No. 801,363. PATENTED OCT. 10, 1905.

F. B. COREY.

MOTORMAN'S VALVE.

APPLICATION FILED APR 27. 1903.

Fig. 1.

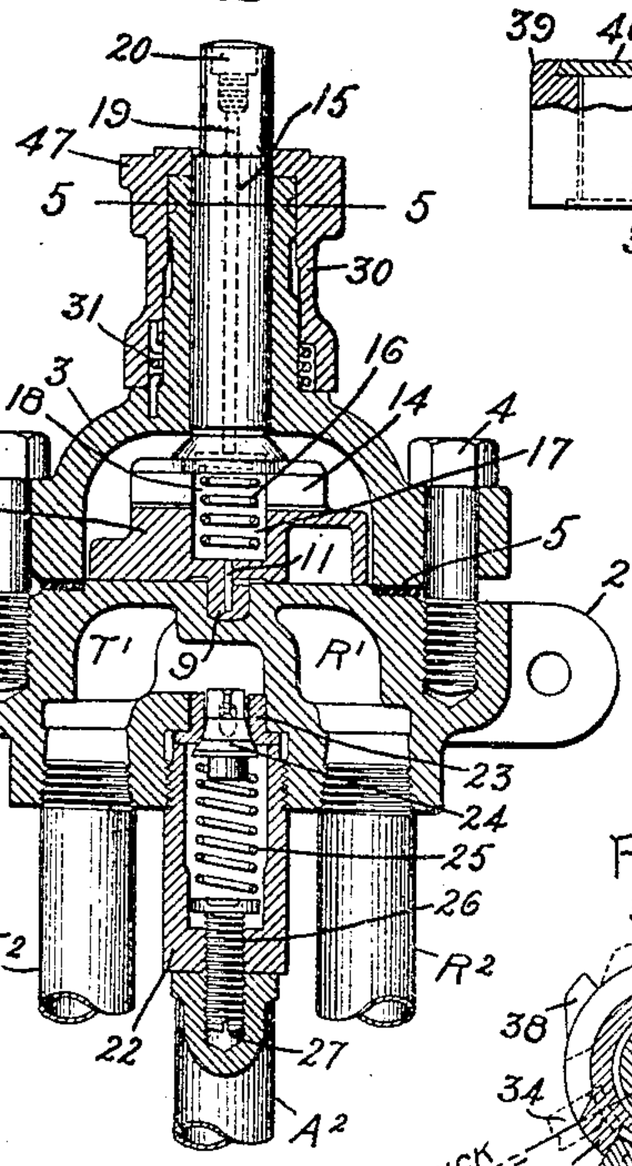

Fig. 2.

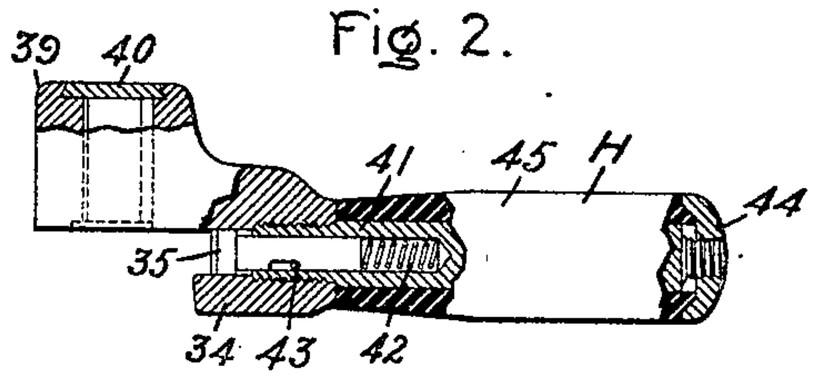

Fig. 3.

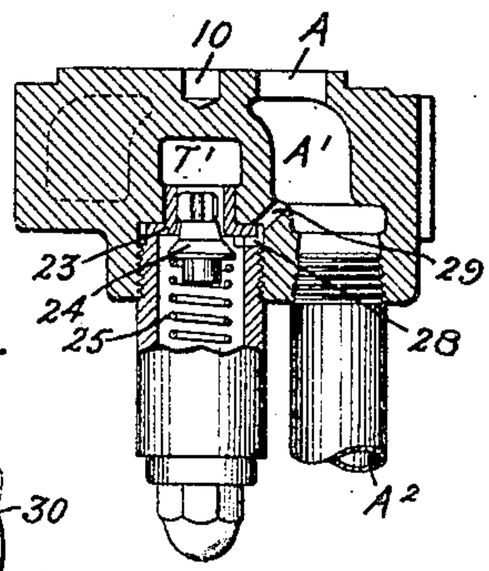

Fig. 4.

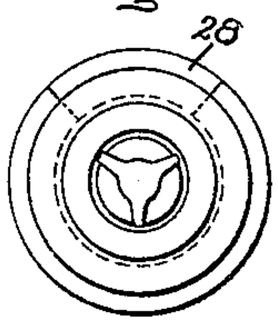

Fig. 5.

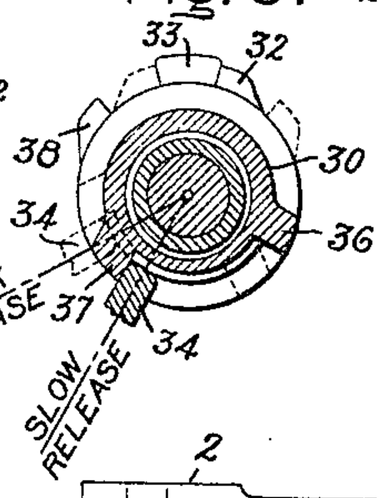

Fig. 6.

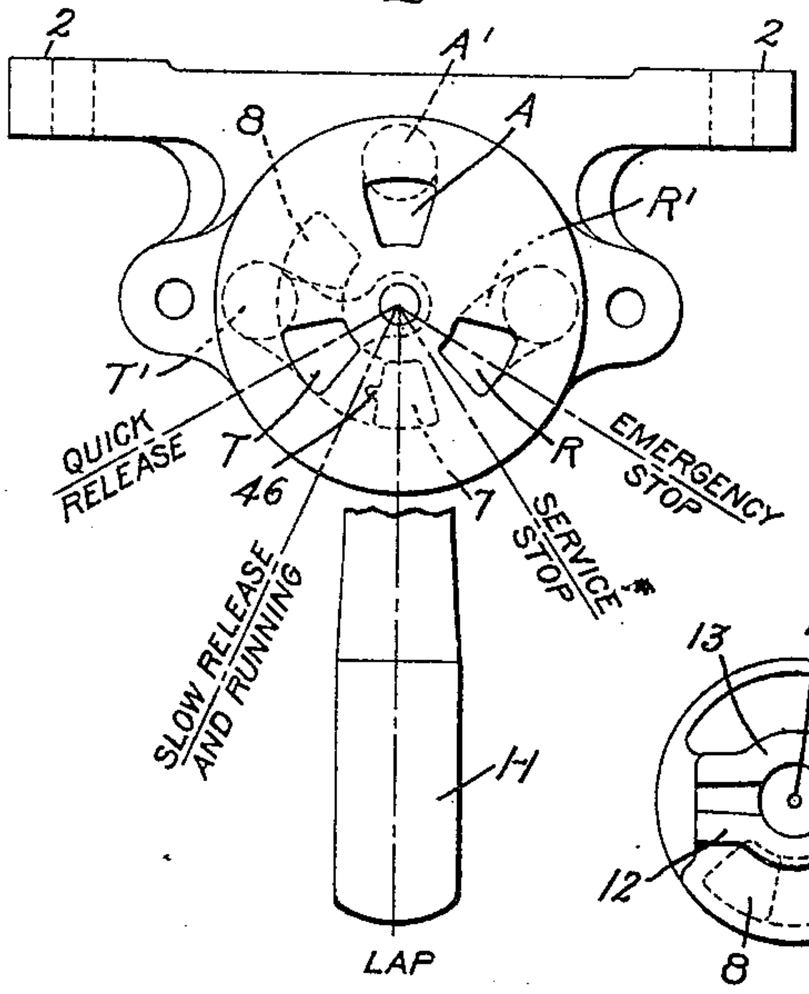

Fig. 7.

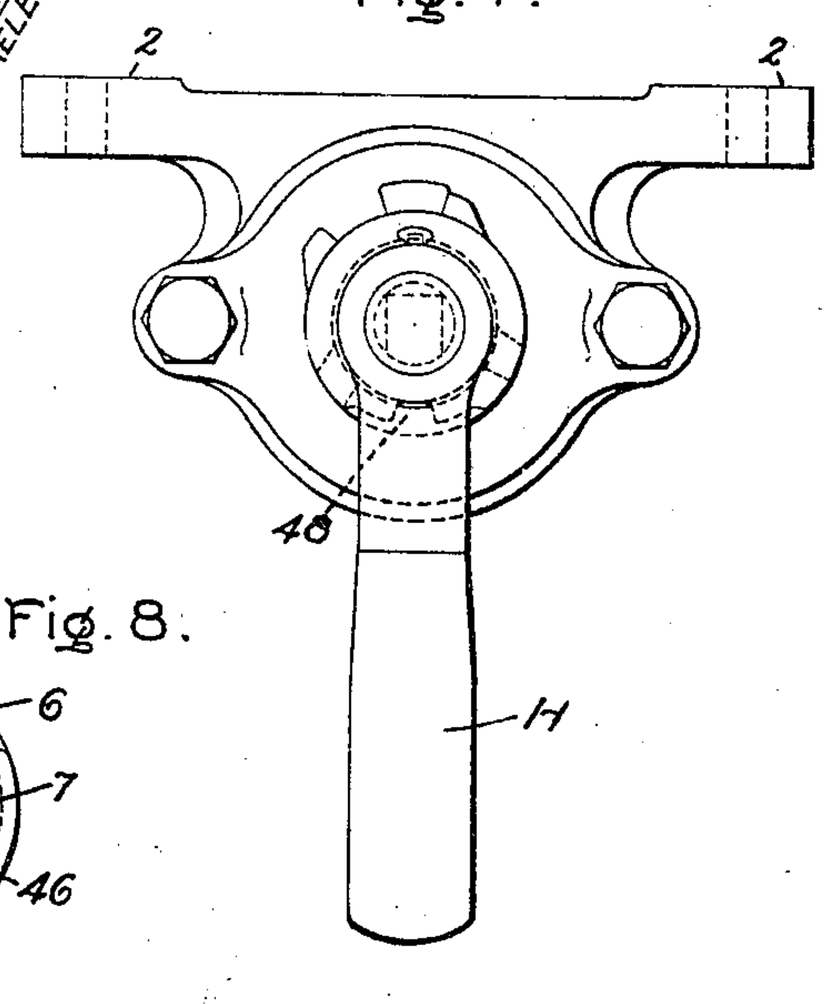

Fig. 8.

Witnesses:

George H. Tilden

Benjamin B. Hull

Inventor:

Fred B. Corey.

by Allen S. Dawes

Att'y.

UNITED STATES PATENT OFFICE.

FRED B. COREY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MOTORMAN'S VALVE.

No. 801,363. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed April 27, 1903. Serial No. 154,430.

To all whom it may concern:

Be it known that I, FRED B. COREY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Motormen's Valves, of which the following is a specification.

My invention relates to improvements in valves employed by engineers and motormen for controlling the application and release of brakes in so-called "straight-air" systems—that is, systems in which the brakes are applied by increasing the pressure of the air in the train-pipe which leads directly to the brake-cylinder in contradistinction to "automatic" systems in which the brakes are applied by reducing said pressure.

It is a well-known fact, first demonstrated by Captain Douglas Galton and recorded in the *Proceedings of the British Institution of Mechanical Engineers*, under dates of June 13, 1878, October 24, 1878, and April 24, 1879, that the coefficient of friction is a function of the speed and that when a train is moving at a high rate of speed more pressure may be brought to bear upon the brake-shoes without causing the wheels to skid than when the train is moving at a low speed. Therefore if air is admitted into the train-pipe at a high pressure while the train is running at full speed and the pressure is gradually reduced as the speed decreases, so that the wheels of the train may be maintained throughout the entire time of making a stop just on the point of skidding, a maximum braking effect will be obtained.

One object of my invention is to produce a valve for use in straight-air systems by which this maximum braking effect is produced, and this, generally stated, is accomplished by providing in the ordinary engineer's straight-air valve means so related to the train-pipe connections and so adjusted that it will open said train-pipe through a contracted passage to atmosphere when the pressure in such train-pipe rises above a predetermined point, thereby allowing said train-pipe pressure, and consequently the brake-shoe pressure, to decrease as the speed of the train decreases.

In air-brake systems it is a common practice to provide some means other than the engineer's or motorman's valve by which the brakes may be applied in case of emergency; but such means are ineffective when the motorman's valve is left in "quick-release" position, which is the position in straight-air systems in which train-pipe is connected directly to atmosphere through a wide opening.

Another object of my invention is to provide a novel means for avoiding this contingency by which when the valve is moved by the hand to the quick-release position and the hand is removed the valve will automatically move from said position to another which will not render the operation of the emergency means ineffective.

Other objects and advantages will appear from the following detailed description, taken in connection with the accompanying drawings, in which—

Figure 1 is a sectional view of a valve embodying the various features of my invention. Fig. 2 is a partial sectional view of the valve-handle. Fig. 3 is a partial section of the valve-body and the relief-valve, taken on a plane at right angles to that of Fig. 1. Fig. 4 is a top view of the relief-valve, drawn to an enlarged scale. Fig. 5 is a section of a portion of the valve-bonnet and the head fitting thereover, taken on the line 5 5 of Fig. 1. Fig. 6 is a top view of the valve-body and represents diagrammatically the position of the valve-ports for the lap position and the various operative positions of the handle. Fig. 7 is a top view of the complete valve, and Fig. 8 is a similar view of the main valve.

In the drawings, in which like characters refer to like parts, 1 designates the valve-body, which is provided with suitable apertured lugs 2, by which it may be secured to any suitable support.

3 designates the valve-bonnet, which is secured to the body 1 by bolts 4 4, and 5 designates a gasket interposed between the bonnet 3 and the body 1.

The main reservoir, train-pipe, and atmosphere connections R^2 T^2 A^2 communicate through corresponding passages R' T' A' with the ports R T A in the valve-body 1. The upper surface of the valve-body 1 forms a seat for the rotary valve 6, which is adapted through suitably-connected ports 7 and 8 (shown in dotted lines, Figs. 6 and 8) to connect the train-pipe either to main reservoir or atmosphere. The lower part of this rotary valve 6 is provided with a central projection 9, engaging in a central socket 10 in the valve-seat, and a suitable oil-passage 11

enables the parts to be properly lubricated. The upper surface of this rotary valve 6 is provided with lugs 12 13, between which the lug 14 on the lower end of the valve-stem 15 is adapted to rest when the parts are in position. A spring 16, extending into sockets 17 and 18 in the rotary valve 6, and the stem 15, respectively, insures a satisfactory engagement of the valve 6 with its seat. The valve-stem 15 is provided with an oil-hole 19, having a suitable screw-cap 20, through which oil may pass to the socket 17 and the oil-hole 11, and the upper end of the stem 15 is suitably shaped for the reception of the handle H.

Screwed into the lower side of the valve-body 1 is a casing 22, the interior of which communicates with the passage T′ in the valve-body. In the upper end of this casing is a valve-seat 23, against which a valve 24 is normally pressed by a spring 25. An adjusting-screw 26, provided with a nut 27, enables the tension of the spring 25 to be adjusted. The interior of the casing 22 is in constant communication with the atmospheric passage A′ through an opening 28 in said casing and an opening 29 in the valve-body 1. The upper end of the valve 24 is longitudinally grooved, as clearly indicated in Fig. 4, so that when the valve is forced downward against the pressure of the spring 25 communication may be readily had between the passages T′ and A′ through the openings 28 and 29.

Mounted upon the upper end of the valve-bonnet 3 is a head 30, which fits about a portion of the upper end of said bonnet and through the agency of a spring 31, one end of which is fixed to the head and the other of which is fixed to the bonnet, is normally held in the position illustrated by full lines in Fig. 5, in which position a stop 32 on the head engages a stop 33 on the bonnet 3. When the handle H is in position on the valve-stem 15, a projection 34 just below the pawl 35 on the handle lies in the same horizontal plane as the projections 36 and 37 on the head 30 and is adapted, therefore, to engage said projections when moved to certain operative positions. In Fig. 5 the dotted-line position of the parts illustrates how the projection 34 on the handle by engaging the projection 37 on the head will rotate said head against the tension of the spring 31 until the stop 38 engages with the stop 33. As these stops are arranged the projection 34 on the handle H does not engage the stop 37 on the head 30 until the handle in moving toward the left has moved the valve 6 to the "slow-release and running" position, so that the head 30 is not moved by the movement of the handle between any of the operative positions to the right of the slow-release and running position; but when it is attempted to move the handle to the left of this position the resistance of the spring 31 is encountered, and should the hand of the motorman be removed from the handle while it is at any point between the slow-release and running and the quick-release positions or at the quick-release position it would immediately be returned by the action of the spring 31 and head 30 to the slow-release and running position.

The handle H is provided with a head 39, apertured so as to closely fit the upper end of the valve-stem 15 and having a cap 40 to close said opening and cover said stem when the handle is in position. Screwed into the head 39 is a stem 41, in which is located a spring 42, employed to hold the pawl 35 in its outward position against the stop 43. A cap-nut 44 is applied to the other end of the stem 41, and thereby secures in place a sleeve 45. The pawl 35 is adapted to engage a notched flange 47 at the upper end of the head 30 and to determine the various operative positions of the main valve by engagement with the shoulders on said flange. The projection 34 on the handle H passing under the flange 47 retains the handle in place on the valve-stem 15 and prevents its removal, except when the projection is brought opposite the notch 48 in said flange and the main valve is in the lap position, which is that illustrated in Figs. 6 and 7. In the lap position none of the ports in the valve 6 communicate with the ports in the valve-seat, so that for this position the main reservoir and train-pipe are completely cut off.

In the operation of the valve after the handle H has been put in place on the valve-stem 15, which is done while the valve 6 is in the lap position, if it is desired to start the car or train the handle H is moved to the slow-release and running position, thereby connecting train-pipe to atmosphere through a contracted passage formed by the extension 46 of the valve-port 7 and a small portion of the valve-port 8, overlapping the seat-ports T and A, respectively, and thereby slowly exhausting the train-pipe if it still contains any air above atmospheric pressure, so as to fully release the brakes. The handle is then retained in this position while the car or train is running and until it is desired to make a stop. In making the usual or "service stop" the handle H is moved from the slow-release and running position to the service-stop position and held there only a short time, after which it is returned to the lap position. The movement to the service-stop position causes the valve-ports 7 and 8 to overlap portions of the seat-ports R and T, thus connecting the main reservoir to train-pipe through a contracted passage and applying the brake. The extent of the braking action depends upon the length of time this connection is maintained, and this in turn depends upon the judgment of the motorman in making the application. If a single movement to service-stop position and return to lap produces an insufficient application of the brakes, the movement may be repeated as many times as nec-

essary. Each time the handle H is moved to the service-stop position air at reservoir-pressure, which here will be assumed to be one hundred pounds to the square inch, rushes into the train-pipe and increases the air-pressure in said pipe to a point depending upon the length of time the handle is held in the service-stop position. If this time is sufficiently long, the train-pipe pressure will increase to that of main reservoir—viz., one hundred pounds—and if of less duration there will be a correspondingly smaller resulting pressure. If this resulting pressure be above that for which the relief-valve 24 is set—say sixty pounds per square inch—said valve will be opened and the train-pipe pressure gradually reduced, through the agency of the exhaust-openings 28, 29, and A′, to a point which will permit the valve 24 to close. The maximum and minimum pressure limits here assumed as one hundred pounds and sixty pounds, respectively, may of course be varied to suit the conditions of any given case. The maximum train-pipe pressure will ordinarily be such that it will produce a maximum braking effect without skidding the wheels when the speed of the train or car is a maximum, and the minimum pressure will be such as to produce a maximum braking effect without causing the wheels to skid when the speed becomes zero. Under these conditions, assuming that the car or train is moving at a maximum speed and it is desired to make a quick service stop, the handle H will be thrown over from the slow release and running position to the service-stop position and held there until the train-pipe pressure has increased to a maximum and then to be returned to lap position. As soon as the train-pipe pressure reaches a maximum a maximum brake-shoe pressure is applied, and this with the low coefficient of friction which exists at maximum speed causes a definite braking effect which, due to the proportion of the various parts, is the greatest that may be applied without causing the wheels to skid. As the speed of the train decreases, and consequently the coefficient of friction increases, the train-pipe pressure, and consequently the brake-shoe pressure, through the action of the relief-valve, correspondingly decrease, so that the braking effect is still the highest permissible—viz., such as to keep the wheels on the point of skidding—and this maximum braking effect is obtained at every instant of the time consumed in making the stop. If for any reason the train or car must be stopped suddenly, the handle H is moved to the extreme right to the position designated "Emergency-stop," at which position the valve-ports 7 and 8 register exactly with the ports R and T, respectively, thus connecting train-pipe with main reservoir through a large opening and enabling the train-pipe pressure to be increased suddenly to that of main reservoir, thereby producing an immediate maximum application of the brakes. When it is desired to release the brakes, the handle H may be removed to either slow release and running or to quick-release position. When moved to the former position, as above indicated, the extension 46 of the port 7 overlaps the port T and connection through a contracted passage is made from train-pipe to atmosphere. This allows the train-pipe pressure to gradually fall to that of atmosphere, and thereby gradually release the brakes. When the handle is moved to the quick-release position, the ports 7 and 8 register with the ports T and A, respectively, thus connecting train-pipe to atmosphere through a large opening and allowing the train-pipe pressure to be decreased suddenly to that of atmosphere.

The purpose of the contracted passage between train-pipe and atmosphere of the slow release and running position in addition to the wide passage of the quick-release position is to enable this valve to be used with an emergency device such as is commonly employed for applying the brakes. Since it is necessary to keep the train-pipe pressure at that of atmosphere while running, and since the brakes in a straight-air system can only be applied by admitting air under pressure to the train-pipe, it is clear that the emergency device would be ineffective if the motorman's valve were maintained in the quick-release position, because of the wide opening between train-pipe and atmosphere in this position. On the other hand, the contracted passage of the slow release and running position will maintain the train-pipe at atmospheric pressure while running and also permit a sufficient increase of train-pipe pressure to apply the brakes when the emergency device is operated.

The purpose of the yieldingly-mounted head 30 and its coöperating stops previously described is to return the valve 6 from quick-release position to slow release and running position in case of injury to the motorman or carelessness on his part in leaving said valve in the quick-release position, so that unless wilfully held in the quick-release position the valve will not prevent an effectual operation of the emergency device to apply the brakes.

Although I have shown and described the features of my invention in connection with a valve for use in straight-air systems, it is clear that the mechanism which I have disclosed for returning the valve automatically to a given position when it has been moved manually beyond that position is equally applicable to automatic air systems in the same manner as the construction disclosed in the patent to Howe and Gärtner, No. 321,971, July 14, 1885, and, further, I do not wish to be limited to the specific construction herein disclosed, but aim to cover in the appended claims all modifications and alterations which

may fall within the spirit and scope of my invention.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a "straight-air" brake system, a main valve constructed and arranged to connect the passage leading to the brake-cylinder to main reservoir to apply the brakes and to atmosphere to release the brakes, and a relief-valve connected to said passage and adapted to reduce gradually the pressure in said passage to a predetermined point to relieve the pressure on the brakes when the pressure in said passage is raised beyond said point by the operation of said main valve.

2. In a "straight-air" brake system, a main valve constructed and arranged to connect the passage leading to the brake-cylinder to main reservoir to apply the brakes and to atmosphere to release the brakes, and a relief-valve connected to said passage and adapted to reduce gradually the pressure in said passage to a predetermined point to reduce the brake-pressure by an amount sufficient to prevent skidding as the speed of the car is reduced.

3. In a controlling-valve for air-brake systems, the combination of a main valve constructed and arranged to connect train-pipe to main reservoir through wide and restricted passages for different positions of said valve and to atmosphere through wide and restricted passages for other positions of said valve, and a relief-valve associated with the train-pipe passage and adapted to connect said passage to atmosphere through a small port to gradually reduce the train-pipe pressure to a predetermined point when said pressure is raised beyond said point by the operation of said valve.

4. In a controlling-valve for air-brake systems, the combination of a main valve constructed and arranged to connect train-pipe to main reservoir through wide and restricted passages for different positions of said valve and to atmosphere through wide and restricted passages for other positions of said valve, a spring-pressed valve normally closing the train-pipe passage to atmosphere and adapted to open said passage to atmosphere through a small port when the pressure in said passage rises above a certain predetermined point.

5. In a controlling-valve for air-brake systems, the combination with the valve-bonnet, of a rotary valve-stem, a relatively rotatable head surrounding said stem, a spring connection between the rotatable head and the bonnet of the valve, and means whereby the rotation of the valve-stem beyond a certain point will cause the said head to be rotated with the valve-stem.

6. In a controlling-valve for air-brake systems, the combination with the valve-bonnet, of a rotary valve-stem, an operating-handle therefor, a relatively rotatable head surrounding said stem, a spring connection between said head and the bonnet of the valve, and a projection on the head adapted to be engaged by the operating-handle when the valve is moved beyond its running position in a direction to release the brakes.

7. In a "straight-air" brake system, a main-valve casing comprising a valve-seat therein, passages in said casing below the valve-seat leading to the brake-cylinder, to the main reservoir, and to the atmosphere, respectively, and a relief-valve inserted in said casing below said valve-seat and connected to the brake-cylinder passage.

8. In a "straight-air" brake system, a main-valve casing comprising a valve-seat therein, passages in said casing below the valve-seat leading to the brake-cylinder, to the main reservoir, and to the atmosphere, respectively, and a relief-valve inserted in said casing below the valve-seat and connected through said casing with the brake-cylinder passage, the relief-valve chamber being connected by a small passage through said casing with the atmosphere-passage.

In witness whereof I have hereunto set my hand this 24th day of April, 1903.

FRED B. COREY.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.