No. 859,843. PATENTED JULY 9, 1907.

L. H. ROGERS.

CONTROLLER FOR PNEUMATIC COMPRESSORS.

APPLICATION FILED DEC. 9, 1904.

2 SHEETS—SHEET 1.

Fig. 4.

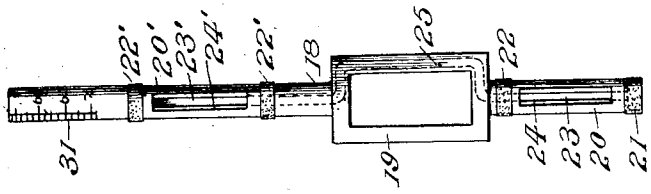

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

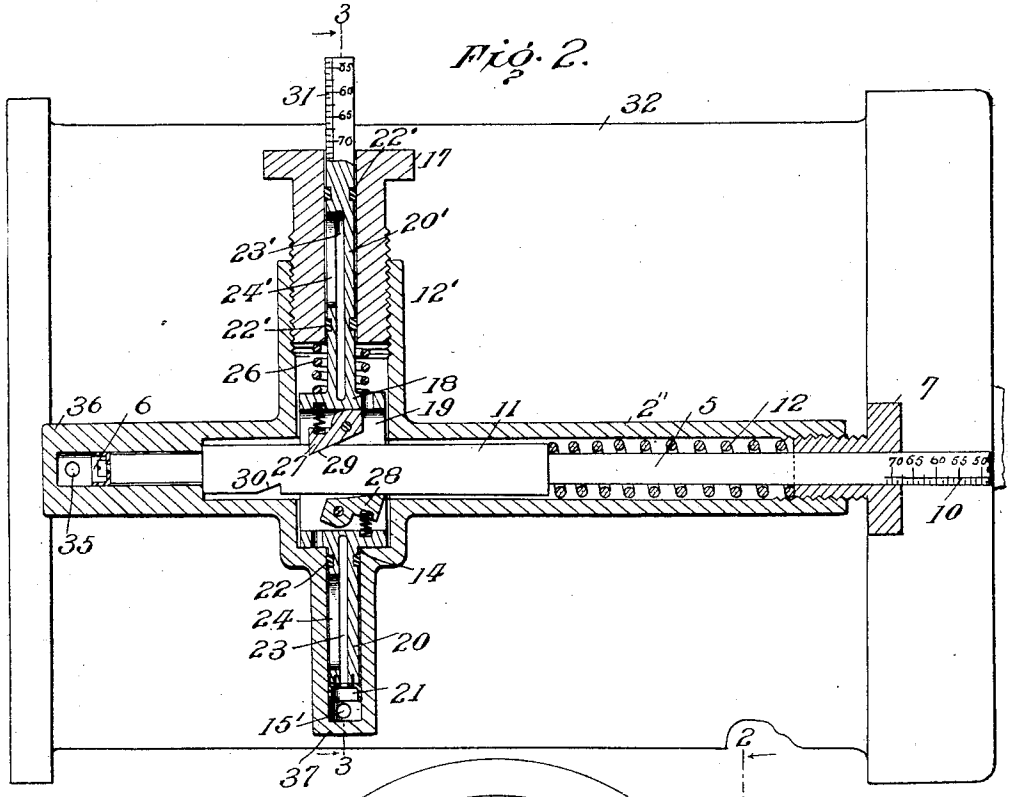
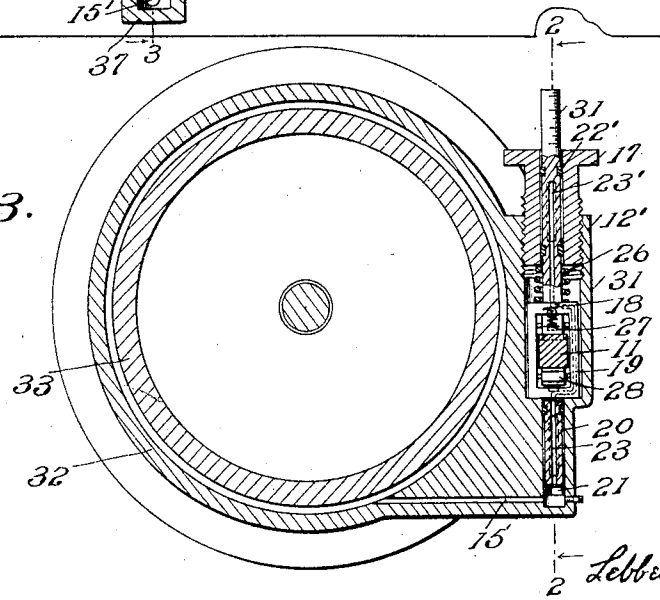


Fig. 3.



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CONTROLLER FOR PNEUMATIC COMPRESSORS.

No. 859,843. Specification of Letters Patent. Patented July 9, 1907.

Application filed December 9, 1904. Serial No. 236,219.

To all whom it may concern:

Be it known that I, LEBBEUS H. ROGERS, of New York, N. Y., have invented a new and useful Improvement in Controllers for Pneumatic Compressors, which invention is fully set forth in the following specification.

This invention relates to controllers and especially to improvements in controllers governing the action of air compressors to the end that the air compressor may be automatically thrown out of action when a certain maximum air pressure is attained or exceeded in the air reservoir, and to automatically start the compressor again when the pressure in the reservoir has fallen below a predetermined limit. Controllers of this general character have been devised before and have been applied in a variety of ways, particularly in connection with air-brakes for street railway cars where a given reservoir pressure is desired for operating the brakes and to secure a uniform action in their operation. One form of such controlling device is illustrated and described in U. S. patent to Bror F. Bergh, No. 787,489, April 18th, 1905, on which this invention is an improvement.

In the controllers of the class referred to, there is a vibratory member subject at one end to reservoir pressure and at the opposite end to an opposing spring pressure. This spring pressure is exerted against the reciprocating bearing pistons of the automatic releasing device, and this pressure increases as the difference between the falling reservoir pressure and the counter-acting spring pressure increases thereby detracting from the sensitive, smooth and gentle operation of the retaining device.

To overcome the above objections, I have devised means whereby the bearing parts of the releasing device used with the reciprocating member are relieved from undue pressure, whereby friction is greatly reduced on the bearing parts of the said device and greater sensitiveness and smoothness of action is secured in its operation. This result may be effected in various ways but one that is preferable is to oppose the pressure on the bearing members of the releasing device by counter-acting reservoir pressure.

It is a further object of this invention to construct the controller integral with the compressor cylinder whereby certain parts of the controller may be dispensed with and the structure simplified and cheapened, and also to provide the controller with simple means for registering pressures whereby the controller itself becomes a means of measuring pressures and lends itself more readily to adjustment.

The inventive idea involved may receive various mechanical expressions.

For the purpose of illustrating the invention, reference is had to the accompanying drawings which illustrate some of the forms which the invention may assume.

Figure 1 is a vertical longitudinal section of a controller designed to operate in connection with an electric or other motor for operating an air compressor and showing the improved counterbalanced releasing device; Fig. 2 is a similar sectional view of a controller in which the body of the controller is cast integral with a compressor cylinder and provided with the improvement shown in Fig. 1; Fig. 3 is a cross section of Fig. 2, on the line 3—3, showing the integral structure of controller and a compressor and one of the fluid conduits leading from the compressor to the controller; Fig. 4 is a view in elevation of the actuating element showing in dotted lines the location of the fluid pressure channel and the communicating openings in the attached parts.

Referring to Fig. 1 of the drawings, in which the controller is shown for use with an electric motor, 1 is any suitable insulating base upon which is mounted a cylinder 2, supported upon standards 3. Extending from one end of cylinder 2 is a conduit 4 which connects with the compressed air reservoir, not shown. Within the cylinder is a vibratory member 5, in the form of a rod having at its end adjacent the reservoir an air-tight piston packing 6. The opposite end of the rod 5, projects out of the cylinder 2, through a screw-threaded closure 7, and bears any suitable device for controlling motive power as, for example, a device for making and breaking an electric circuit containing a motor operating an air compressor, not shown. The standard for such a make-and-break device is indicated at 8 with one of the leads 9. As the electrical device is no part of this invention, it will receive no further description. The protruding end of the rod 5 is preferably provided with a series of graduations 10 which indicate at any time the reservoir pressure. Intermediate the ends of the rod 5 is an enlarged portion 11 forming at one end an abutment for one end of the spring 12, which surrounds the reduced portion of rod 5 and is retained at its opposite end by the closure 7. Near the reservoir end of the rod 5 is a similar shoulder which limits the movement of the rod 5 in its travel to the left when it abuts against a corresponding ledge on the cylinder casing 2. The cylinder 2, intermediate its ends, is provided with a cross cylinder 2′, the ends of which project above and below the cylinder 2, the lower end being contracted so as to form a cylindrical passage 13, and a shoulder 14. The passage 13 is closed at its lower end as, for instance, by a screw plug 15 and communicates by a by-pass 16 with the conduit 4 leading to the pressure reservoir. The upper end of the cross-cylinder 2′ is closed by a screw-threaded closure 17. Located within cross-cylinder 2′ is a detent device which is mounted to vibrate transversely to the rod 5. This detent device is formed of a frame 19 preferably rectangular in shape to permit it to reciprocate freely without interfering with the rod 5. Extending from

the lower side of frame 19 is a hollow piston rod 20, having at its lower end a cup packing 21, and at its end near the frame 19 a packing ring 22. Extending lengthwise of rod 20 is a passage 23, opening through a slot 24 in the wall of the tubular rod 20. On the upper side of frame 19 is a guide rod 20′, provided with packing rings 22′, 22′, and a central passage 23′ opening into a slot 24′ through the wall of the hollow guide rod 20′. In the side walls of frame 19, shown in Figs. 3 and 4, is formed an interior channel or passage 25, which connects the passages 23, 23′, in the two rods 20, 20′, thereby forming a continuous passage from conduit 4, through conduit 16, piston rod 20, frame 19, to opening 24′ in guide rod 20′, thus permitting reservoir pressure to act only on the sides of rods 20, 20′ nearer the reservoir in opposition to the pressure exerted by spring 5. A spring 26, surrounds the guide rod 20′, between the end of screw plug 17 and the top of the rectangular frame 19 the tension of which is regulated by adjustment of screw-threaded plug 17. Pivotally supported on the interior of frame 19 are two spring-pressed pawls 27, 28, which engage notches 29 and 30, respectively, in the enlarged portion of rod 5, and are so positioned that when the frame 19 is in its lowermost position the pawl 27 will engage notch 29 when said notch passes under it, while the pawl 28 will engage notch 30 when the frame 19 is in its uppermost position and notch 30 passes over it. Guide stem 20′ is provided with a pressure-indicating scale 31, to indicate the pressure on the releasing device.

The operation of the controller as thus far described is as follows: The conduit 4 is connected to the reservoir directly or through the pressure side of the compressor pump and the tension of the spring 12 is regulated by means of the screw-threaded plug 7 to the desired tension, and the tension of spring 26, similarly regulated by means of screw-threaded plug 17, to the point where it will yield when the maximum pressure is exerted to raise piston rod 20, assuming the parts in the position shown in Fig. 1 and the pressure in the reservoir increasing. When the maximum pressure has been reached for which the springs 12 and 26 have been set, the compressed fluid in conduits 4 and 16 will exert a pressure on the bottom of piston 21, lifting frame 19 and withdrawing pawl 27 from engagement with notch 29 in stem 5, thereby permitting the fluid under pressure in conduit 4 to act on the end of rod 5 to compress the spring 12. When the reservoir pressure has forced the rod 5 to the right against the spring pressure of 12 to where the notch 30 is over spring pawl 28, the latter enters the notch and holds the rod in its extreme right hand or maximum pressure position. During this movement of the rod 5 to the right the end of rod 5 extending beyond screw plug 7 has, by reason of suitable connections with a switch or fluid pressure valve, cut off power to the pressure pump, thereby preventing accumulation of further pressure in the reservoir. At the moment of maximum pressure when the pressure pump stops action, the reservoir pressure and spring pressure being equal the effective pressure on the rods 20, 20′ is that due to the reservoir pressure alone acting laterally thereon through openings 24, 24′. When, however, by reason of fall of pressure in the reservoir the spring 12 begins to exert an increasing pressure on the rods 20, 20′ towards the left through the pawl 28 and frame 19, there will be a time when this spring pressure will just neutralize the reservoir pressure at 24, 24′ to the right, thereby relieving the said rods from side thrust in either direction and practically removing all friction of the rods on their bearings due to lateral fluid and spring pressures, whereby the spring 26 will be enabled to perform its work in retracting pawl 28 from its notch 30 without also having to overcome the friction of rods 20 and 20′ which heretofore have been held against their bearings by the pressure of spring 12, thereby preventing the detent device following in its action close upon the predetermined fall of reservoir pressure. It will be seen from the construction that as the reservoir pressure falls towards a certain limit the side thrust on the rods 20, 20′ decreases, preparing the detent frame for an easy release of rod 5, whereas heretofore as the pressure in the reservoir fell the detent device met increased resistance in its movement to disengage its pawl. When the reservoir pressure has lowered by reason of removal of air from the reservoir to its predetermined lower limit, the spring 26 overcomes the reservoir pressure on piston 21 without resistance of the rods 20, 20′ on their bearings, releasing the pawl 28 whereupon the spring 12 throws the rod 5 to its first position at the left and opens again the flow of current or motive fluid to the prime mover and starts the pump to raise the pressure in the reservoir.

In Figs. 2 and 3 are shown the walls of the controller formed integral with those of the compressor pump. In this construction the cylinder 2″ for receiving the vibratory member 5 is formed by boring out the casing from one end, leaving a solid end 36. At right angles to the direction of the passage in 2″ is a passage 35 bored in a similar manner leading into the interior of the pressure side of a pump cylinder 32, which is preferably of the rotary type provided with a piston-carrying drum 33. The cross cylinder 12′ is likewise bored out of the casting, the lower and contracted end being left integral at 37. Passage 15′ connects the interior of the pressure cylinder 32 with the lower part of the cross chamber 12′, containing the piston rod 20, whereby the pressure behind and within the detent-actuating device is kept the same as that behind rod 5. In other respects the construction and mode of operation of the controller is the same as that previously described. By reason of this integral construction of the controller and pump, greater compactness is secured which makes this type very desirable in use with air-brakes for street cars and materially cheapens the construction by doing away with separate standards for the controller and independent pipe connections to the pressure reservoir.

What is claimed is:

1. In a pneumatic pump controller, the combination of a vibratory member subjected to reservoir pressure, a spring opposing said pressure, a detent restraining said member against movement by said spring, a detent releasing device subject to reservoir pressure, said device provided with rods subjected to reservoir pressure opposing said spring pressure.

2. In a pump controller, a vibratory member subject to reservoir pressure, resilient means opposing said pressure, detent means for engaging said member, a detent-releasing member provided with an actuating piston subjected to said reservoir pressure and means for subjecting one

side of said piston to said reservoir pressure to oppose the pressure of said resilient means.

3. In a pump controller, a vibratory member subject to reservoir pressure, resilient means opposing said pressure, detent means for engaging said member, a detent-releasing member provided with an actuating piston and a guide rod, and means for subjecting one side of said piston and guide rod to said reservoir pressure opposing the pressure of said resilient means.

4. In a pump controller, a vibratory member subject to reservoir pressure, resilient means opposing said pressure, detent means restraining said resilient means, a detent-releasing member provided with a chambered actuating piston subject to reservoir pressure, and a chambered guide rod, said chambers communicating with each other and opening through one side of the piston and guide rod and communicating with said pressure reservoir.

5. In a pump controller, a vibratory member subject to reservoir pressure, resilient means opposing said pressure, detent means restraining said resilient means, a detent-releasing member provided with a chambered actuating piston subject to reservoir pressure and a chambered guide rod, said chambers communicating with each other through said releasing member and opening through one side of the piston and guide rod and communicating with said pressure reservoir.

6. In a pump controller, a detent-releasing member provided with an actuating piston and a guide rod, casings for receiving said piston and rod, packings on said piston and rod and means for subjecting one side of said piston and rod to fluid pressure intermediate said packings.

7. In a pump controller, a detent-releasing member provided with an actuating piston the latter having an interior chamber opening through the face of the piston and through the side of the same.

8. In a pump controller, a longitudinal casing, a cross cylinder integral therewith, said casing and cylinder having ends integral with their walls, and having openings near their ends for admitting fluid under pressure, a vibratory member in said casing subject to said fluid pressure, resilient means opposing said pressure, restraining and releasing means for said member controlled by said reservoir pressure and subject to reservoir pressure opposed to the spring pressure on said vibrating member.

9. In a pump controller, the combination of a casing having a longitudinal and cross passage therein open to reservoir pressure, a vibratory piston member in said first passage, a spring opposing the movement of said member against reservoir pressure, detents for retaining said member in its extreme positions, a detent releasing frame for the same provided with piston rods closely fitting in said cross-passages, said rods having interior passages open to reservoir pressure and provided with side openings on their reservoir side, and a spring opposing the movement of said frame.

10. In a fluid pressure controller, the combination of a power-controlling spring-pressed vibrating member, said member being subject to reservoir pressure, restraining and releasing means for said member controlled by said reservoir pressure and subject to reservoir pressure opposed to the spring pressure on said vibrating member.

11. In a pump controller, the combination of a power controlling spring-pressed vibratory member subject to reservoir pressure, a detent device for engaging said member, and means for operating the same, said device being subject to reservoir pressure opposed to the spring pressure on said vibratory member.

12. In a fluid pressure controller, the combination of a power controlling spring-pressed vibratory member, a detent supporting frame, guide members for the same, a piston subject to reservoir pressure for actuating the frame, and means for applying reservoir pressure to said guide members to oppose the spring pressure on said vibrating member.

13. In a pneumatic pump controller, the combination of a power controlling spring-pressed vibratory member subject to reservoir pressure, a retaining and releasing device for said member, said device being subject to reservoir pressure opposed to the spring pressure on said member.

14. In a pump controller, the combination of a power controlling spring-pressed member subject to reservoir pressure, a detent supporting frame in operative relation thereto and having a guide rod and an actuating piston subject to reservoir pressure, said piston, frame and guide rod being provided with a channel open at one end to the reservoir and its opposite end opening through the wall of said guide rod.

15. In a pump controller, the combination of a power controlling spring pressed member subject to reservoir pressure, a detent supporting frame in operative relation thereto and having guide rods one of said rods having a piston subject to reservoir pressure, said rods having lateral slots in communication with a source of fluid pressure and packing rings on each side of said slots.

16. In a pump controller, the combination of a power controlling spring-pressed vibratory member subject to reservoir pressure, a detent supporting frame in operative relation thereto and having guide rods one of which is provided with graduations and the other with a piston subject to reservoir pressure, and means for applying reservoir pressure at one side of said rods to oppose the spring pressure on said vibratory member.

17. In a pump controller, the combination of a casing having longitudinal and transverse intersecting channels, a vibratory spring-pressed member in said longitudinal channel subject to reservoir pressure, a spring-pressed detent supporting frame movable in said transverse channel in operative relation to said vibratory member, fluid pressure means for moving said frame against said spring pressure and means applying lateral fluid pressure to the same to oppose the spring pressure on said vibratory member.

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

LEBBEUS H. ROGERS.

Witnesses:
HIRAM D. ROGERS,
L. HARDING ROGERS, Jr.