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W. V. TURNER & D. M. LEWIS.

RETARDING VALVE MECHANISM FOR FLUID PRESSURE RAILWAY BRAKES.

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Fig. 1.

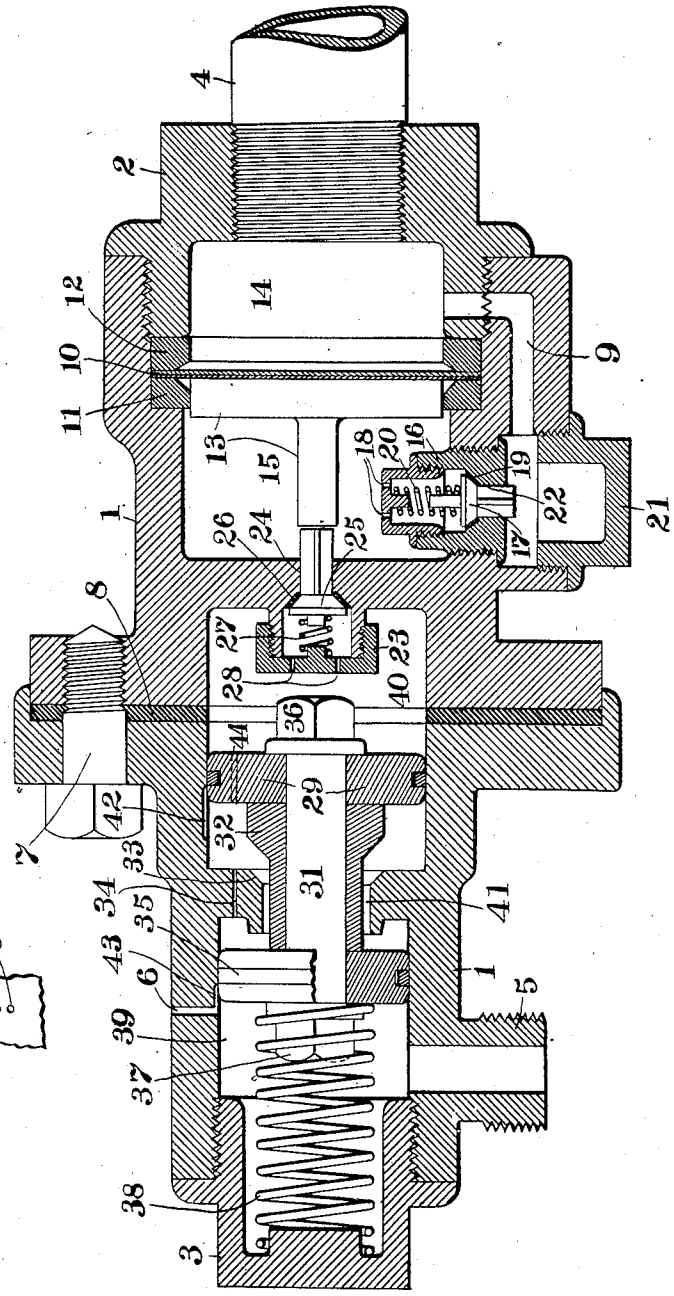
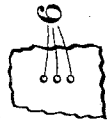


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

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RETARDING-VALVE MECHANISM FOR FLUID-PRESSURE RAILWAY-BRAKES.

No. 837,980. Specification of Letters Patent. Patented Dec. 11, 1906.

Application filed January 29, 1903. Renewed March 24, 1905. Serial No. 251,849.

To all whom it may concern:

Be it known that we, WALTER V. TURNER, residing at Topeka, Shawnee county, State of Kansas, and DAVID M. LEWIS, residing at Raton, Colfax county, Territory of New Mexico, citizens of the United States, have invented certain new and useful Improvements in Retarding-Valve Mechanism for Fluid-Pressure Railway-Brakes, of which the following is a specification.

Our invention relates to valve mechanism for retarding the release of brake-cylinder pressure in fluid-pressure railway-brake mechanism; and our object is to provide an improved retarding-valve mechanism for brake-cylinder release the action of which shall be controlled by and dependent upon the variations in pressure in the train-line from the head to the rear end of trains, so that when the fluid-pressure, such as air, is admitted to the train-pipe for releasing the brakes the release of brakes at and toward the head end will be retarded to such an extent as to permit all brakes on the train to release practically simultaneously, thereby avoiding the breaking in two of trains and other damage to cars and equipment resulting from the release of brake-cylinder pressure at the head end in advance of the rear end, especially in a long train of cars.

With the object stated in view our invention consists in the novel construction and details thereof, as hereinafter described with reference to the accompanying drawings and more particularly pointed out in the claims.

In the drawings, Figure 1 is a central longitudinal section of our improved retarding-valve structure, showing the parts in their normal position of rest when the brakes are applied or in release; and Fig. 2 is a fragmentary detail of the final exhaust or release port.

Referring to the drawings, in which the same reference characters refer to the same parts in both views, we preferably make the valve-body 1 in two parts for convenience of assembling, said parts being provided with flanges secured together by suitable bolts 7, with a gasket 8 interposed between the said flanges, thereby making an air-tight joint. A cap 2 closes the chamber 14 in one part of the valve-body, while a cap 3 closes the chamber 39 in the other part of the valve-body. A double diaphragm 10, of brass or other suitable flexible material, constituting a movable abutment, divides the right-hand chamber into two chambers 14 and 15, the former of which communicates with the train-pipe through the cap 2 by means of a pipe or conduit 4 and the latter of which constitutes an equalizing-chamber which is adapted to be placed in communication with the train-pipe chamber 14, through a conduit or passage 9, leading from said chamber 14 and communicating with a check-valve cage 16 through a port or passage 22, normally closed by a check-valve 17, seated against a rubber valve-seat 19 under the pressure of a spring 20, confined between the valve and the end of the cage. Ports 18 connect the valve-cage 16 with the equalizing-chamber 15, so that when the valve 17 is moved from its seat fluid-pressure can pass from the chamber 14 through the passage 9, port 22, cage 16, passages 18, into the said chamber 15. A removable cap 21 closes an opening in the wall of the valve-body structure opposite the check-valve, whereby ready access for insertion and removal of the cage 16 and its contained ports is afforded.

The diaphragm 10 is held in place by suitable rings 12, concaved or beveled on the adjacent edges of their inner peripheries to afford sufficient play for the movement of the diaphragm, such rings being held in place by the inner end of the nut 2 pressing them against a suitable shoulder in the valve-body.

A piston or abutment chamber 40 communicates with the equalizing-chamber 15 by way of a port 24, controlled by a check-valve 25, pressed against its rubber seat 26 by a spring 27, confined between the valve and the inner face of the cap 23, which covers the check-valve chamber, and in which cap are passages 28 for establishing communication between the check-valve chamber and the chamber 40. The tension on the spring 27 is sufficient to keep the check-valve 26 closed against a pressure of, say, eighty pounds in the chamber 15, even though there be only atmospheric pressure in the chamber 40. The stem of the check-valve 25 extends into the chamber 15, terminating a slight distance

from the diaphragm-piston 13, attached to the diaphragm, so that when the diaphragm is moved from its normal position toward the left the said piston will engage the stem of said check-valve and move the latter from its seat, thereby establishing communication between the chambers 15 and 40. In the chamber 40 is a piston or abutment 29, connected by a stem 31 to the piston-retarding valve 35, operating in the chamber 39, thus constituting a retarding-valve structure. The chamber 39 communicates with the chamber 40 through an enlarged port or passage 41, which passage is closed by a retaining-valve 32, preferably consisting of a sleeve having a valve-face thereon seating against a seat 33 when the piston 29 is in its extreme left-hand position, such closing movement of the valve 32 occurring immediately upon the admission of air to the train-pipe for release of the brakes. The chamber 39 is connected to the triple-valve exhaust, and hence to the brake-cylinder, through the passage or conduit 5 entering the said chamber on the left side of the piston-retarding valve 35. Passages 34 in the web or partition dividing the chambers 39 and 40 afford communication between the two when the piston-valve 35 is moved to blocking position, covering the final exhaust-port 6, which port is preferably in the form of a series of holes. A leak passage or groove 42 in the wall of the chamber 39 and a similar passage 43 in the wall of the chamber 40 or in the piston, as shown by dotted lines 44, allows the air-pressure to reduce rapidly from the chamber 40 to the atmosphere when the pressure has been confined in the latter, as hereinafter described, and when the valve 35 is in blocking position covering the final release-ports.

With the parts in the normal position shown, the brakes being applied, the check-valves 17 and 25 being closed, upon the admission of air-pressure to the train-pipe the heavy pressure, heaviest at the head end of the train, will enter the chamber 14 and force the abutment or diaphragm 10 to the left, bringing its post or piston 13 into engagement with the stem of and moving the check-valve 25, thereby opening communication between the chambers 15 and 40, while the same pressure will flow through the passage 9, lifting the check-valve 17 from its seat and entering the chamber 15, where it will then pass through the port 24, passages 28, into the chamber 40, and there act against the abutment or piston 29, forcing it to the left. This movement carries the retarding piston-valve 35 to a position covering the final release-ports 6, thereby blocking the same, and at the same time the retaining-valve 32 will be closed against its seat, so that the only communication between the chamber 40 and the chamber 39 is by way of the restricted pasage around or through the abutment or piston 29 and through the passage 34. When the pressure in the chamber 15 equalizes with that in the chamber 14, the valve 17 will be closed, thus preventing return of pressure to the train-pipe, and as the pressure in the train-pipe reduces the abutment or diaphragm 10 will resume its normal position, while reduction of pressure to a predetermined point from the chamber 15 to the chamber 40 will permit the spring 27 to seat the valve 25, thus cutting off further flow of pressure into the chamber 40. Pressure in the chamber 40 will now rapidly reduce to the atmosphere by way of the restricted passage around or through the piston or abutment 29, passage 34, and the final exhaust-port 6, thus permitting the spring 38 and brake-cylinder pressure to move the piston-retarding valve 35 to the right, uncovering the release or exhaust ports 6 and affording a free release for the brake-cylinder pressure through the triple-valve exhaust by way of the connection or conduit 5, such release having been retarded to the extent of time the ports 6 have been covered by the valve 35. Such retardation will, it will be observed, be proportionate to the variations in pressure from the head to the rear end of the train, being the least at the latter end, and as a result the release of brake-cylinder pressures will take place at the same time from all the brake-cylinders and not in succession from the head to the rear end, as has been commonly the practice in brakes heretofore in use.

It will be observed that the chamber 39, in which the retarding piston-valve operates to block and retard the release of the brake-cylinder pressure, is normally closed against the train-line and that the release-ports 6, normally open to the atmosphere when the brakes are either in release or applied are only opened to flow of pressure from the chamber 40 to the atmosphere during the time necessary to effect reduction of pressure confined in the chamber 40 by the closing of the valve 25 to the atmosphere in order to permit the spring 38 to move the retarding piston-valve 35 and uncover the final release port or ports 6. This time of retardation will be dependent upon and controlled by the pressure in the train-pipe at the particular location of the valve structure in the train-line, and consequently will vary with that pressure, thereby effecting a retardation of release of the brake-cylinder pressure in proportion to the variations of pressure in the train-pipe from the head to the rear end of the train.

Our improved construction of retarding-valve mechanism embodies the simplest arrangement and fewest number of parts, so grouped as to provide for the direct flow of pressure to the points desired in the quickest

time, thereby securing the result sought in the most effective manner, with minimum loss of fluid or air, and the several parts are so designed as to be readily applicable to the standard automatic brakes in common use. Moreover, the parts are readily accessible for removal and repair without necessitating the removal of the entire valve structure, for the check-valves, retarding piston-valve, and its operating-piston may, evidently, be removed and replaced without breaking the connection of that part of the valve-body communicating with the train-line.

It will be understood that the term "abutment" includes either a piston or diaphragm as equivalents and that where the connection between the opposite sides of the abutment or piston 10 is defined as "around the piston" it includes the use of the restricted passage in the wall of the chamber structure or the restricted passage through the abutment or piston as a means of establishing communication from one side to the other thereof.

We claim as our invention—

1. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of a retarding-valve chamber communicating with the triple-valve exhaust and provided with final release-port open to the atmosphere when the brakes are applied, a valve in said chamber normally uncovering said release-port, a chamber communicating with said retarding-valve chamber through an enlarged port and a restricted passage, an abutment in said chamber connected with the retarding-valve, a train-line pressure-chamber connected with the train-line and normally closed against the abutment-chamber, and means controlled by the train-line pressure for admitting air from the train-line through said train-line chamber to the abutment-chamber and adapted to cut off the said pressure when it reduces below a predetermined point, whereby the retarding-valve is moved by the abutment to cover the final release-port, and a restricted passage around the said abutment to the atmosphere, substantially as described.

2. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brakes, the combination of a retarding-valve chamber communicating with the triple-valve exhaust and provided with a final release-port normally open to the atmosphere when the brakes are applied or in release, a valve in said chamber normally uncovering said port, an abutment-chamber in communication with the retarding-valve chamber through enlarged and restricted passages, an abutment therein connected to the retarding-valve, connections between said chamber and the train-line normally closed against train-line pressure, and means controlled by the pressure in the train-line for admitting train-line pressure to the abutment-chamber to move the same, whereby pressure from the train-line moves the piston and its connected retarding-valve so that the latter may cover the final release-port and retard the release of brake-cylinder pressure, substantially as described.

3. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brakes, the combination of a retarding-valve chamber communicating with the triple-valve exhaust and provided with a final release-port normally open to the atmosphere when the brakes are applied or in release, a valve in said chamber normally uncovering said port, an abutment-chamber communicating with the retarding-valve chamber through enlarged and restricted passages, an abutment therein connected to the retarding-valve, connections between said chamber and the train-line normally closed against train-line pressure, means controlled by the pressure in the train-line for admitting train-line pressure to the abutment-chamber, whereby pressure from the train-line moves the abutment and its connected retarding-valve so that the latter may cover the final release-port and retard the release of brake-cylinder pressure, and a restricted passage around the abutment to the atmosphere, whereby pressure in the abutment-chamber may reduce and permit the abutment to return to its normal position, substantially as described.

4. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of a retarding-valve chamber communicating with the triple-valve exhaust provided with a final release-port open to the atmosphere when the brakes are applied or in release, a valve in said chamber normally uncovering said release-port, a chamber communicating with said retarding-valve chamber through an enlarged port and a restricted passage, an abutment in said chamber connected with the retarding-valve, a train-line-pressure chamber connected with the train-line and normally closed against the abutment-chamber, means controlled by the train-line pressure for admitting air from the train-line through said train-line chamber to the abutment-chamber and adapted to cut off the said pressure when it reduces below a predetermined point, whereby the retarding-valve is moved by the abutment to cover the final release-port, a restricted passage around the said abutment to the atmosphere, and a retaining-valve operated by the abutment to close the enlarged port between the abutment-chamber and the retarding-valve chamber when the abutment is moved by train-line pressure, substantially as described.

5. In a retarding-valve mechanism for

brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of retarding-valve chambers provided with passages or conduits communicating with the triple-valve exhausts and provided with final release-ports to the atmosphere, retarding-valves in said chambers normally uncovering said ports, abutment-chambers having enlarged ports and restricted passages communicating with the retarding-valve chambers, abutments in said chambers connected with the retarding-valves, and means controlled by the train-line pressure for admitting said train-line pressure to each of the abutment-chambers to move the abutments and for cutting the said pressure off from said chambers when the train-line pressure reduces to a predetermined point, varying from head to rear end according to the variations in the train-line pressure from the head to the rear end of the train, whereby the retarding-valves are moved to cover the final release-ports when pressure is admitted to the train-line, thereby retarding release of brakes from the head to the rear end, substantially as described.

6. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of retarding-valve chambers provided with passages or conduits communicating with the triple-valve exhausts and provided with final release-ports to the atmosphere, retarding-valves in said chambers normally uncovering said ports, abutment-chambers having enlarged ports and restricted passages communicating with the retarding-valve chambers, abutments in said chambers connected with the retarding-valves, means controlled by the train-line pressure for admitting said train-line pressure to the abutment-chambers to move the abutments and for cutting the said pressure off from said chambers when the train-line pressure reduces to a predetermined point, varying from head to rear end according to the variations in the train-line pressure from head to the rear end of the train, and restricted passages around the abutments to the atmosphere, whereby the retarding-valves are moved to cover the final release-ports when pressure is admitted to the train-line, thereby retarding the release of brakes from the head to the rear end, substantially as described.

7. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of retarding-valve chambers communicating with the triple-valve exhausts and provided with final release-ports, retarding piston-valves in said chambers normally uncovering said ports, piston-chambers having ports and restricted passages in communication with said retarding-valve chambers, pistons therein connected to the retarding piston-valves, restricted passages from one side of the pistons to the other, retaining-valves connected with the pistons adapted to cover the ports between the two chambers, chambers communicating with the train-line, and means controlled by the train-line pressure for admitting train-line pressure through said chambers to the corresponding piston-chambers, substantially as and for the purpose specified.

8. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of retarding-valve chambers communicating with the triple-valve exhausts and provided with final release-ports, retarding piston-valves in said chambers normally uncovering said ports, piston-chambers having ports and restricted passages in communication with said retarding-valve chambers, pistons therein connected to the retarding piston-valves, restricted passages from one side of the pistons to the other, retaining-valves connected with the pistons adapted to cover the ports between the two chambers, chambers communicating with the train-line, ports connecting said chambers with the corresponding piston-chambers, check-valves normally closing said ports, and means controlled by the train-line pressure for opening said check-valves, substantially as described.

9. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of retarding-valve chambers communicating with the triple-valve exhausts and provided with final release-ports, retarding piston-valves in said chambers normally uncovering said ports, piston-chambers having ports and restricted passages in communication with said retarding-valve chambers, pistons therein connected to the retarding piston-valves, restricted passages from one side of the pistons to the other, retaining-valves connected with the pistons adapted to cover the ports between the two chambers, chambers communicating with the train-line, ports connecting said chambers with the corresponding piston-chambers, check-valves normally closing said ports, diaphragms dividing said train-line chambers into receiving and equalizing chambers, valve-controlled passages connecting the receiving and equalizing chambers, and connections between the diaphragms and the check-valves for positively opening the latter as the diaphragms are moved by the train-line pressure, substantially as described.

10. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of retarding-valve chambers communicating with the triple-valve exhausts and provided with final release-ports, retarding piston-valves in said chambers normally uncovering said ports, piston-chambers having ports and restricted passages in communication with

said retarding-valve chambers, pistons therein connected to the retarding piston-valves, restricted passages from one side of the pistons to the other, retaining-valves connected with the pistons adapted to cover the ports between the two chambers, chambers communicating with the train-line, ports connecting said chambers with the corresponding piston-chambers, check-valves normally closing said ports, diaphragms dividing said train-line chambers into receiving and equalizing chambers, valve-controlled passages connecting the receiving and equalizing chambers, and posts carried by the diaphragms adapted to engage the check-valves to positively open the same, substantially as described.

11. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brake mechanism, the combination of retarding-valve chambers communicating with the triple-valve exhausts and provided with final release-ports, retarding piston-valves in said chambers normally uncovering said ports, piston-chambers having ports and restricted passages in communication with said retarding-valve chambers, pistons therein connected to the retarding piston-valves, restricted passages around said pistons to the atmosphere, retaining-valves connected to the pistons adapted to close the ports when the retarding-valves are moved by the pistons to block the final release-ports, train-line-pressure chambers, diaphragms dividing said chambers into equalizing and train-line-pressure-receiving chambers communicating with the train-line, ports connecting the equalizing-chambers with the piston-chambers, check-valves normally closing said ports, passages connecting the receiving-chambers with the equalizing-chambers, check-valves normally closing said passages adapted to be opened by train-line pressure, and posts on the diaphragms adapted to positively open the check-valves between the equalizing and piston chambers when train-line pressure is admitted to the receiving-chambers, substantially as described.

12. A retarding-valve structure for retarding the release from brake-cylinders of automatic fluid-pressure railway-brake mechanism comprising a valve-body, a retarding-valve chamber therein provided with a connection for the triple-valve exhaust, and having a final release-port, a valve in said chambers adapted to close said final release-port, a piston-chamber communicating with said retarding-valve chamber, a piston therein rigidly connected to the retarding-valve, a spring normally acting against the valve structure to uncover the release-port, a port and restricted passage connecting these two chambers, a retaining-valve connected to the valve structure for closing the port, a train-line-pressure chamber adapted to communicate with the train-line, a diaphragm-piston dividing said chamber into equalizing and receiving chambers, a conduit connecting the receiving and equalizing chambers on opposite sides of the diaphragm, a check-valve normally closing said conduit and adapted to be opened by train-line pressure, a port connecting the equalizing and piston chambers, and a check-valve normally closing the same and adapted to be positively opened by the diaphragm-piston, substantially as described.

13. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brakes, the combination of a retarding-valve chamber normally closed against train-line pressure, a final release-port therein normally open, a conduit connecting said chamber with the triple-valve exhaust, a retarding-valve structure in said chamber, a chamber open to train-line pressure, a movable abutment in said chamber, means controlled by the train-line pressure for causing train-line pressure to act upon the retarding-valve structure when the abutment is moved by said pressure and thereby close the final release-ports, and means for reducing the pressure upon the said valve structure to permit it to return to normal position.

14. In a retarding-valve mechanism for brake-cylinders of automatic fluid-pressure railway-brakes, the combination of a retarding-valve chamber connected to the triple-valve exhaust normally closed against train-line pressure and having a release-port normally open, of a chamber, a movable abutment therein open on one side to the train-line pressure and normally closed on the other side against said pressure, means for permitting train-line pressure to pass to the latter side as the abutment is moved by said pressure, and means operated by the abutment as it moves for admitting said train-line pressure to the retarding-valve structure, whereby the latter is caused to cover the release-port, and means for reducing said pressure and causing the said valve structure to resume its normal position, substantially as described.

15. In a retarding-valve mechanism for fluid-pressure railway-brakes, the combination with the triple-valve exhaust, of a retarding-valve structure normally uncovering said exhaust when the brakes are applied or in release, a movable abutment exposed to train-line pressure on one side and normally closed against said pressure and against the retarding-valve structure on the other side, conduits connecting said latter side with the train-line and the retarding-valve structure, and valves normally closing said conduits and opened upon the admission of pressure to the train-pipe for releasing the brakes to admit said pressure to the retarding-valve structure and closing when pressure on both sides of the abutment is equalized, and means for restoring the re-

tarding-valve structure to its normal position, whereby release from the brake-cylinder is retarded, substantially as described.

16. In a fluid-pressure brake, the combination with a train-pipe and triple valve, of a valve for controlling the outlet through the triple-valve exhaust-port, a piston for operating said valve, and a regulating-valve and movable abutment operated by the train-pipe pressure for varying the pressure on one side of said piston.

17. In a fluid-pressure brake, the combination with a train-pipe and triple valve, of a valve for controlling the outlet through the triple-valve exhaust-port, a piston for operating said valve, a regulating-valve for controlling the supply of air to one side of said piston, and a movable abutment subject to train-pipe pressure for operating said regulating-valve.

18. In a fluid-pressure brake, the combination with a train-pipe and triple valve, of a valve for controlling the outlet through the triple-valve exhaust-port, a piston for operating said valve, a regulating-valve for controlling the supply of air to one side of said piston, a restricted vent-passage leading from the piston-chamber, and a diaphragm subject to the opposing pressures of the train-pipe and a fluid-pressure chamber for operating said regulating-valve.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WALTER V. TURNER.
DAVID M. LEWIS.

Witnesses to W. V. Turner's signature:
P. H. DONNAN,
CHAS. E. GAYER.

Witnesses to D. M. Lewis' signature:
C. E. STICKLEY,
L. A. BARLEY.