

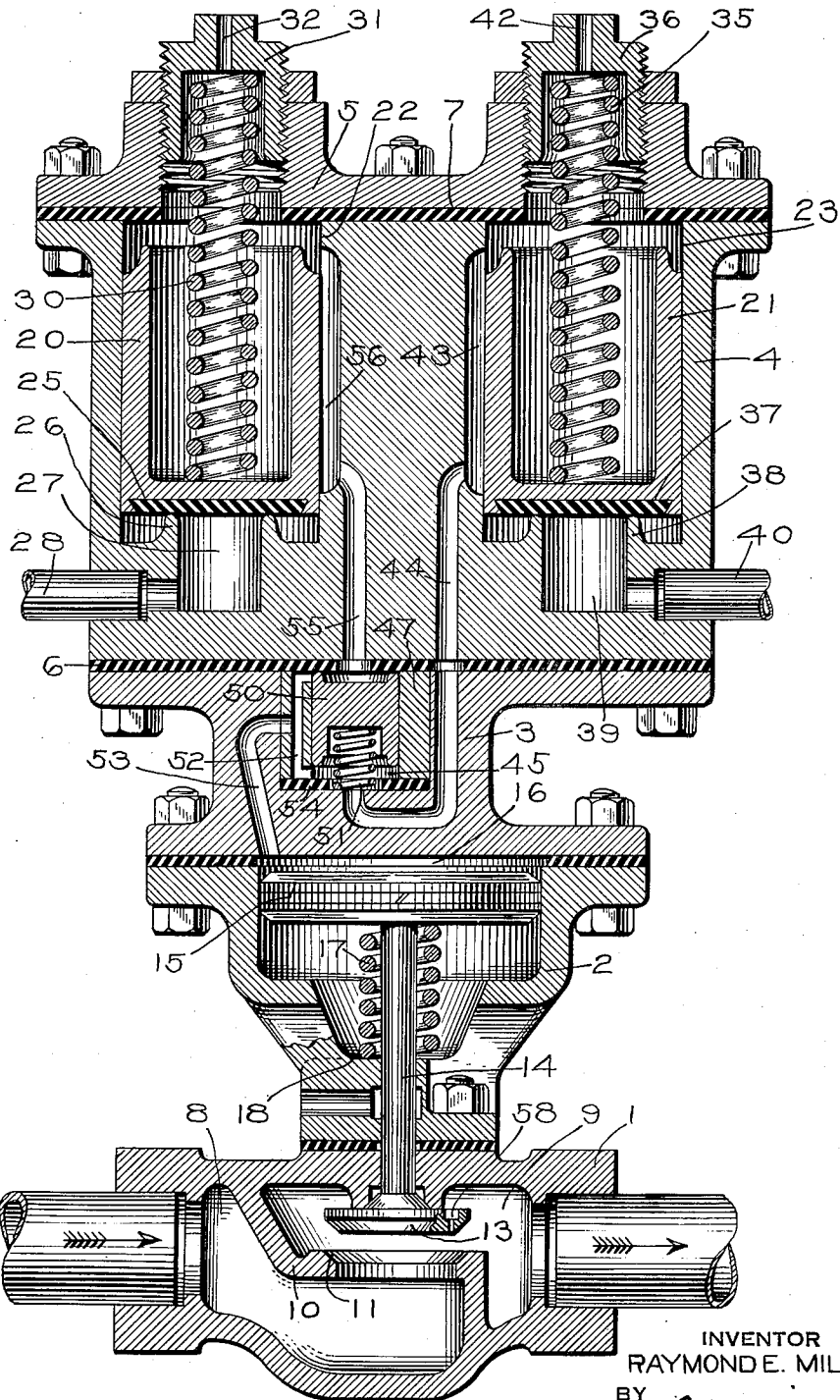
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COMPRESSOR GOVERNOR

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COMPRESSOR GOVERNOR

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This invention relates to compressor governor devices, and more particularly to a compressor governor of the class adapted to be carried on a locomotive for controlling the supply of steam to one or more air compressors in accordance with the demand for compressed air being supplied to an air brake system.

A well known type of compressor governor commonly employed in steam railway service comprises a fluid pressure operated steam valve mechanism for controlling the supply of steam to the usual compressors, a diaphragm operated low pressure valve adapted to control supply of fluid under pressure to the steam valve mechanism while the demand for compressed air for use in the air brake system is low, and a similar diaphragm actuated high pressure valve adapted to control the supply of fluid under pressure to the steam valve mechanism when the demand for compressed air is at a maximum. It will be understood that the first mentioned or low pressure valve is adapted to effect control of operation of the compressors in accordance with the pressure of air delivered thereby to the main reservoirs while the air brakes are in running or release condition, while the high pressure valve is adapted to perform the same function only after an application of the brakes has been effected, during which time it is desirable to maintain high air pressure in the main reservoir.

In order to insure an adequate supply of compressed air, a locomotive may be equipped with two steam driven compressors, both of which are adapted to be simultaneously controlled by a single compressor governor device of the above type, which is designed to permit supply of steam to the two compressors at a rate sufficient to effect simultaneous operation thereof at a speed promoting maximum efficiency. In this way the work required in maintaining the main reservoirs supplied with compressed air is shared equally by the compressors. In practice, however, it has been found that a compressor governor as above described may sometimes respond to slight variations in main reservoir pressure in such a manner as to throttle the supply of steam to the pair of compressors, with the result that one of the compressors may be operated for longer intervals or at a faster rate than the other, particularly when one of the compressors offers considerably greater resistance to operation than the associated machine. In such a case the compressor operated most frequently is subject to greater than normal

wear, and the usual advantages of a dual compressor equipment are largely lost.

The principal object of my invention is to provide a steam compressor governor device including low pressure and high pressure control valves adapted to control both supply and release of fluid under pressure to and from a steam cut-off valve piston, each of the valves being adapted for quick operation at one time from seated position to fully open position and for an equally rapid closing movement in releasing fluid from the piston at another time, so as to avoid possible balancing of the piston in an intermediate position and consequent throttling of the steam supply.

Another object of the invention is to provide an improved steam compressor governor including a steam valve actuating piston, a plurality of pressure controlled valves, each of which is responsive to a predetermined pressure of air in the receiving reservoir for rapidly supplying fluid under pressure to the piston, and means for automatically facilitating operation of the active valve while preventing interference therewith by the inactive valve.

These objects, as well as others, are attained by means of the apparatus hereinafter described in connection with the accompanying drawing, in which the single figure is a vertical sectional view of a steam governor device constructed in accordance with the invention.

As shown in the drawing, the casing structure of the compressor governor includes a steam valve body 1, a cylinder section 2, a casing section 3, a valve section 4, and a head or cover plate 5, which members are respectively secured together by suitable means such as bolts. For insuring leak tight joints, suitable gaskets may be interposed between the adjacent sealing faces of the various casing sections, such as a gasket 6 which is interposed between the casing section 3 and the valve section 4, and a gasket 7 similarly clamped between the section 4 and head 5.

The valve body 1 has formed therein a steam inlet chamber 8 and an outlet chamber 9 which are separated by an apertured baffle wall 10 having an annular valve seat 11. A steam valve 13 disposed in the chamber 9 is adapted to engage the valve seat 11, and is provided with a vertically disposed stem 14 which is slidably mounted in a suitable bore in the cylinder section 2 and is connected at the upper end thereof to a piston 15, the upper face of which is subject to the pressure of fluid in a chamber 55

16. A coil spring 17 is preferably interposed between the piston 15 and a shoulder 18 formed on the cylinder section 2 for urging the piston and associated steam valve 13 upwardly to open position as shown in the drawing.

According to the invention, the supply of fluid under pressure for operating the steam valve piston 15 may be controlled by one or the other of a pair of valve pistons 20 and 21, which are slidably mounted in vertically disposed bores 22 and 23, respectively, that are formed in the valve casing 4. Secured to the lower face of the piston valve 20 is a sealing element 25 which is adapted for engagement with an annular seat rib 26 formed in the valve casing 4. The diameter of the seat rib 26 is less than that of the valve piston 20, so that, with the valve piston in seated position as shown in the drawing, a relatively small area thereof is subjected to the pressure of fluid in a chamber 27 formed in the casing, which chamber is adapted to be connected with the main reservoir through the medium of a pipe 28 and the usual brake valve device, not shown, when the brake valve device is in running position. A coil spring 30 is interposed between the upper side of the valve piston 20 and an adjustable spring seat 31, which is screwed in a suitably threaded bore in the head 5 and is provided with a calibrated or restricted atmospheric exhaust passage 32.

Similarly, a coil spring 35 supported by an adjustably mounted spring seat 36 is adapted to act against the valve piston 21 for urging the sealing element 37 on the lower face thereof into engagement with an annular seat rib 38 of smaller diameter formed on the valve section 4, in opposition to the pressure of fluid acting on a small area thereof within a chamber 39. Fluid under pressure may be supplied to chamber 39 from the main reservoir through a pipe 40, which in standard brake systems is normally connected to the main reservoirs at all times. The portion of the bore 23 at the upper side of the valve piston 21 is open to the atmosphere by way of a calibrated discharge passage 42, and, with the valve piston in a seated position as shown in the drawing, this vented portion of the bore 23 also communicates through a groove 43 formed longitudinally in a wall of the bore, and by way of a passage 44, with a valve chamber 45 that is formed in a bushing 47 within the casing section 3.

The bushing 47 is vertically disposed within a suitable recess in the casing section 3 adjacent the gasket 6. Slidably mounted in the bushing 47 is a double check valve 50, which is normally urged upwardly into seating engagement with the gasket 6 by the force of a coil spring 51 for maintaining communication between the passage 44 and a port 52 formed in the bushing and communicating by way of a passage 53 with the piston chamber 16. A gasket 54 is interposed between the lower surface of the bushing 47 and the casing section 3 and provides a seat for the double check valve 50 when it is moved downwardly against the force of the spring 51 as hereinafter explained, in which lower position of the valve communication from the passage 44 to the port 52 is cut off while communication is established to the port from a passage 55 leading to a groove 56 formed in the wall of the bore 52 and controlled by operation of the valve piston 20.

It will be understood that the valve piston 20 is adapted to serve as a low pressure valve

controlled by the load of the coil spring 30 and operative to unseated position when main reservoir pressure in the chamber 27 exceeds a predetermined low value, with the associated air brake system in running condition, while the valve piston 21 is subject to the somewhat higher force exerted by the spring 35 for controlling supply of fluid from the chamber 39 only when main reservoir pressure exceeds a predetermined high value, while the brake system is being recharged following an application of the brakes.

In operation, the steam valve 13 is normally maintained unseated so as to permit free flow of steam by way of the chambers 8 and 9 in the valve body 1 to the usual compressors, which are thus operated to build up the pressure of air in the main reservoir. Assuming that the associated air brake system is in running condition, and that fluid at main reservoir pressure is thus supplied through the pipe 28 to the chamber 27, upon subsequent increase in such pressure beyond a predetermined low value, the valve piston 20 is forced slightly away from the seat rib 26, thereby permitting the fluid pressure to act upon the greater area of the face of the valve piston to move it quickly to its uppermost position, in which communication from the groove 56 to the atmospheric port 32 is cut off due to engagement of the upper end of the valve piston with the gasket 7, while fluid under pressure is supplied through the passage 55 to the upper face of the double check valve 50. The double check valve is thereby forced against the pressure of the spring 51 into seating engagement with the gasket 54, so that fluid under pressure continues to flow from the passage 55 through the port 52 and passage 53 to the piston chamber 16 at a fast rate for effecting quick downward movement of the valve piston 15 against the opposing force of the spring 17. The steam valve 13 is thus quickly forced into engagement with the seat 11 for cutting off flow of steam from the chamber 8 to the chamber 9 in the valve body, with the exception of a slow feed of steam by way of a restricted passage 58 formed in the valve to permit maintenance of the compressors in an operative condition.

With the valve piston 20 in its uppermost position, and with the entire surface thereof thus exposed to the pressure of fluid supplied from the main reservoir, it will be apparent that the compressors controlled by the governor device will remain inoperative until the main reservoir pressure within the chamber 27 reduces considerably below the predetermined value at which the valve piston was initially unseated. As the fluid pressure is thus reduced, the spring 30 becomes effective to force the valve piston 20 away from the gasket 7, whereupon fluid under pressure is quickly supplied by way of the groove 56 to the upper portion of the bore 22 at a rate faster than that of flow through passage 32, so that the opposing fluid pressures acting on the valve piston are equalized for permitting the full force of spring 30 to snap the valve piston into seating engagement with the rib 26. Communication from the chamber 27 to the passage 55 is thus quickly cut off, and since that passage is at the same time vented through the groove 56 and exhaust passage 32, the double check valve 50 is then returned to its upper seated position by the spring 51, as shown by the drawing. Fluid under pressure previously supplied to the chamber 16

is consequently vented to the atmosphere by way of the passage 53, chamber 45, passage 44, groove 43 and passage 42, so that the coil spring 17 is again enabled to force the piston 15 and associated steam valve 13 to their uppermost position, permitting operation of the compressors to be resumed with a free, unrestricted supply of steam.

When an application of the brakes is effected, pipe 28 is disconnected from the main reservoir at the brake valve, but pipe 40, which is in communication with the main reservoir at all times, continues to supply fluid at main reservoir pressure to chamber 39. Control of the steam valve is thus transferred from the low pressure valve 20 to the high pressure valve 21.

As a result of this transfer of control of the steam valve, the compressors will operate to supply air to the brake system until the value of pressure is sufficient to unseat valve 21, which will move upwardly with the same snap action as described for valve 20 until seated against gasket 7. Passage 44 will be then disconnected from the atmosphere and connected to chamber 39, so that air under pressure may now readily flow to piston chamber 16, via the lower end of double check valve 50, and thus cause positive seating of steam valve 13.

The double check valve 50 will be held in its upper position by the combined action of spring 51 and the high pressure of the air therebelow. This check valve acts therefore to permit full control of the steam valve by which ever of valves 20 and 21 it is desired to have the controlling function.

The high pressure valve 21 will of course function to keep the brake system charged to the higher pressure until the brake valve of the brake system is again moved to running position to return control to the valve 20.

It will thus be apparent that I have provided an improved compressor governor device of readily assembled and inexpensive construction, which is operative to ensure full opening and closing movement of the steam valve controlling the supply of steam to the compressors, so that possibility of undesired throttling of the supply and consequent inefficient operation of the compressors is avoided.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a compressor governor mechanism, in combination, a pressure operated steam valve, a low-pressure responsive valve, a high-pressure responsive valve, each of said valves having a seated position wherein a portion of the pressure area thereof is subject to the corresponding fluid pressure and an unseated position wherein the full area thereof is exposed to the pressure of fluid flowing to said fluid pressure operated steam valve, means for quickly equalizing the fluid pressures acting on opposite sides of each of said valves upon initial movement thereof from unseated position toward seated position, each valve being consequently operable with a snap action in both an opening and a closing direction, and a double check valve operable to open communica-

tion from one of said low and high pressure valves to said pressure operated steam valve while closing communication to the other.

2. A steam compressor governor of the type including fluid pressure operated steam valve means adapted to control operation of the fluid compressor to maintain a low reservoir pressure at one time and a high reservoir pressure at another time, comprising a casing with low and high pressure portions each having a valve chamber adapted to be charged with fluid at reservoir pressure and a spring chamber always communicating with the atmosphere through a restricted port, low and high pressure valve elements operatively interposed between the valve chambers and spring chambers of said casing portions, respectively, each of said valve elements when in seated position presenting a small area to the corresponding valve chamber, and when in unseated position having a large area exposed to said valve chamber while establishing communication therefrom to said fluid pressure operated steam valve means, spring means in each spring chamber for urging said valve elements toward seated position, and communications controlled by said valve elements adapted to effect sudden flow of fluid under pressure from either valve chamber to the adjacent spring chamber during traverse of the interposed valve element from unseated to seated position, whereby each valve element is operable with a snap or pop action in both opening and closing directions for avoiding throttling of the supply and release of the fluid under pressure to and from the steam valve means.

3. A steam compressor governor of the type including fluid pressure operated steam valve means adapted to control operation of the fluid compressor to maintain a low reservoir pressure at one time and a high reservoir pressure at another time, comprising a casing with low and high pressure portions each having a valve chamber adapted to be charged with fluid at reservoir pressure and a spring chamber always communicating with the atmosphere through a restricted port, low and high pressure valve elements operatively interposed between the valve chambers and spring chambers of said casing portions, respectively, each of said valve elements when in seated position presenting a small area to the corresponding valve chamber, and when in unseated position having a large area exposed to said valve chamber while establishing communication therefrom to said fluid pressure operated steam valve means, spring means in each spring chamber for urging said valve elements toward seated position, communications controlled by said valve elements and adapted to effect sudden flow of fluid under pressure from either valve chamber to the adjacent spring chamber during traverse of the interposed valve element from seated to unseated position for insuring quick non-throttling movement thereof, and check valve means operative by fluid under pressure supplied by either of said valve elements to said steam valve means to prevent escape of fluid by way of the inactive valve element.

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