

No. 841,470.

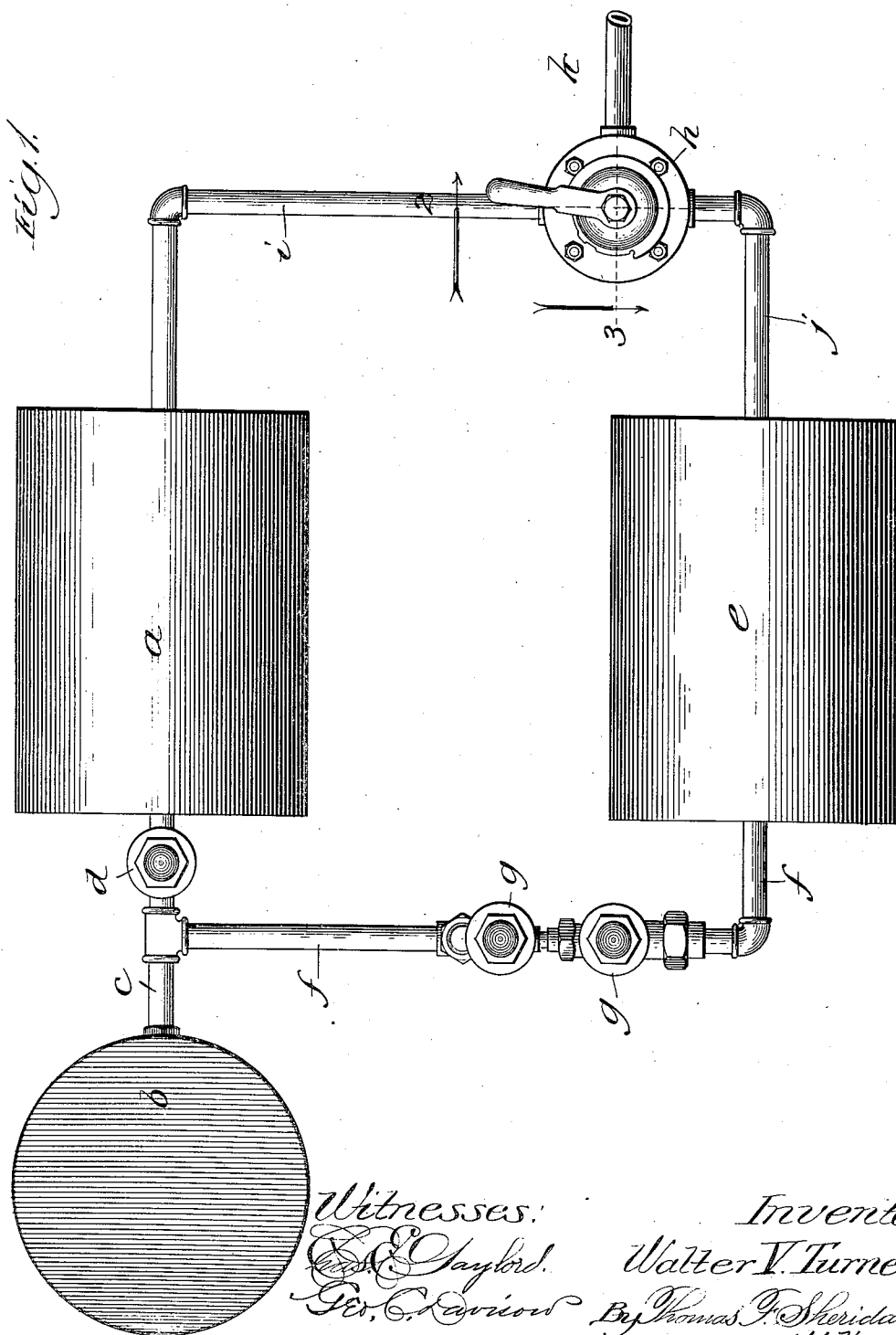
PATENTED JAN. 15, 1907.

W. V. TURNER.

AIR BRAKE MECHANISM.

APPLICATION FILED JULY 6, 1903. RENEWED APR. 23, 1906.

4 SHEETS—SHEET 1.



Witnesses:

*E. A. Gaylord.*

*Geo. C. Davison*

Inventor:

*Walter V. Turner,*

*By Thomas P. Sheridan,*

*Att'y.*

No. 841,470.

PATENTED JAN. 15, 1907.

W. V. TURNER.  
AIR BRAKE MECHANISM.

APPLICATION FILED JULY 6, 1903. RENEWED APR. 23, 1906.

4 SHEETS—SHEET 2.

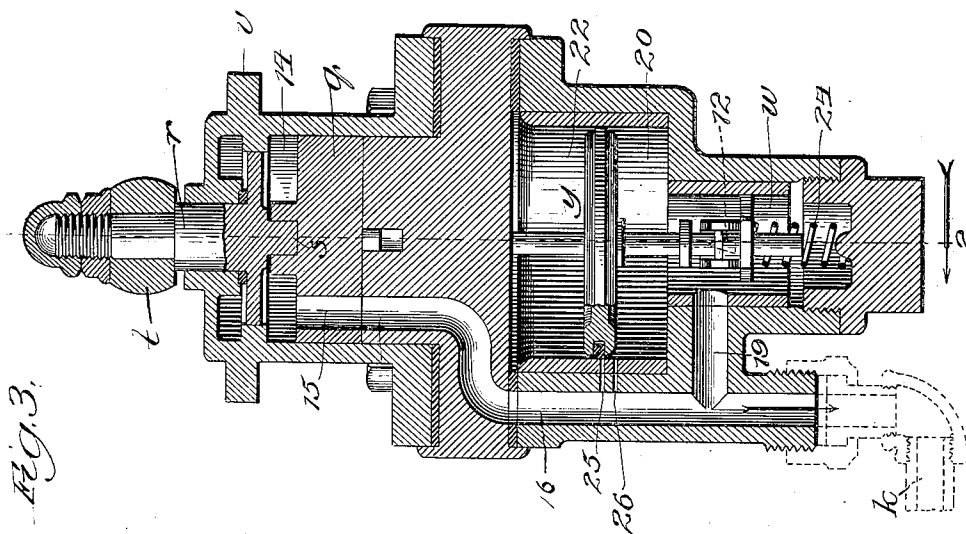


Fig. 3.

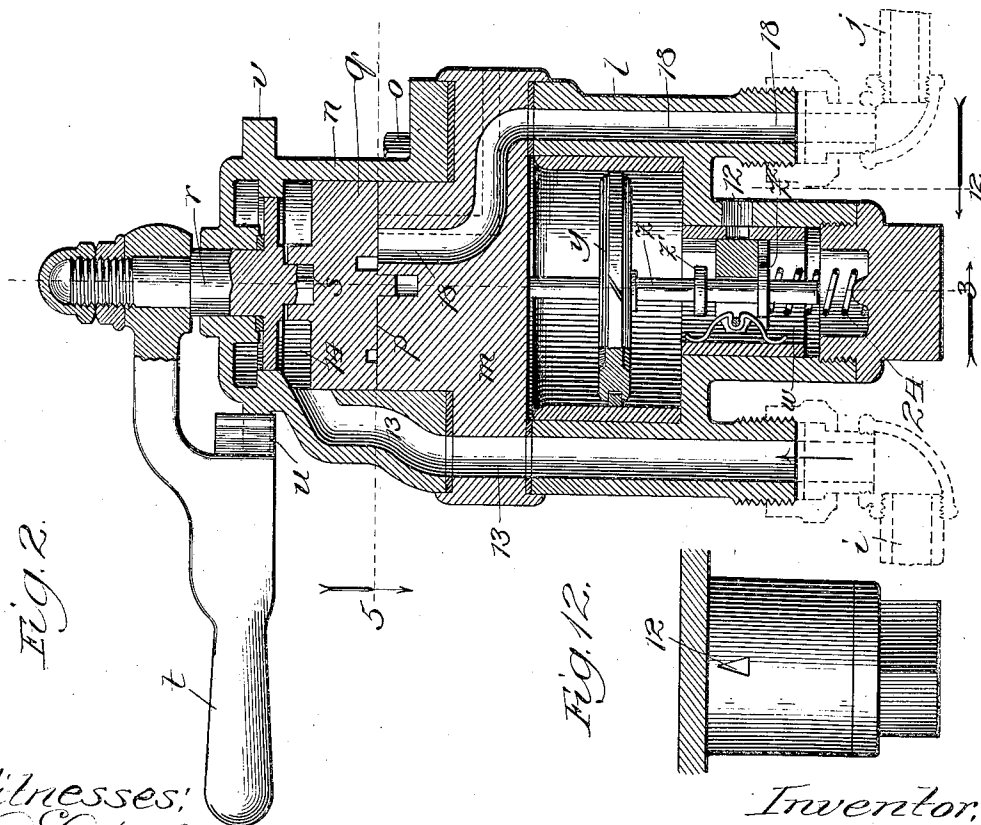
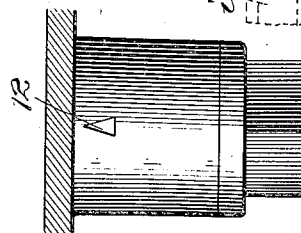


Fig. 2.

Fig. 12.



Witnesses:  
Edw. C. Saylord.  
Geo. C. Brown.

Inventor:  
Walter V. Turner;  
By Thomas F. Sheridan,  
Att'y.

No. 841,470.

PATENTED JAN. 15, 1907.

W. V. TURNER.

AIR BRAKE MECHANISM.

APPLICATION FILED JULY 6, 1903. RENEWED APR. 23, 1906.

4 SHEETS—SHEET 3.

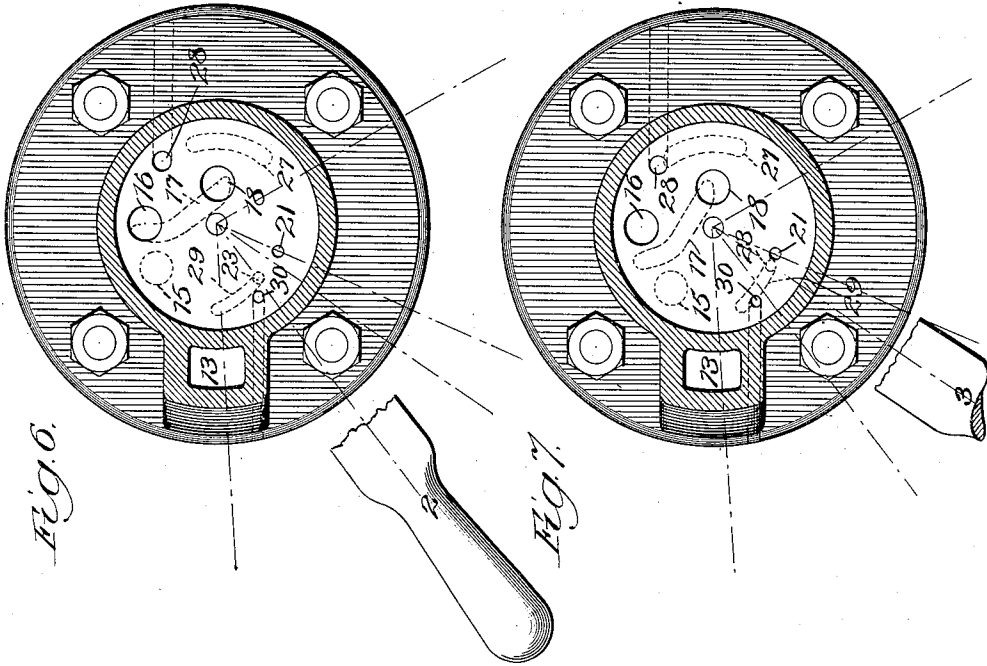


Fig. 6.

Fig. 7.

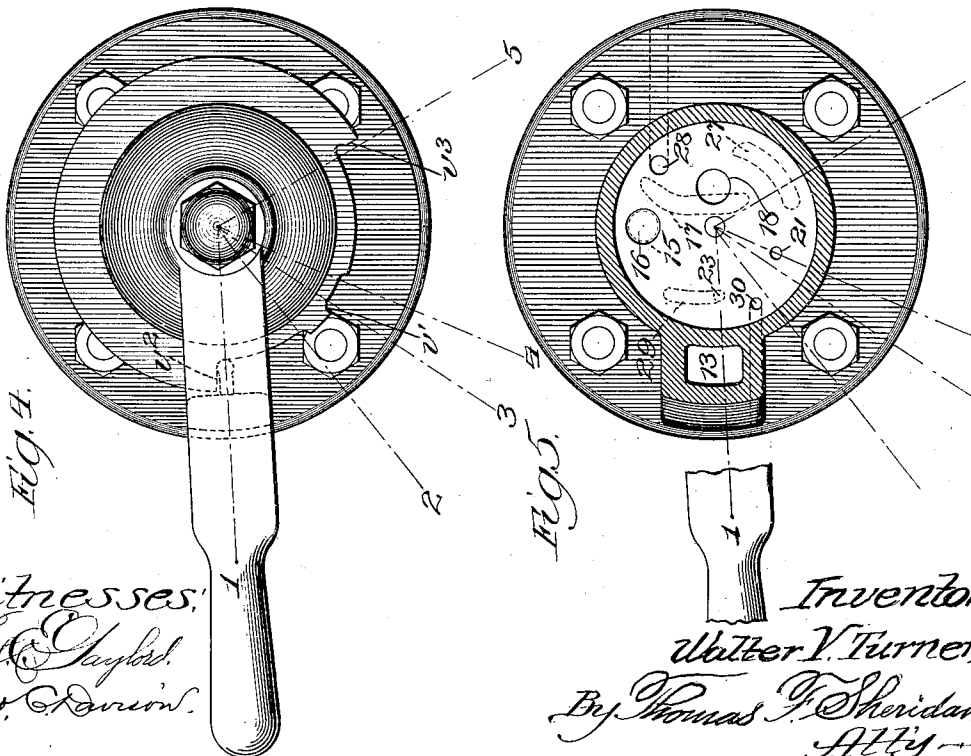


Fig. 4.

Fig. 5.

Witnesses:  
C. C. Taylor,  
Geo. C. Davis.

Inventor:  
Walter V. Turner,  
By Thomas F. Sheridan,  
Atty.

No. 841,470.

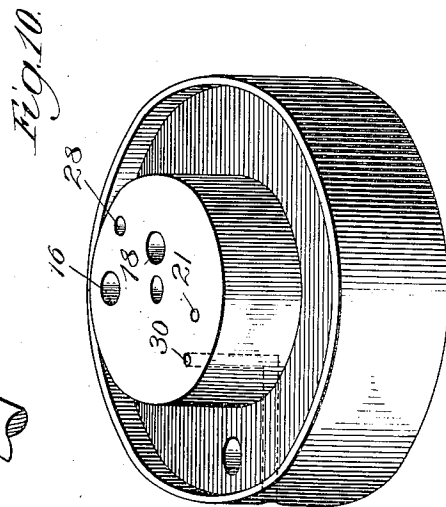
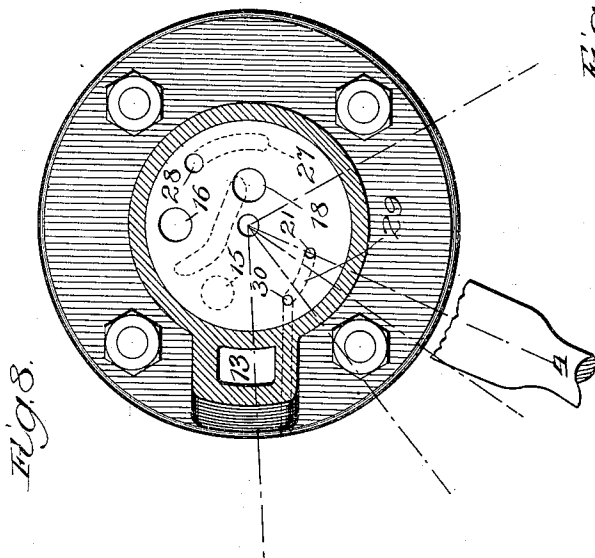
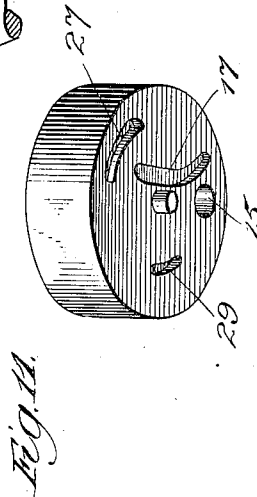
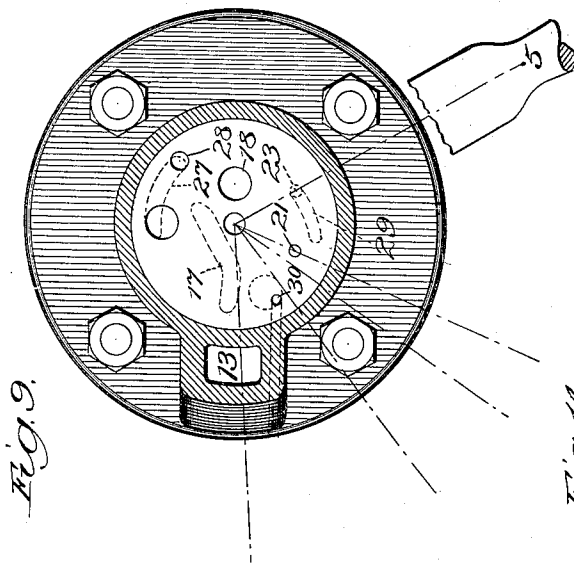
PATENTED JAN. 15, 1907.

W. V. TURNER.

AIR BRAKE MECHANISM.

APPLICATION FILED JULY 6, 1903. RENEWED APR. 23, 1906.

4 SHEETS—SHEET 4.



Witnesses:  
*Geo. C. Taylor*  
*Geo. C. Taylor*

Inventor:  
*Walter V. Turner*  
By *Thomas P. Sheridan*  
*Att'y*

# UNITED STATES PATENT OFFICE.

WALTER V. TURNER, OF WILMERDING, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## AIR-BRAKE MECHANISM.

No. 841,470.

Specification of Letters Patent.

Patented Jan. 15, 1907.

Application filed July 6, 1903. Renewed April 23, 1906. Serial No. 313,280½.

*To all whom it may concern:*

Be it known that I, WALTER V. TURNER, a citizen of the United States, residing at Wilmerding, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Air-Brake Mechanisms, of which the following is a specification.

This invention relates to that class of air-brake mechanisms known as fluid pressure systems, in which air under desired pressure is used to operate intermediate mechanisms for the purpose of applying and releasing the ordinary brakes of a railway car, and particularly to the construction and arrangement of an engineer's valve by which the air under pressure is furnished the system and governed or controlled therein, all of which will more fully hereinafter appear.

The principal object of this invention is to provide a simple, economical and efficient engineer's valve which will allow the engineer to feel the effect of reduction in air pressure as he is making it. A further object is to provide a valve of novel construction that will not permit a sudden reduction in train pipe pressure, or a sudden cutting off of the exhaust. Other and further objects of the invention will be apparent from an examination of the drawings and the following description and claims.

In the accompanying drawings—

Figure 1 is a preferred form of air-brake system to which this invention is applicable.

Figure 2 is a vertical sectional elevation of the brake valve, taken on line 2 of Figure 3 looking in the direction of the arrow.

Figure 3 is a vertical sectional elevation of the same, taken on line 3 of Figure 2 looking in the direction of the arrow;

Figure 4 is a plan view of the engineer's valve;

Figure 5 is a plan sectional view, taken on line 5 of Figure 2 looking in the direction of the arrow and showing the parts in the first position, viz., release position;

Figure 6 is a similar view, showing the parts in the second position, viz., running position;

Figure 7 is a similar view, showing the parts in the third position, viz., lap position;

Figure 8 is a similar view, showing the

parts in the fourth position, viz., the position known as "service" position;

Figure 9 is a similar view, showing the parts in the fifth position, viz., emergency position;

Figure 10 is a perspective view showing the valve seat for the rotary valve, looking at it from above;

Figure 11 is a perspective view of the rotary valve looking at it from below; and

Figure 12 is a partial elevation of the lower portion of the valve body, to show the service exhaust port.

In illustrating and describing these improvements, I have only illustrated and described that which I consider to be new, taken in connection with so much that is old as will properly disclose the invention to others and enable those skilled in the art to practice the same, leaving out of consideration other and well known mechanisms, which, if set forth herein, would only tend to confusion.

In the use of a valve of this construction, I prefer to use it in connection with an air-brake system in which there is a main reservoir *a*, fed directly from an air pump *b* through a supply pipe *c*, in which there is a feed valve *d* that closes communication between the main reservoir and air pump when the pressure reaches a predetermined amount; say, ninety pounds to the square inch. This main reservoir, as well as the air pump, is connected with a supply reservoir *e* by means of a branch pipe *f*, in which there is interposed a fluid pressure controlling valve *g*. The main reservoir is connected with an engineer's brake valve *h* by means of the main reservoir pipe *i*, and the supply reservoir with the same valve by means of a supply reservoir pipe *j*. The engineer's brake valve is also connected with the train line by means of the train pipe *k*. It will be understood that the supply reservoir contains pressure up to seventy pounds to the square inch and that the controlling valve *g* cuts off all pressure above the same, so that the engineer has at his disposal a main reservoir with ninety pounds pressure to the square inch and a supply reservoir with seventy pounds pressure to the square inch,

which may be fed into the train pipe whenever required, all as will hereinafter more fully appear.

In constructing an engineer's brake-valve, as shown in Figures 2 to 11 inclusive, I make a valve body composed of three parts, a bottom portion *l*, an intermediate portion *m*, and an upper or cap portion *n*, secured together by bolts *o*. The intermediate portion of the valve body is provided with a valve seat *p*, upon which a rotary valve *q* operates and this rotary valve is operated by means of a stem portion *r* having a bearing portion in the upper part of the valve body and a wedge shaped portion *s* fitted in a central recess in the rotary valve. The stem is provided with a valve handle *t*, in turn having a spring-pressed pawl *u* arranged to contact with stops *v'*, *v''* and *v'''*, on the flange *v*, of the upper part of the valve body so as to guide the engineer in positioning the valve.

The lower part of the valve body is provided with an exhaust chamber *w*, in which an exhaust slide valve *x* operates to open and close a triangular service exhaust port 12 for the train pipe. This exhaust chamber connects with the lower part of a piston chamber in which an exhaust piston *y* operates. This piston has a stem *z*, the shoulders *z'* and *z''* of which operate the exhaust slide valve. It will be seen that these shoulders permit a certain amount of loose play to the piston before the exhaust slide is operated. The piston is operated to close the exhaust by means of pressure contained in the train line system below the same and to open it by means of pressure admitted from the main reservoir above the same, all of which will more fully hereinafter appear.

The body of the valve is provided with three passages, 13, 16 and 18, which connect respectively with the main reservoir, the train pipe, and the supply reservoir. The passage 13 is adapted to have continuous connection with the chamber 14 at the top of the valve, but the passages 16 and 18 are not so connected, the passage 16 being adapted to be shut off by a revolution of the rotary valve *q*, and the passage 18 not having any connection with the chamber 14, but being adapted to be connected with the train pipe 16 by means of the passage 17 on the under side of the rotary valve *q*. Rotary valve *q* is provided with the passage 15 (Fig. 3), by means of which passage chamber 14, and consequently the passage 13, is connected and disconnected with the passage 16. As clearly shown in Figure 11 the bottom of the rotary valve is provided with a plurality of grooves, 17, 27, and 29, and as shown in Figure 10, the valve seat *p* is provided with a plurality of openings 21, 30, and 28, in addition to the previously mentioned passages 16 and 18. The grooves in the valve and the passages in the valve seat are so arranged

relatively that by adjustment of the rotary valve any desired connection may be made, as will be more fully explained hereafter. The purpose of the groove 17 is to connect the passage 16, with the passage 18, thereby admitting pressure from the supply reservoir to the train pipe. The purpose of the groove 29, is to connect the top of the passage 21, in the valve seat, with the top of the passage 30 in the valve seat, which passage 30 has connection to the outer air as indicated in Figure 10. Connected to one end of the groove 29 is the passage 23 (see Figure 9) extending vertically through the valve, and adapted to connect the top of the passage 21 with the chamber 14. When the valve is in the position shown in Figure 8, connection is made between the main reservoir and the chamber 22 by the passage 13, chamber 14, passage 23 and passage 21, whereby pressure is admitted on to the piston, and such piston is forced down, opening the exhaust valve 12. In this position of the valve the passages 23 and 21 are also connected to the outside air by the passage 30 and groove 29, and as long as the valve remains in this position the air under pressure from the main reservoir issues from such passage 30 with a slight hissing, thereby giving warning that the exhaust is open and the brakes are set. The groove 27 connects the top of the passage 16 with the top of the exhaust port 28. This exhaust port 28 as indicated in Figure 10, extends vertically through the valve seat and then turns at an angle and leads to the outer air.

When the rotary valve is in the proper position to connect the passage 16, and the exhaust port 28, by means of the groove 27, while the other passages are blanked, a very rapid exhaust is allowed from the train pipe to the outer atmosphere in emergency applications of the brake. The relative position and function of the various passages will be more fully appreciated when taken in connection with a recital of the operation, which follows.

Describing the operation of the system when the parts of the engineer's brake valve are in their first position (viz., release position—see Figures 2, 3, 4 and 5), or the position assumed when the brakes are released by admitting pressure to the train pipe, and to obtain a direct recharging of the train pipe from the main reservoir, the valve body is provided with a port or passage 13 connected with the main reservoir pipe *i*, and leads to a chamber 14 above the rotary valve, so that air under pressure contained in the main reservoir passes down through a passage 15 in the rotary valve, which is registering with passage 16 in the valve seat and body—see Figure 3—and is guided through these passages into the train pipe *k*, and the train line charged or re-charged directly from the main reservoir and at the pressure contained there-

in in a manner to quickly charge the system and release the brakes. It may be stated at this time that this position of the valve will not ordinarily be used, for the reason that the arrangement is such that if the pressure in the train pipe reaches that in the main reservoir it is impossible to exhaust by means of the service exhaust. This will appear more clearly after the description of the other position of the valve.

When the engineer places the valve handle in its second or running position (as shown in Fig. 6), the passages 15 and 16 are disconnected, or, in other words, using the technical term, "blanked." At the same time a groove 17 in the under face of the rotary valve connects the supply reservoir passage 18 with the passage 16, which in turn is connected with the train pipe *k*, see Figure 1, so that air under pressure of seventy pounds from the supply reservoir is fed through these passages 18, 17, and 16, to the train pipe and the train pipe pressure maintained at the desired amount, viz., seventy pounds to the square inch, while all other ports and passages in the engineer's valve are blanked. At the same time it will be seen—see Figure 3—that by means of a by-pass 19 air under pressure—train pipe pressure—is fed into the exhaust chamber *w* and the piston chamber 20 below the piston *y* to keep the same at its upper limit of movement and close the exhaust passage 12 between the exhaust chamber and the atmosphere, and also thereby between the atmosphere and the train line. The system is now arranged in such a manner that there are ninety pounds pressure in the main reservoir and seventy pounds pressure to the square inch in the supply reservoir.

When the valve handle is placed in the third or "lap" position—as shown particularly in Figure 7—all ports and passages in the rotary valve seat and rotary valve are blanked.

When the parts are placed in the fourth or "service" position—as shown particularly in Figure 8—a small service application port 21 in the valve seat—and which leads therefrom down into the piston chamber 22 above the exhaust piston—is brought into communication with the chamber 14 above the rotary valve by means of a passage 23 extending through the rotary valve, so that air is free to pass from the reservoir pipe through passage 13, chamber 14 and application passages 23 and 21 to said piston chamber 22, above the piston therein, to depress it against the tension of helical spring 24. When the loose play is taken up, the exhaust slide valve *x* is moved so as to gradually uncover the triangular shaped exhaust passage 12 connecting the exhaust chamber and thereby the train line with the atmosphere, so as to make a train line reduction in a gradual manner. The engineer holds the valve at service position un-

til the required reduction is made in the train pipe, and then returns it to the lap position, blanking the application ports or passages above described. At the same time two small passages 25 and 26 which connect the upper part of the piston chamber 22 with the train line passage 16 are open, so that an equalizing effect can take place between the pressure in the chamber and in the train pipe. The pressure in the chamber 22 is thus gradually reduced to that contained in the train pipe, and the piston, with the assistance of the helical spring 24, is gradually raised to first blank the passage 26, which partly retards the movement of the piston and finally blanks the passage 25, as shown in Figure 3. This also closes the triangular shaped exhaust passage in a gradual manner, which, on account of its peculiar shape, provides for a gradual cut-off of the train line reduction, thereby preventing any surge of air in the train pipe, as might result were the train line exhaust to be cut off suddenly. If other reductions are required, it will be seen that the engineer may make it by repeating the application and moving the rotary valve to service position as often required.

It is desirable that the engineer shall always be kept informed when the parts are placed in service position, and in order to give him notice of such positioning, the passage 23 connects with a groove 29 in the lower face of the rotary valve, so that when the parts are in the fourth position, above described, a portion of the air entering passage 23 will also be diverted through this groove 29 in the lower face of the rotary valve to a minute exhaust passage 30 contained in the valve seat and body, and through which the air may emerge with a slight hissing noise as long as the parts are kept in such position.

It will be seen from the foregoing that service exhaust is secured by admitting pressure to the upper side of the piston *y*, and as previously indicated with regard to the first or "release" position this service exhaust will not be possible if main reservoir pressure has been obtained in the train pipe by the direct connection as described for the first or "release" position for the reason that if the train pipe pressure on the under side of the piston *y* is the same as in the main reservoir, such piston cannot be depressed by admitting main reservoir pressure above the piston. Such first or "release" position will therefore not ordinarily be used and when used the valve will be held in such position only momentarily so that the pressure in the train pipe will not fully attain that of the reservoir. It will be seen after such momentary operation, there will be no difficulty in securing the service exhaust.

The release of the brakes may be accomplished by putting the valve in the first or "release" position, as described above, and

again permitting air under pressure from the main reservoir to flow directly to the train pipe and restore the pressure therein.

When an emergency application of the brakes is required the rotary valve handle *t* is moved to the fifth or "emergency" position, as shown particularly in Figure 9. In this position all the ports and passages from the main reservoir to the train pipe are blanked, as are the ports and passages from the supply reservoir, but the rotary valve seat is moved to such position that a groove 27 in the lower face thereof connects the train line passage 16, as shown, with a supplementary large emergency exhaust passage 28 in the valve seat, thereby permitting a reduction of the train line pressure through large passages and direct to the atmosphere.

Having thus described my invention and illustrated its use, what I claim as new, and desire to secure by Letters Patent, is the following:

1. In combination, a main reservoir for relatively high pressure, a supply reservoir for relatively lower pressure, means for maintaining the desired pressure in these reservoirs, a train pipe and an engineer's valve provided with service exhaust means and having connection with the two reservoirs and the train pipe and adapted to connect the main reservoir with the service exhaust means whereby such means are operated.

2. In combination, a main reservoir for relatively high pressure, a supply reservoir for relatively low pressure, means for maintaining the desired pressure in these reservoirs, a train pipe and an engineer's valve provided with service exhaust means normally held closed by pressure from the train pipe and having connections with the two reservoirs and the train pipe, and adapted to connect the supply reservoir with the train pipe and to connect the main reservoir with the service exhaust means thereby overcoming the train pressure and opening the exhaust.

3. In combination, a main reservoir for relatively high pressure, a supply reservoir for relatively lower pressure, means for maintaining the desired pressure in these reservoirs, a train pipe, and an engineer's valve having connection with the reservoirs and the train pipe and adapted to connect either of the reservoirs with the train pipe.

4. In combination, a main reservoir for relatively high pressure, a supply reservoir for lower pressure, means for maintaining the desired pressure in these reservoirs, a train pipe, and an engineer's valve having connection with the reservoirs and train pipe adapted to connect either of the reservoirs with the train pipe and to connect the train line pipe to the exhaust.

5. In combination, a main reservoir, for relatively high pressure, a supply reservoir

for relatively lower pressure, an air pump connected to each reservoir, pressure regulating valves between the reservoirs and the pump, a train pipe, and an engineer's valve having connection with the reservoirs and the train pipe and adapted to connect either of the reservoirs with the train pipe.

6. In mechanism of the class described, the combination of an air-pump, a main reservoir for relatively high pressure fluid, a supply reservoir for relatively lower pressure directly connected with the main reservoir and with the air pump, a train pipe, an engineer's valve body provided with three main passages connected with the main and supply reservoirs and train pipe, a rotatable valve in such engineer's valve body provided with one passage to connect and disconnect the main reservoir and train pipe so as to supply main reservoir pressure or cut off the same from the train line, and a second passage to connect the supply reservoir directly with the train pipe and disconnect the same during the movements of such valve, substantially as described.

7. In mechanism of the class described, the combination of an air pump, a main reservoir for relatively high pressure connected therewith, a supply reservoir for relatively low pressure connected directly with the pump and main reservoir, a train pipe, an engineer's valve body provided with an emergency exhaust opening and with three main passages connected with the main and supply reservoirs and train pipe a rotatable valve in such valve body provided with a passage adapted to connect and disconnect the main reservoir with the train line, a second passage to connect and disconnect the supply reservoir with the train pipe, and a third passage to connect and disconnect the train pipe with the emergency exhaust opening, substantially as described.

8. In combination, a plurality of reservoirs, means for maintaining different pressures in these reservoirs, a train pipe and an engineer's valve provided with service exhaust means and having connections with the reservoirs and the train pipe, and adapted to connect the different reservoirs with the train pipe and to connect a high pressure reservoir with the service exhaust means whereby such means are operated.

9. In combination, a plurality of reservoirs, means for maintaining different pressures in these reservoirs, a train pipe and an engineer's valve provided with service exhaust means normally held closed by pressure from the train pipe and having connections with the reservoirs and the train pipe, and adapted to connect the different reservoirs with the train pipe and to connect a high pressure reservoir with the service exhaust means, thereby overcoming the train line pressure and opening the exhaust.

10. In an engineer's valve, means for governing the service exhaust comprising a valve chamber, a service exhaust port, a slide valve therein, a piston cylinder connected to the valve chamber, an operating piston therefor, a connection between the valve chamber and the train pipe whereby one side of the piston is continuously under pressure to hold the slide valve in closed position, and  
 10 a connection for the other side of the piston from a high pressure reservoir controlled by the main valve.

11. In an engineer's valve, means for governing the service exhaust comprising a  
 15 valve chamber, a service exhaust port of triangular shape, a slide-valve therein, a piston cylinder connected to the valve chamber, an operating piston therefor, a connection between the valve chamber and the train pipe  
 20 whereby one side of the piston is continuously under pressure to hold the slide valve in closed position, and a connection for the other side of the piston from a high pressure reservoir controlled by the main valve.

25 12. In an engineer's valve, means for governing the service exhaust comprising a valve chamber, a service exhaust port, a slide valve therein, a piston cylinder connected to the valve chamber, an operating  
 30 piston therefor, a connection between the valve chamber and the train pipe whereby one side of the piston is continuously under pressure to hold the slide valve in closed position, a connection for the other side of the  
 35 piston from a high pressure reservoir con-

trolled by the main valve, and a throttling passage between the latter side of the piston and the train pipe adapted to be opened when the piston is operated from the high-pressure reservoir.

13. In an engineer's valve, means for governing the service exhaust comprising a  
 40 valve chamber, a service exhaust port, a spring held slide valve therein, a piston cylinder connected to the valve chamber, an operating piston therefor, a connection between the valve chamber and the train pipe  
 45 whereby one side of the piston is continuously under pressure to hold the slide valve in closed position, and a connection for the  
 50 other side of the piston from a high pressure reservoir controlled by the main valve.

14. In an engineer's valve, means for governing the service exhaust comprising a valve chamber, a service exhaust port, a slide valve  
 55 therein, a piston cylinder connected to the valve chamber, an operating piston having a lost motion connection with the slide valve, a connection between the valve chamber and the train pipe whereby one side of the piston  
 60 is continuously under pressure to hold the slide valve in closed position, and a connection for the other side of the piston from a high pressure reservoir controlled by the main valve.

WALTER V. TURNER.

Witnesses:

HARRY IRWIN CROMER,  
 ROBERT H. WILES.