E. J. ROHRBACHER.

FLUID PRESSURE REGULATOR.

APPLICATION FILED MAY 21, 1908.

951,513.

Patented Mar. 8, 1910.

Fig. 1.

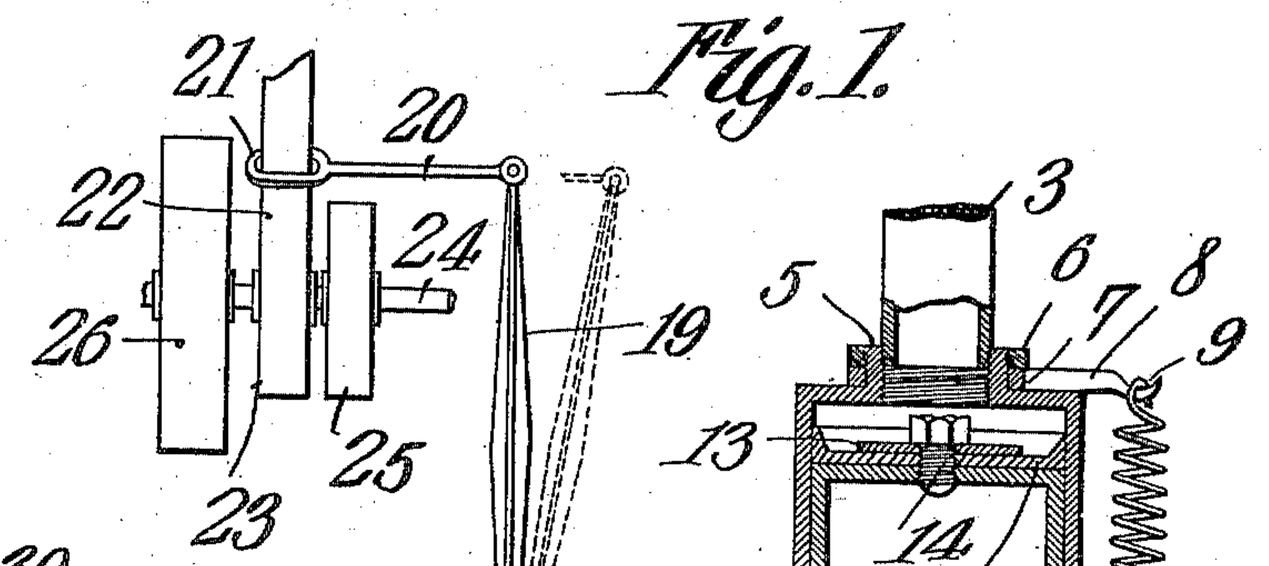
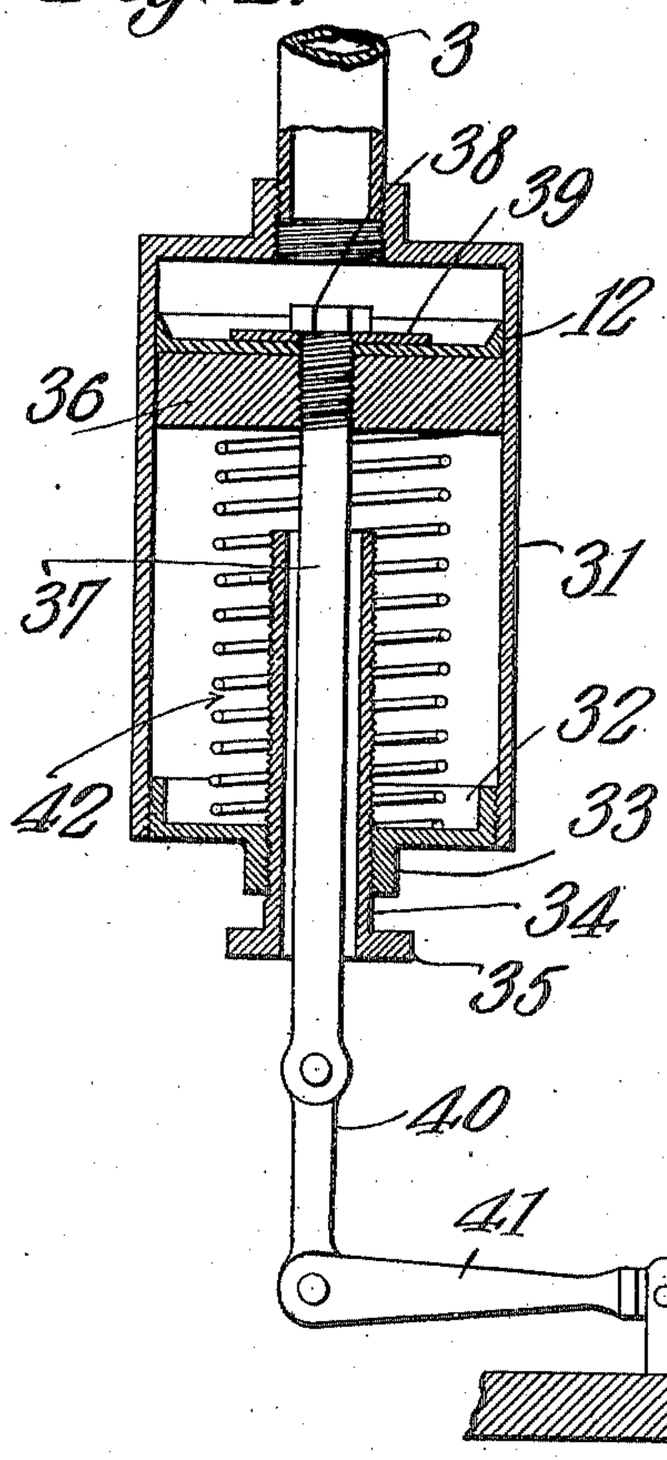
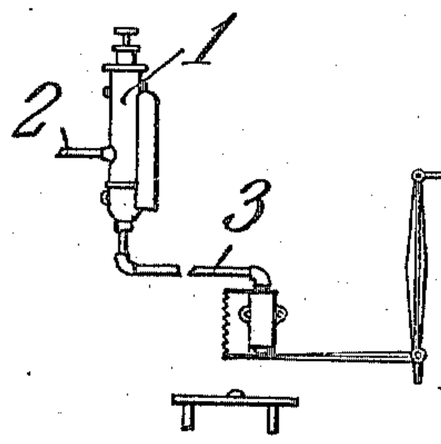


Fig. 2.





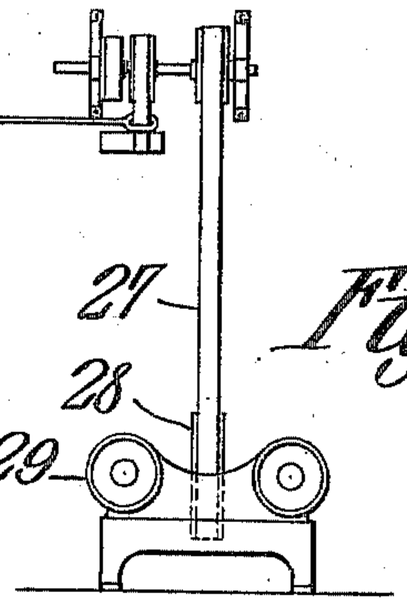
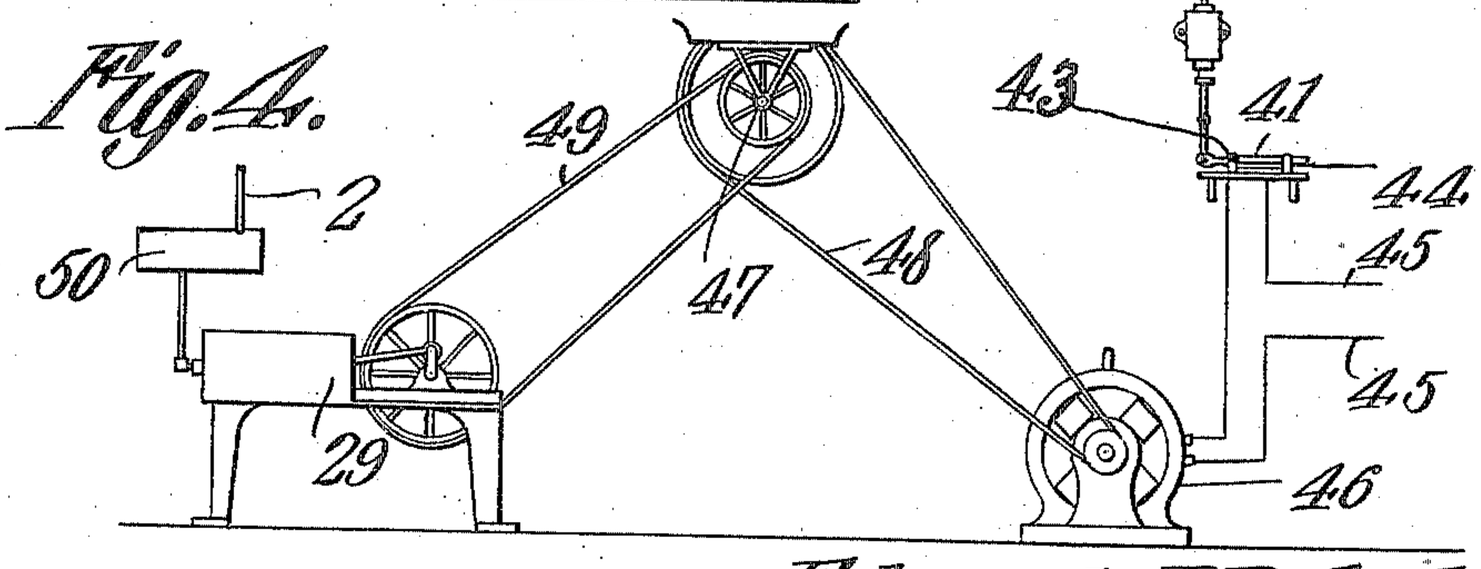


Fig. 3.

Fig. 4.



Witnesses

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FLUID-PRESSURE REGULATOR.

951,513. Specification of Letters Patent. Patented Mar. 8, 1910.

Original application filed February 15, 1908, Serial No. 416,091. Divided and this application filed May 21, 1908. Serial No. 434,212.

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 Fluid-Pressure Regulator, of which the following is a specification.

This invention has reference to improvements in fluid pressure regulators for automatic governors for fluid compressors, and is designed more particularly for use in connection with the automatic governor for fluid compressors shown and described in my application for Letters Patent of the United States, No. 416,091, filed February 15, 1908, of which this is a division. The automatic governor of the said application is designed to operate under any fluid pressure and more particularly under air pressure, it being constructed to permit the passage of compressed air after the attaining of a predetermined pressure, to an intermediate mechanism through which the compressed air is caused to actuate power controlling devices, so that the air compressor is cut out of action on the attaining of the predetermined pressure, and is held out of action by the accumulated pressure until the reservoir or source has been depleted to a predetermined extent, after which the air pressure maintaining the intermediate mechanism in active position, is exhausted and the intermediate mechanism is permitted to return to its initial position of inactivity.

The present invention has reference more particularly to the intermediate mechanism, whereby the compressed air, which latter throughout this specification is to be considered merely as typical of any compressed fluid, is caused to actuate a movable member against the action of a constraining device in such manner as to simultaneously move a power controlling means to a commensurate degree. The power controlling means may be of any suitable kind, such as a valve or an electric switch, or a belt, so that the valve or switch may be opened or closed, or the belt may be shifted from a tight to a loose pulley, or the reverse, and the power be thereby rendered active or cut off, as the case may be.

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

Figure 1 is an elevation with parts in section, showing one form of the intermediate mechanism forming the subject matter of the present invention, wherein the mechanism is utilized for the purpose of operating a belt shifter. Fig. 2 is a longitudinal section of another form of intermediate mechanism. Fig. 3 is a view showing the application of the structure illustrated in Fig. 1. Fig. 4 is a view showing the application of the structure illustrated in Fig. 2.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In Figs. 3 and 4 there is indicated at 1 an automatic governor responsive to differences in fluid pressure, and this governor may be considered as that shown and described in the aforesaid application. The governor is so constructed that at a predetermined maximum pressure it will open a conduit whereby the fluid under pressure will flow to the intermediate mechanism and actuate the same to shut off power, and when a predetermined minimum pressure is reached the governor will again act to relieve the intermediate mechanism from the action of the compressed fluid and the said mechanism will be actuated to again cause the application of power. This governor is in communication with a suitable reservoir of compressed air or other fluid through a pipe or conduit 2, and the compressed air passes from the governor by a pipe 3, the other end of which is in free communication with one end of a cylinder 4 of a structure such as shown in Fig. 1, the pipe 3 being connected to the cylinder by means of a neck 5. This neck is externally threaded to receive a collar 6, and thereby clamps a ring 7 to the corresponding end of the cylinder, and from this ring 7 there projects an arm 8 terminating in a suitable hook 9 to which reference will hereinafter be made. The end of the cylinder 4 remote from that entered by the pipe 3 is open, and within the cylinder there is a hollow cylindrical piston 10 having the end toward the open end of the cylinder rounded outwardly as shown at 11. Secured to the end of the piston 10 adjacent to the closed end of the

cylinder 4 is a packing 12 held to the cylinder by a suitable washer 13 and screw 14.

Pivoted to a fixed structure of any kind at one side of the cylinder 4 is a bell crank lever 15, one arm 16 of which is arranged in the path of the rounded end 11 of the piston 10, and at its free end is formed into a hook 17 to which is secured one end of a helical spring 18, the other end of which is made fast to the hook 9 of the arm 8. The other arm 19 of the bell crank lever 15 has its free end connected to a link 20 which in turn has its free end formed into an eye 21 encircling a belt 22 coming from some suitable source of power, and passing about a pulley 23 on a counter-shaft 24, which in turn carries another pulley 25 adapted to be engaged by the belt 21 when properly shifted. The counter-shaft 24 carries another pulley 26 connected by a suitable belt 27 to a pulley 28 on the crank shaft of a suitable air compressor 29.

In the path of the arm 16 of the bell crank lever 15 is a stop 30 which may, if desired, be made adjustable, so as to accommodate the structure to varying conditions of installation.

In the structure shown in Fig. 2, there is a cylinder 31, similar to the cylinder 4, except that the end remote from that entered by the pipe 3 is closed by a head 32 screwed into said cylinder, and this head is provided with a central neck 33 internally threaded for the reception of an externally threaded sleeve 34, having its outer end formed with a head 35 for the application of a wrench or other tool, and for preventing the sleeve from being screwed to too great an extent through the head 32. Within the cylinder 31 is a piston 36 having applied to the face adjacent to the end of the cylinder entered by the pipe 3, a packing ring 12, like that applied to the piston 10. Screwed through the center of the piston 36 is the threaded end of a piston rod 37, which threaded end projects beyond the packing 12 and has applied to it a nut 38 for confining the packing to the end of the piston by means of a suitable washer 39. The piston rod 37 extends centrally through the sleeve 34, which latter is of sufficient length to project a suitable distance into the interior of the cylinder, and this piston rod beyond the sleeve 34 is connected by a link 40 to one end of the switch lever 41 of an electric switch. Within the cylinder 31 between the piston 36 and the head 32 there is confined a helical spring 42, surrounding the piston rod 37, and sleeve 34. The tension of this spring may be adjusted by the head 32, which may be screwed to a greater or less extent into the cylinder 31, and the extent of travel of the piston 36 is adjustable by means of the screw sleeve 34.

The application of the structure shown in Fig. 2 is best shown in Fig. 4, where it will be seen that the switch arm 41 when in the closed position bridges terminals 43, 44 of an electric circuit 45, which circuit includes an electric motor 46 of any suitable type. This motor may drive a counter-shaft 47, by means of a suitable belt 48, and from the counter-shaft power is conveyed to the air pump 29 through a suitable belt 49. In Fig. 4 there is shown in connection with the air pump an air reservoir 50. This showing is to be taken as illustrative only, and not as indicating any relative proportions, since the air reservoir is shown very small in proportion to the size of the pump. Leading from the air reservoir is the pipe 2 which ultimately reaches the governor 1 and may, of course, be branched off at any intermediate point to convey the fluid under pressure to the point of utilization.

Let it be considered that the intermediate mechanism of Fig. 1 is in the position shown in said figure, this being the position which the parts assume when there is no air pressure in the reservoir. If it be further assumed that power is applied to the belt 22, which in this position is on the tight pulley 23, then motion is transmitted to the countershaft 24 and pulley 26, and by the belt 27 to the pump 29. Air is thereby pumped into the reservoir 50 and the pressure increases until the predetermined maximum has been reached. The governor 1 which up to this time has been in a position to close the cylinder 4 to the reservoir pressure, now responds to the predetermined pressure, and air under such pressure is admitted through the pipe 3 to the interior of the cylinder 4. This air pressure acting against the piston 10 forces the same outwardly and the lever 15 participates in this action through the rounded end of the piston 10 bearing against the arm 16, this rounded end preventing any rubbing action between the piston and the arm 16, since the arm will relatively roll on the piston. The movement of the arm 16 away from the end of the cylinder 4 places the spring 18 under increased stress. As the movement of the bell crank lever 15 in the manner described continues, the arm 16 engages the stop 30. This movement of the bell crank lever 15 is sufficient to cause the link 20 to shift the belt 22 from the pulley 23, which is the tight pulley, to the pulley 25, which is the loose pulley, and when this occurs power is cut off from the pump 29, and the latter ceases to operate.

The governor 1 is so constructed that when equilibrium of pressure is established between the pressure side of the governor and the cylinder 4, the pressure in the cylinder 4 is maintained even though the pressure in the reservoir should drop because the air therein is being utilized for some useful

work. When, however, the air pressure in the reservoir 50 has reached a predetermined minimum, then the governor acts to open the cylinder 4 to the atmosphere, and the pressure in the cylinder is rapidly reduced to atmospheric pressure thus causing a spring 18 to act to return the piston 10 to its normal position, and, at the same time, shift the belt 22 from the loose to the tight pulley. When this condition of affairs occurs, the pump 29 is again put into action and the pressure in the reservoir is caused to increase until the predetermined maximum of pressure is reached, when the belt is again shifted as before described.

In the case of the structure shown in Fig. 2, the action of the reservoir pressure is the same as before, except that instead of a belt being shifted, the switch 41 is closed or opened, as the case may be, and the motor is set into motion, or is stopped in accordance with the position of the switch. In the structure shown in Fig. 2, provision is made for adjusting the piston 36 to respond quickly or slowly to the air pressure, and the extent of movement of the piston is determined by the projection of the sleeve 34 into the interior of the cylinder 31.

It is to be understood that the invention is not limited to the various details of construction illustrated, since these details may be changed in different manners without departing in any degree from the invention.

What is claimed is:—

1. In a device for compressing air or the like, a means for coupling up and cutting off power from the compressing mechanism comprising a cylinder, a pipe leading from one end thereof and constituting the means for the introduction into and escape of compressed air from the cylinder, a piston in the cylinder movable in one direction under the action of the compressed air, a spring for moving the piston in the other direction, an abutment independent of the spring for limiting the active movement of the piston under the compressed air, and a lever carrying power controlling means at one end and acted on at the other end by the said piston, said lever being actuated to the full extent of its travel at each movement of the piston.

2. In a device for compressing air or the like, a means for coupling up and cutting off power from the compressing mechanism comprising a cylinder, a pipe leading into one end thereof and constituting the only means for the introduction into and escape of compressed air from the cylinder, a piston in the said cylinder, a piston rod carried by the piston, a lever connected to the outer end of the piston rod and at the other end carrying power controlling means, said lever being actuated to the full extent of its travel at each movement of the piston, a spring within the cylinder and surrounding the piston rod, means carried by the cylinder for adjusting the tension of the spring, and a sleeve surrounding the piston rod and terminating within the cylinder in the path of the piston, said sleeve being adjustable in the direction of the length of the cylinder and constituting an elongated guide for the piston rod and a limiting abutment adapted to be engaged directly by the piston.

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:

D. M. Horne,

J. A. Bettine.