Referring to the drawings, and more particularly to Figs. 1, 2, 3 and 4, there is shown a casing 1 which may be in the form of an elongated cylinder having one end threaded on the outer face for the reception of a cap 2, through the center of which is formed a nut for the reception of a hand screw 3 to be hereinafter referred to. The lower end of the cylinder 1 is externally threaded for the reception of the bell end 4 of a casing extension 5, the lower end of which is contracted and formed into a neck 6, the inner surface of which is screw-threaded to receive a pipe or other structure 7. The lower end of the casing 1 is radially thickened, as shown at 8, and the inner walls of this thickened portion or annular flange is formed with screw threads to receive a bushing 9 having one end contracted and formed into a valve seat 10. The other end of this bushing is formed with a lateral enlargement 11 having its lower end formed into an inwardly-directed annular flange 12. Extending through the bushing is a valve stem 13 surrounded near its lower end by a sleeve 14 formed about midway of its length with an exterior collar 15 and at its lower end receiving a nut 16. Between the valve 15 and nut 16 the sleeve carries a washer 16′ of such size as to engage the valve 12 when brought against the lower end of the bushing 9. The lower end of the valve stem 13 carries a collar 17 arranged to engage the lower end of the sleeve 14. The valve stem carries a valve head 18 and is extended above this valve head and terminates at the upper end in another collar 19 fast on the valve stem.

A short distance above the lower end of the casing 1 there is formed a laterally-extending neck 20. This neck is internally threaded to receive a pipe or other conduit 21 to be hereinafter referred to.

Within the casing 1 is a piston 22 formed at its upper end in a cup 23 to receive one end of a helical spring 24 housed in the casing and carrying at its other end a cap 25 against which bears the lower end of the screw 3. The piston 22 is formed on its lower side with a sleeve-like extension 26, at the end of which there is formed an inwardly-extending annular rib 27 internally threaded to receive a bushing 28 which in turn has its lower end formed with an outwardly-extending flange 29 and an inwardly-extending flange 30. The flange 29 serves to clamp a cup packing 31 against the lower end of the rib 27, while the flange 30 serves to embrace and guide the valve stem 13 which extends through it.

The upper end of the bushing 28 ultimately engages the collar 19 on the valve stem when the piston moves to a sufficient distance as will hereinafter appear.

Between the lower end of the piston and the top of the bushing 9 there is formed a chamber 32, and within the casing extension 5 there is formed another chamber 33. The casing extension 5 has a side neck 34 into which is screwed a short ell 35 receiving at its lower end a removable screw plug 36. The wall of the ell above the screw plug 36 is pierced by an opening formed into a valve seat 37, and this opening is normally closed by a valve 38 the stem 39 of which is extended upward through a small chamber 40 formed on the top of the ell above the valve seat 37, and thence through a guide 41 and finally terminates in a head or collar 42 between which and the top of the guide the valve stem is surrounded by a helical spring 43. The chamber 40 communicates with the atmosphere through a constantly open port 44.

Fast on the piston 22 and projecting through an elongated slot 45 in the wall of the casing is a stem 46 terminating in a head 47 which is internally threaded for the passage of a screw 48 formed at its upper end with a slot 49 for the reception of a screwdriver or other suitable tool, and at the lower end this screw is formed into a finger 50 which may be adjusted into operative relation to the collar or head 42 on the valve stem 39. A lock nut 51 applied to the screw 48 serves to hold it in adjusted positions on the head 48 of the stem 46. A suitable protecting hood 52 sliding in guides 53 formed on the casing 1 serves to protect the screw 48 and the valve stem 39 from damage.

Suppose, now, that air pressure reaches the chamber 32 through the pipe 21. If this air pressure be sufficient, or if insufficient, shall increase to the requisite amount, then ultimately the piston 22 will be raised against the action of the spring 24, it being understood that the valve 18 is normally seated on the valved seat 10. As the piston 22 yields to the increasing air pressure the upper end of the bushing 28 is finally brought into engagement with the collar 19, and the valve 18 is lifted from its seat 10 and air finds its way into the interior of the bushing 9 and so through the lower end thereof into the chamber 33 to and through the pipe 7, for a purpose which will presently appear. The air pressure is thus equalized between the chambers 32 and 33, but as the air pressure increases the piston 22 is finally raised to such an extent that the collar 17 lifts the sleeve 14 until the washer 16′ is brought into engagement with the flange 12 and so closes the air passage between the bushing 9 and the chamber 33. Suppose, now, that the air pressure in the chamber 32 should decrease. Then the piston 22 will be lowered by the action of the spring 24 and ultimately the valve 18 will rest on the seat 10. However, the air pressure in the chamber 33 has not decreased because the washer 16′ remains over the lower open end of the bushing 9 and prevents the escaping of the air in the chamber 33, even though the head or collar 17 has been lowered away from the sleeve 14.

If the air pressure in the chamber 32 continues to decrease to a sufficient extent the finger 50 will ultimately be brought into contact with the head 42 of the valve stem 39 and the valve 38 will be moved out of engagement with its seat 37. Now, the chamber 33 is in communication with the atmosphere through the port 44 and the air pressure in the chamber 33 rapidly decreases until it reaches a point below the pressure in the chamber 32, when the washer 16′ will fall away from the lower end of the bushing 9.

The structure thus far described may be used in connection with many different mechanisms, and in Fig. 5 one such mechanism is illustrated in detail while in Fig. 6, the application of the invention is shown more extensively and more or less diagrammatically.

In Fig. 5 there is shown a cylinder 54 formed at one end with a threaded neck 55 into which the pipe 7 of Fig. 1 is assumed to lead. The other end of the cylinder is internally threaded for the reception of a bushing 56, through the central threaded opening of which there extends a threaded sleeve 57, passing into the interior of the cylinder for a distance. Through the sleeve 57 there extends a piston rod 58 having an eye 59 formed at its outer end, and at its inner end the piston rod 58 is threaded as indicated at 60. Within the cylinder 54 is a cylindrical piston 61 closed at both ends and there provided with inwardly directed bosses 62, each of which is provided with a central threaded opening. The threaded end 60 of the piston rod 58 enters the threaded opening of the corresponding boss at the appropriate end of the piston 61, and a lock nut 63 applied to the threaded end of the piston rod serves to secure it firmly to the end of the piston 61. Surrounding the piston rod between the piston 61 and the inner face of the bushing 56 is a helical spring 64, tending at all times to force the piston 61 toward the end of the cylinder 54 entered by the pipe 7. The tension of this spring is adjustable by means of the bushing 56, and the extent of movement of the piston 61 in opposition to the spring 64 is limited by the extent to which the sleeve 57 is screwed into the interior of the cylinder 54. Applied to the end of the piston remote from the piston rod is a cup washer 65 held in place by a screw 66 and interposed washer 67. The purpose of the cup washer 65 is to prevent air from passing by the piston 61. The eye

59 on the outer end of the piston rod 58 is suitably shaped to embrace the belt 68 which may be assumed to be a power belt, and this belt is arranged for engagement with either pulley 69 or 70, on a countershaft 71, one of the pulleys 69 or 70 being fast on the counter-shaft and the other pulley being loose thereon. The counter-shaft 71 carries another pulley 72 fast thereon, as is usual, and from this pulley 72 there extends a belt 73 to the work which in this case is represented as a dynamo electric machine 74, but which of course, may be any other driven machinery.

If it be assumed that the generator 74 be driving a motor which in turn drives an air compressor, or if it be assumed that the belt 73 directly drives an air compressor, and if it also be assumed that the air pumped by the air compressor finally reaches the governor of Fig. 1 through the pipe 21, then ultimately as the pressure increases to the predetermined limit, the spring 24 will yield and the valve 18 is opened thus permitting the air under pressure to reach the pipe 7 and finally enter the cylinder 54 and engage the corresponding end of the piston 61. As soon as the air pressure within the cylinder 54 is sufficient to overcome the resistance of the spring 64, the piston 61 will move in a direction to cause the eye 59 on the piston rod 58 to shift the belt 68 from the pulley 69 to the pulley 70. Assuming that the pulley 69 is the tight pulley then when the belt 68 has passed from the pulley 69 on to the loose pulley 70, power will no longer be transmitted to the counter-shaft 71 and the generator 74 or other operated mechanism will cease to work. By the time this has occurred the washer 16′ has been brought into engagement with the flange 12 and communication between the pressure pipe 21 and the conduit or pipe 7 has been closed.

As before explained the superior pressure in the chamber 33 will keep the washer 16′ against the flange 12 even though the pressure in the chamber 32 has materially decreased. Therefore there may be a very material drop of pressure in the reservoir without any change in the condition present in the cylinder 54. When, however, the pressure on the reservoir side of the governor has decreased to a predetermined point then the valve 38 will be opened and the air pressure against the piston 61 in the cylinder 54 is allowed to escape through the port 44 to the atmosphere. This permits the spring 64 to act to move the piston 61 toward the end of the cylinder entered by the pipe 7, and the power belt 68 is shifted from the loose pulley 70 on to the tight pulley 69, thus bringing the power into operative connection again with the work. There is thus provided a means responsive to variations in pressure for cutting the power into and out of operative relation with the work and the extremes of pressure under which the governor becomes active, may be regulated at will.

The invention is adapted to various purposes and the example given is to be taken as largely illustrative, and the scope of the application of the invention is not in any manner limited to the particular example shown. For instance, instead of being used for the purpose of shifting the belt the governor may be used to open or close an electric switch, or a pump by forcing a friction wheel into engagement with the prime mover, or to close a steam valve in case the pump or the generator or whatever the work may be is driven by a steam engine. In fact the invention may be used to operate levers for any purpose or to control the flow of fluid under pressure to whistles, or horns, or signals of any kind, whether on land or on shipboard, where warnings are to be given when the pressure of a fluid has risen beyond a certain predetermined limit.

What is claimed is:—

1. In a governor for fluid compressors a normally closed valve, means under the control of the fluid being compressed, yieldable under a predetermined pressure to engage and open the valve, means controllable by fluid pressure for operating suitable mechanism, means controlled by the valve for closing communication between the fluid compressor and the means for operating the said mechanism timed to act after the valve has been opened, and means for reducing the air pressure for operating the said mechanism, said means being controlled by a reduction of pressure on the active side of the valve.

2. A means for governing the application of compressed fluids to mechanism set in action by said fluid comprising a valve interposed between the source of compressed fluid and the mechanism to be operated thereby, means for operating said valve yieldable to a predetermined pressure on the power side of the valve, another valve structure under the control of the first-named valve for closing communication between a source of compressed fluid and the mechanism to be driven thereby, and means controllable by a reduction in pressure on the supply side of the valve for reducing the pressure on the other side of the valve.

3. A governor for controlling the application of fluid under pressure to mechanism to be operated thereby comprising a casing, a valve therein dividing the casing into two compartments, a spring-controlled piston on the reservoir side of the valve yieldable to a predetermined pressure and arranged to engage and open the valve when moved by such pressure, another valve member on that side of the main valve seat remote from the reservoir and movable by the first-named valve to close communication between the two chambers of the casing after the main

valve has been actuated, and an exhaust valve communicating with the chamber remote from the reservoir and controlled by the movement of the piston when the reservoir pressure falls.

4. A governor for controlling the application of compressed fluids to mechanisms to be operated thereby, comprising a suitable casing divided into two compartments, one communicating with a source of compressed air and another compartment communicating with the mechanism to be operated by the compressed air, a valve interposed between the two compartments, a spring-controlled piston in the first-named compartment movable under a predetermined pressure to open the valve, another valve structure in the second-named compartment controlled by the first-named valve to close communication between the two compartments after the first-named valve has been opened, an exhaust valve communicating with the second compartment, and adjustable means connected to the piston for operating the exhaust valve when the pressure on the reservoir side of the first-named piston has reached a predetermined minimum.

5. A governor for controlling the application of compressed fluids from a reservoir of the same to mechanism to be operated by said compressed fluids, comprising a suitable casing having two compartments, one compartment being connected to the source of compressed fluid and the other compartment being connected to the mechanism to be operated, a valve interposed between the two compartments, a sliding piston within the first compartment, a spring opposing the movement of the piston under fluid pressure, connections between the sliding piston and the valve arranged to permit an inactive movement of the piston before engaging the valve, a valve structure within the second-named chamber movable by the first-named valve to close communication between the two chambers after the first-named valve has been opened, a normally closed valve between the second-named chamber and the atmosphere, and an adjustable member carried by the piston and movable into operative relation to the last-named valve after the piston has traveled on its return movement sufficient to close the first-named valve.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

EDWARD J. ROHRBACHER.

Witnesses:

HELEN L. MCKINNON,

BENJAMIN J. NICKLIN.