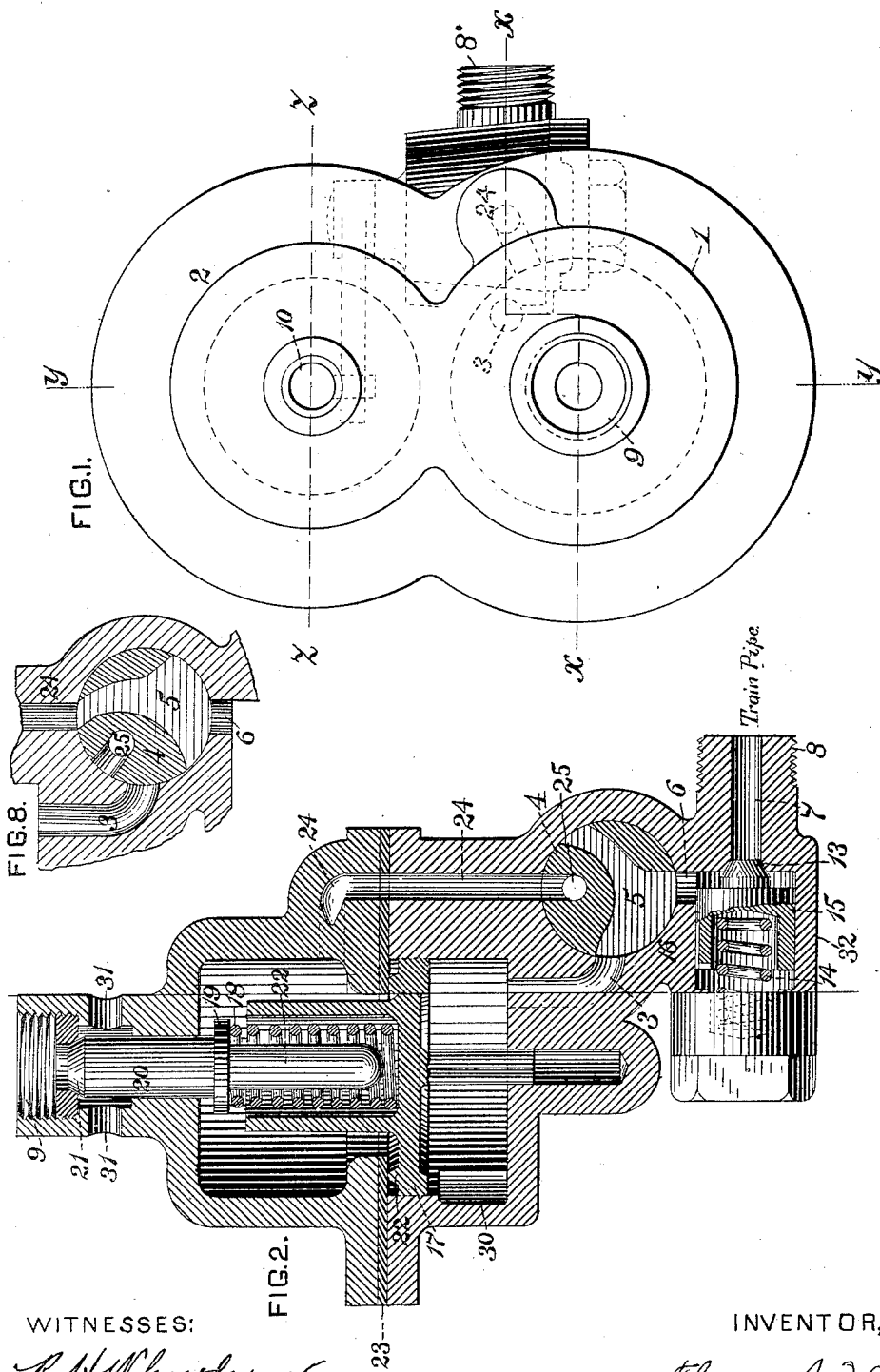


T. J. HOGAN.
AIR BRAKE.

No. 433,127.

Patented July 29, 1890.



WITNESSES:

R. H. Whittles
F. C. Gächter

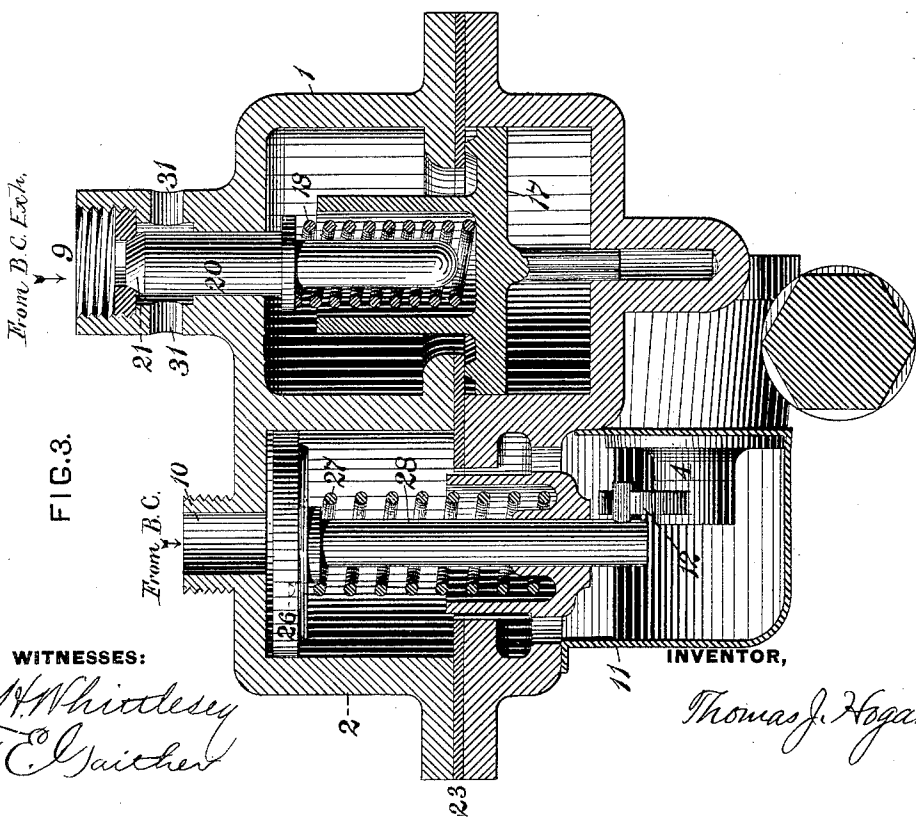
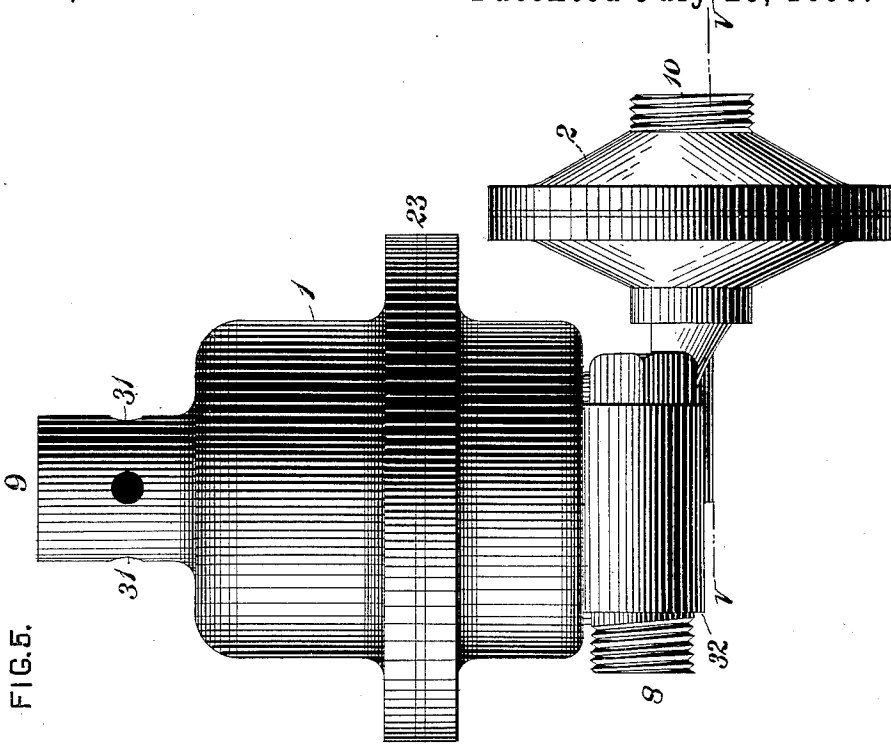
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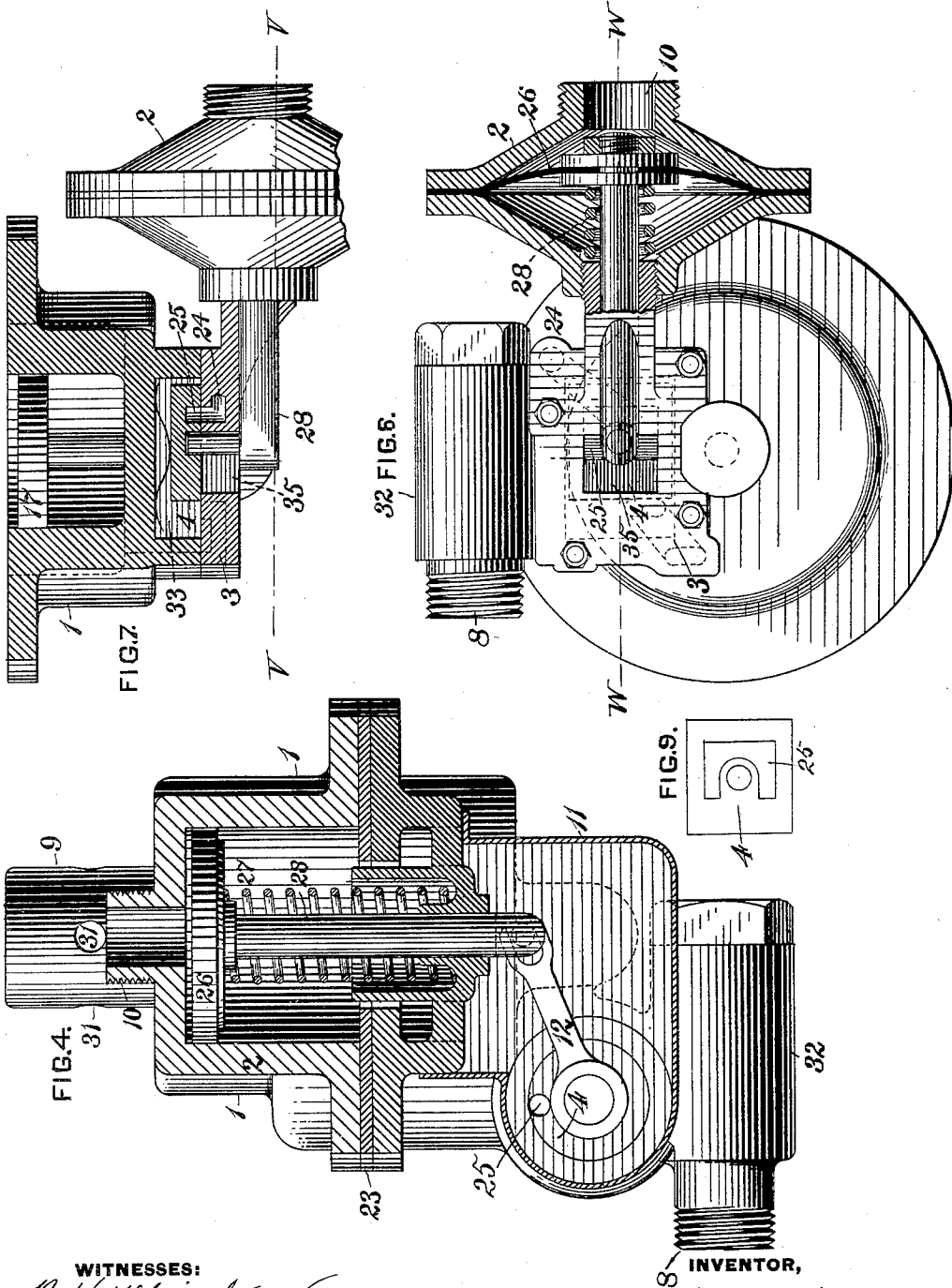
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(No Model.)

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FIG. 10.

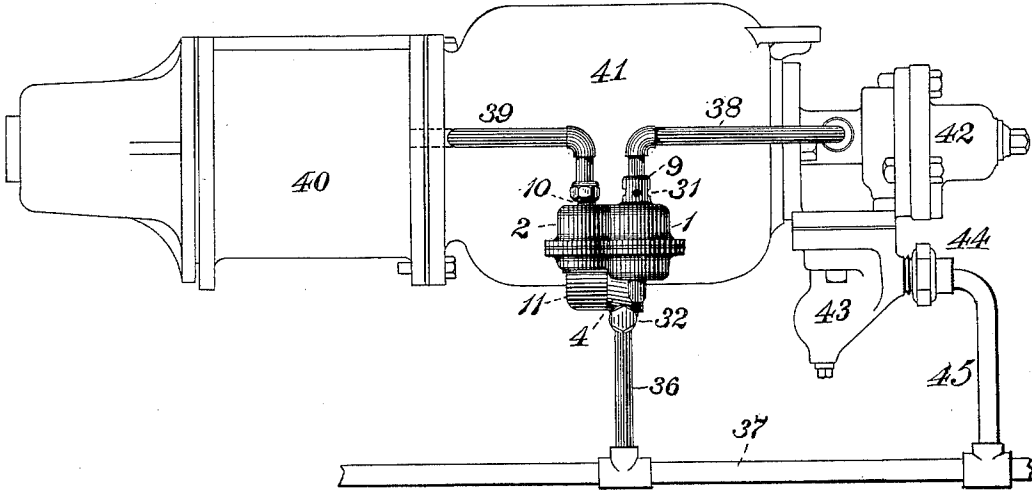
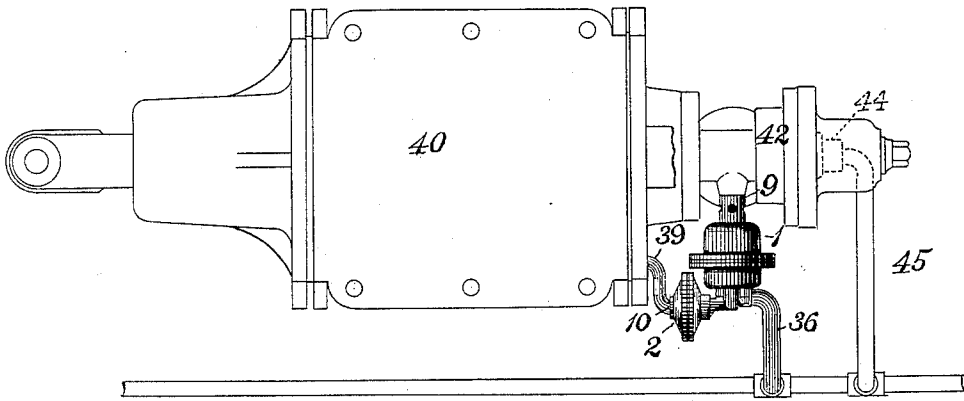


FIG. 11.



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UNITED STATES PATENT OFFICE.

THOMAS J. HOGAN, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE
WESTINGHOUSE AIR BRAKE COMPANY, OF SAME PLACE.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 433,127, dated July 29, 1890.

Application filed May 15, 1890. Serial No. 351,981. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. HOGAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Air-Brakes, of which improvements the following is a specification.

The object of my invention is to provide means for refilling the auxiliary-reservoir in automatic fluid-pressure railway-brake systems without releasing the brakes; and to this end it consists of a pressure-retaining valve controlling the escape of air from the brake-cylinder, which pressure-retaining valve is operated from the locomotive by the engineer for the purpose of opening or closing the brake-cylinder exhaust-port. By "pressure-retaining valve" I mean a valve which acts to retain in the brake-cylinder a certain pressure of air which would be allowed to escape when the train-pipe pressure is increased for the purpose of recharging the auxiliary reservoirs if the escape-port were not controlled by the pressure-retaining valve. Such valves are usually employed on long trains when descending long and steep grades, where it is necessary to keep the brakes applied with a moderate pressure. In such cases, as the brakes are often held applied for a considerable length of time, a loss of air frequently occurs from leakage, and it is found necessary to refill the auxiliary reservoirs; but this necessitates the opening of the brake-cylinder exhaust-port by the movement of the triple valve caused by increasing the train-pipe pressure, and if no pressure-retaining valve were used all of the air would escape from the brake-cylinders, the brakes would be released, and the train might get such headway that it would be impossible for the engineer to control it. The pressure-retaining valve at present in use is operative only when a hand-valve on each car has been adjusted to bring it into the line of communication between the brake-cylinder exhaust-port and the atmosphere. This is usually done before the train reaches the grade, and to make it inoperative and allow a free exhaust from the brake-cylinder the hand-valve on each car must be turned back, so as to shut off the

pressure-retaining valve from the exhaust-passage and open a free passage from the brake-cylinder exhaust-port to the atmosphere. This must be done when the train reaches the bottom of the grade, as it is necessary to operate without using the pressure-retaining valve when running on levels or portions of the track that are nearly level.

By my improvement the engineer is enabled to operate the pressure-retaining valve on each car, either to open or close it, by fluid-pressure from the locomotive by merely charging the train-pipe to a certain pressure, and the operation is not dependent on the pressure in the auxiliary reservoir, so that the required opening or closing movement is made as soon as the required pressure in the train-pipe is reached.

Another and a great advantage of my improvement is that it is not necessarily brought into operation at every operation of the brakes, but only when its employment is desirable. At other times the ordinary brake system may be operated as if there were no pressure-retaining valve. It does not therefore interfere with the quick application and release of the brakes.

It will be seen that my improvement, by doing away with the hand-operated or mechanically-operated pressure-retaining valve, makes a complete automatic fluid-pressure system of those brake systems which are only partially automatic when using a pressure-retaining valve.

My improvement is intended for use on such automatic fluid-pressure-brake systems as the Westinghouse, and may be used on any other system in which auxiliary reservoirs and triple valves are used under each car. By "triple valves" I mean any automatic governing-valve which controls the passage of air from the auxiliary reservoirs to the brake-cylinders and which is operated by variations in the train-pipe pressure.

My improvement is specially intended for use on brake systems employing a single line of train-pipe, and I consider this an important feature of my invention, as it accomplishes what before required two lines of pipe. It may, however, be used with two lines of pipe by connecting it either to the main or

supplemental pipe. It is entirely independent of and unaffected by the movement of the triple valve, and is also independent of the auxiliary reservoir-pressure.

5 With my improvement the brakes may be applied and the train-pipe pressure increased to its normal extent to refill the auxiliary reservoirs without releasing the brakes, and the brakes may be held in this condition for
10 any length of time that it may take to refill the reservoirs. At the same time, if the train should break apart, the system would act automatically, as before, to hold the brakes on.

My improvement is illustrated in the accompanying drawings, in which—

15 Figure 1 is a plan view of one form of my improvement; Fig. 2, a vertical section on line *xx* of Fig. 1; Fig. 3, a vertical section on line *yy* of Fig. 1; Fig. 4, a vertical section on
20 line *zz* of Fig. 1; Fig. 5, an elevation of a modification; Fig. 6, an inverted bottom view of said modification, partly in section, the section being on line *vv* of Figs. 5 and 7; Fig. 7, a partial section on the line *ww* of Fig. 6,
25 only the lower portion of the device shown in Fig. 5 being shown—that is, the portion below the gasket 23; Fig. 8, a section of the valve 4 and part of the casing, showing the valve turned to another position from that
30 shown in Fig. 2; Fig. 9, a bottom plan view of the slide-valve 4, shown in Fig. 7 in section and in dotted lines in Fig. 6; Fig. 10, an elevation showing the connections of my improvement with the train-pipe, triple-valve
35 casing, and brake-cylinder; Fig. 11, a plan view showing the modification of my improvement with its connections to another arrangement of brake-cylinder, triple-valve casing, and train-pipe.

40 As illustrated in the drawings, I employ two cylinders 1 and 2, placed side by side, as shown in Figs. 1, 3, and 10.

In the general arrangement shown in Figs. 10 and 11 the parts representing my improvement are shown shaded and the parts
45 which are old are shown in outline. The arrangement shown in Fig. 10 is that used on freight-cars, the brake-cylinder 40, auxiliary reservoir 41, and triple-valve 42 being placed end to end. Fig. 11 shows the arrangement
50 used on passenger-cars, the triple valve being placed on the brake-cylinder head and the auxiliary reservoir not being shown. In Fig. 10 the quick-acting attachment 43 for releasing the air from the train-pipe to the brake-
55 cylinder is shown connected to the triple valve 42 and having a coupling 44, to which the usual branch pipe from the train-pipe to the triple valve is connected. This branch
60 pipe is marked 45 in Figs. 10 and 11. The cylinder 1 is connected through the screw-thread coupling 8 with the main pipe 37, or the branch pipe 45 from the main pipe to the triple valve 42, or with the main pipe by a
65 separate branch pipe 36, which may be provided with a plug-cock between train-pipe and valve-casing. It is also connected by the

screw-threaded opening 9 to the exhaust-port from the brake-cylinder 40, either directly to the brake-cylinder exhaust-port in the triple-
70 valve casing or by a branch pipe 38, which connects it with said exhaust-port in the triple-valve casing. The other cylinder 2 is connected by the screw-threaded opening 10 to the brake-cylinder 40 at the charging end,
75 either directly by pipe 39 or to the passage in the triple-valve casing, which opens to the brake-cylinder and which always has the same pressure in it as exists in the brake-cyl-
80 inder. The cylinder 2 opens below to the atmosphere, but is shown in the drawings covered by the casing 11, which may be used to protect the plug-cock 4 and the lever-connection 12 from dust and dirt.

The parts being connected as described, we
85 will suppose that the train is approaching a long downgrade, where it will be necessary to hold the brakes applied for a greater or less length of time. As is customary in practice, the engineer will before reaching the
90 grade begin to pump up the main reservoir to a high pressure in order to have a good supply of air for use. This extra pressure in the main reservoir will be much higher than is usually carried when running on levels and
95 is not necessary to the operation of my invention, as the ordinary main-reservoir pressure is at all times sufficient; but my invention would ordinarily be used when this high pressure existed, and the high pressure is of
100 advantage, because my improvement requires a somewhat higher pressure in the train-pipe than that which exists normally in the train-pipe while the train is running with the
105 brakes off.

The valve 13, Fig. 2, is held to its seat by a spring 14, which is strong enough to prevent the valve from opening when the normal running-pressure exists in the train-pipe, and is
110 adjusted to permit the valve to open at a predetermined pressure above the normal—say five, ten, or fifteen pounds above the normal. This being the case, to bring my device into operation the engineer opens communication
115 between the main reservoir and train-pipe to increase the train-pipe pressure to the amount required to open valve 13, or to a somewhat greater amount, which need not be much greater, however, because any pressure which
120 is great enough to open the valve will hold it open for a time on account of its construction. The valve being open, the pressure will act on the larger area of piston 15 to hold it
125 open until the pressure on the two sides of the piston is equalized through the groove 16 in the piston, which extends from one side to the other, although it is only shown where the piston is broken away, because, being narrow, it would not show clearly in elevation. The air after passing the valve 13 fills
130 the passages 6 5 3, and entering the lower chamber of the cylinder 1 forces up the movable abutment or piston 17, compresses the spring 18, which presses against the collar 19

on the stem 20 and closes the valve 21, thereby closing the port through which air escapes from the brake-cylinder. The valve 13 closes by the action of the spring and the air which passes through port 16 from the face of the piston 15 to the back of it. The movable abutment or piston 17, when moved up into position to close the valve 21, seats by the V-shaped annular ridge 22 on the gasket 23, thereby preventing escape of air from below piston 17 to the space above, which is then in communication with the atmosphere through passage 24 in the casing and passage 25 in the plug-cock 4, which latter passage leads out through the end of the cock to the open air. The pressure-retaining valve 21 having been closed in the manner described, the engineer may now reduce the train-pipe pressure to the normal amount by manipulating the engineer's valve to allow it to escape to the atmosphere, or by merely closing the engineer's valve and allowing it to pass to the auxiliary reservoirs in the usual manner, which will take but a short time, as the quantity of air thus admitted which has been used in closing the pressure-retaining valve has been small, it having been necessary to increase the pressure in the train-pipe only and fill the small chambers below the piston 17. As regards the pressure thus admitted to piston 17, valve 13 acts as a reducing-valve, and it may be constructed to close after any desired pressure has been admitted below the piston 17. The pressure desired below piston 17 will of course depend on the pressure which it is desired to retain in the brake-cylinders and on the relative areas of the piston 17 and the face of the pressure-retaining valve 21, which is exposed to brake-cylinder pressure.

The pressure-retaining valves being closed, the engineer applies the brakes at any time thereafter by reducing the train-pipe pressure below the normal in the usual way, which reduction, by the action of the triple valves, opens communication between the auxiliary reservoirs and the brake-cylinders. The brakes being thereby applied, the pressure in the brake-cylinders then acts through the passage 10 of cylinder 2, which is in open communication with the brake-cylinder, as previously stated, forces down the movable abutment or piston 26, compresses the spring 27, and through the rod 28 turns the lever 12 and plug-cock 4, Figs 3 and 4, and shifts the upper right-hand end of passage 5 in plug-cock 4, as shown in Fig. 2, to register with the passage 24 in the casing of cylinder 1, as illustrated in Fig. 8, and at the same time closes the passage 25 to the atmosphere. When the plug-cock is in this position, passage 3 is closed and passage 6 is put in communication with passage 24 by the passage 5 in the plug-cock. All of the parts of the device remain in the position they now have as long as the brakes are on—that is, the piston 17 is seated upward on the gasket 23 and is held there by the air previously admitted, the pressure-retaining

valve 21 is closed, the plug-cock 4 is in the position shown in Fig. 8, the valve 13 is closed, and the piston 26 in cylinder 2 is seated downward on gasket 23, which prevents the brake-cylinder air from escaping from cylinder 2—and so long as this position of the devices is preserved—that is, until the engineer again increases the pressure in the train-pipe to a degree materially above normal pressure—the pressure-retaining valve 21 will be held to its seat by means of the compressed air previously charged in beneath its piston 17 up to the amount or degree of such pressure—that is to say, assuming that the air-pressure under piston 17 holds the valve 21 to its seat with a force equal to fifteen pounds per square inch on the exposed face of the valve 21, then such valve 21 will remain seated as against any pressure less than fifteen pounds per square inch, and consequently, as soon as the compressed air previously charged into the brake-cylinder has, by unseating the valve 21, escaped through the ports 31 to the open air and become reduced to fifteen pounds per square inch, the valve 21 will be resealed, and thereby retain such degree of pressure in the brake-cylinder, and to the extent thereof such pressure so retained in the brake-cylinder will continue to be operative in keeping the brakes on and the brake-shoes in contact with the wheels, even while the engineer is recharging the auxiliary reservoirs, which latter he may do from time to time, as the exigencies of the work may require, and to so recharge the auxiliary reservoirs he may increase the train-pipe pressure to the normal degree, or even to a degree slightly above the normal, so long as it is not great enough to open the valve 13. In this way he can refill the auxiliary reservoirs, and by again reducing the train-pipe pressure put the reservoirs in communication with the brake-cylinders with much or little force, as desired, and hold or vary the same at pleasure. This may be repeated any number of times.

When it is desired to release the brakes entirely, the engineer increases the train-pipe pressure sufficiently to open valve 13. The air then passes through passages 6, 5, and 24, Fig. 8, to the upper chamber of cylinder 1 and, assisted by the spring 18, forces piston 17 down, thus opening valve 21, or permitting it to be opened, and thus allowing the air-pressure in the brake-cylinder to become reduced by permitting the air to escape from the brake-cylinder through the ports 31 to the atmosphere, and thereby effect a complete release of the brakes. When the piston 17 is forced down, the air below it communicates with that above through the groove 30 in the wall of the casing. (Shown in Fig. 2.) As soon as the air is released from the brake-cylinder through ports 31 the pressure above piston 26 of cylinder 2 is released through the same ports 31, and the spring 27 moves piston 26 up and through the rod 28, and lever 12 turns the plug-cock 4 back to the position

shown in Fig. 2, thus allowing the air to escape from the upper chamber of cylinder 1 through ports 31. The pressure above piston 26 of cylinder 2 is released through the same 5 ports 31, and the spring 27 moves piston 26 up and, through the rod 28 and lever 12, turns the plug-cock 4 back to the position shown in Fig. 2, thus allowing the air to escape from the upper chamber of cylinder 1 through 10 passages 24 and 25 to the atmosphere. Of course the valve 13 has been closed before this time, as it is only necessary that it should be open but a moment. It takes some little time for the plug-cock to be turned back into 15 the position shown in Fig. 2, because the brake-cylinder pressure must be considerably reduced before the spring 27 will turn the plug-cock against the pressure on piston 26.

In using the term "normal" as applied to 20 the pressure in the train-pipe I mean the pressure at which the air is kept in the train-pipe when the train is running with the brakes off, and where I use the term "abutment" in the specification and claims I intend 25 it to mean a piston or its mechanical equivalent, a diaphragm.

Figs. 5, 6, and 7 show a modification of my device, in which a slide-valve 4 is used instead of a plug-cock, and a diaphragm-chamber 30 2 instead of a cylinder and piston, which is placed below instead of alongside of cylinder 1 in position for the stem 28 to connect with the slide-valve 4. The slide-valve is moved in one direction by brake-cylinder 35 pressure acting on diaphragm 26, admitted through opening 10, and in the other direction by the pressure of the spring 27. The functions of all of the parts are the same as in the device shown in Figs. 1 to 4, Figs. 40 5, 6, and 7 being shown to illustrate one of the many ways in which the construction may be varied. The slide-valve 4 controls the passage 3 leading to the cylinder 1 below the piston 17 for forcing that piston up and closing 45 the pressure-retaining valve. It also controls the passage 24 leading to the space above piston 17. As shown in Fig. 7, the valve 4, by means of exhaust-port 25, (see Fig. 9,) puts passage 24 in communication with 50 the atmosphere through the opening 35 and holds open the passage 3 so that air can pass from chamber 33 to the under side of piston 17. Train-pipe air enters at 8, passes valve 13 in casing 32, which is the same as valve 13 55 in Fig. 2, and enters chamber 33, and in the position of the valve 4 (shown in Fig. 7) passes to cylinder 1 below piston 17. When the brakes are applied, brake-cylinder pressure enters at 10, acts on diaphragm 26, and moves 60 valve 4 over to close port 3, and at the same time open passage 24 to the chamber 33, so that when the train-pipe pressure is again increased sufficiently to open valve 13 in casing 32 air will pass from the train-pipe through 65 opening 8 by valve 13, which is the same as shown in Fig. 2, into the chamber 33, and thence by passage 24 to the upper side of pis-

ton 17, forcing it down and opening the pressure-retaining valve. The brakes will now be released, and the spring 27 will return the diaphragm 26 and valve 4 to the positions shown 70 in Figs. 6 and 7. The air will then escape from above piston 17 through passage 24 in the casing, passage 25 in the valve, and opening 35 in the casing to the atmosphere. The 75 cylinder 1, piston 17, spring 18, stem 20, and pressure-retaining valve 21 are the same in both forms of my device; but they have not all been shown in Figs. 6 and 7, as it is not thought necessary. Fig. 7 only shows that 80 portion of cylinder 1 which is below the gasket 23. The spring 18, which surrounds the stem of the pressure-retaining valve 21, may be connected at one end to the shoulder on the stem of the pressure-retaining valve and 85 at the other end to the piston 17, so that when the piston 17 is forced down it will tend to carry the valve with it; or, if preferred, the spring may be fastened to the piston 17 only, as it is not necessary to withdraw the valve 90 21 from the exhaust-port, because a very slight degree of pressure in the brake-cylinder will be able to move it, and if the valve is placed in a vertical position it will move away from the discharge-port by gravity. 95

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The method of controlling the exhaust of air from brake-cylinders in automatic-brake systems, which consists in increasing the 100 train-pipe pressure above the normal to close a pressure-retaining valve before the application of the brakes, and again increasing the train-pipe pressure above the normal after the brakes have been applied to release the 105 brakes by opening the retaining-valve.

2. The method of controlling the exhaust of air from brake-cylinders in automatic-brake systems, which consists in increasing the 110 train-pipe pressure above the normal to close a brake-cylinder exhaust-port, causing brake-cylinder pressure to operate to hold the brake-cylinder exhaust-port closed and to open a communication by which a subsequent increase of train-pipe pressure above the normal 115 may open the brake-cylinder exhaust-port to release the brakes.

3. In an automatic fluid-pressure-brake system, the method herein described, which consists in first increasing the train-pipe 120 pressure to close the brake-cylinder exhaust-port, then reducing the train-pipe pressure to apply the brakes, again increasing train-pipe pressure to refill the auxiliary reservoirs, and afterward increasing train-pipe 125 pressure to open the brake-cylinder exhaust-port and release the brakes.

4. In an automatic fluid-pressure-brake system, the herein-described method, which consists in first increasing the train-pipe 130 pressure to close the brake-cylinder exhaust-port, then reducing the train-pipe pressure to apply the brakes, again increasing train-pipe pressure to refill the auxiliary reservoirs,

then again reducing the train-pipe pressure to allow reservoir-air to pass to the brake-cylinders, and afterward increasing train-pipe pressure to open the brake-cylinder exhaust-port and release the brakes.

5. The method herein described of operating fluid-pressure railway-brakes, which consists in closing and opening a pressure-retaining valve by a pressure in excess of that employed in the ordinary operation of the brakes, and while such pressure-retaining valve is closed operating the brakes by a less degree of pressure than that employed in operating the pressure-retaining valve.

6. In combination with a fluid-pressure-brake mechanism adapted by variations of fluid-pressure to be operative in applying and releasing brakes, a pressure-retaining valve suitably arranged to close or cut off the brake-cylinder exhaust and adapted to be operated in closing or opening such exhaust by a greater degree or amount of air-pressure than that actually employed in the operation of the brakes, substantially as described.

7. In an automatic fluid-pressure-brake system, the combination, with a main train-pipe, auxiliary reservoir, and brake-cylinder, of a pressure-retaining valve independent of auxiliary-reservoir pressure, which is closed by increasing the train-pipe pressure above the normal.

8. In an automatic fluid-pressure-brake system, the combination, with a train-pipe, auxiliary-reservoir, and brake-cylinder, of a pressure-retaining valve which is closed by an increase of train-pipe pressure above the normal and opened by a subsequent increase of train-pipe pressure above the normal after the brakes have been applied.

9. In an automatic fluid-pressure-brake system, the combination of a main train-pipe, a cylinder connected thereto, a valve between the cylinder and the train-pipe, a piston in the cylinder whose movement controls a pressure-retaining valve, and a movable abutment which controls the passage of air to either side of the piston in the cylinder.

10. In an automatic fluid-pressure-brake system, the combination of a train-pipe, a cylinder connected to the train-pipe, a piston in said cylinder subject to pressure on both sides from the train-pipe, and a pressure-retaining valve operated by the piston.

11. In an automatic fluid-pressure-brake system, the combination, with a main train-pipe, a triple valve, an auxiliary reservoir, and a brake-cylinder, of a pressure-retaining valve operated by air from the main train-pipe to close the brake-cylinder exhaust-port and to hold it closed for the purpose of refilling the auxiliary reservoir without releasing the brakes, said pressure-retaining valve being independent of the auxiliary-reservoir pressure.

12. The combination, with an automatic fluid-pressure-brake system having a single line of train-pipe, of a pressure-retaining valve which is opened and closed by air directly from the train-pipe.

13. The combination, in an automatic fluid-pressure-brake system, of a pressure-retaining valve which is controlled and operated by varying the pressure in the train-pipe independent of the auxiliary-reservoir pressure.

14. The combination, in an automatic fluid-pressure-brake system, of a pressure-retaining valve operated by the action of train-pipe air on a piston, and a valve operated by brake-cylinder pressure and which controls the admission of air to the opposite sides of the piston which operates the pressure-retaining valve.

15. The combination, in an automatic fluid-pressure-brake system, of a pressure-retaining valve operated by air from the train-pipe, and a valve through which air is allowed to pass to operate the pressure-retaining valve when the pressure in the train-pipe has reached a predetermined amount above the normal train-pipe pressure.

16. The combination, in an automatic fluid-pressure-brake system, of a pressure-retaining valve operated by air from the train-pipe acting on a piston and a supply-valve which opens at a predetermined pressure to permit air to pass from the train-pipe to another valve which is operated by the pressure in the brake-cylinder to control the admission and release of air to and from the piston after it passes the supply-valve.

In testimony whereof I have hereunto set my hand.

THOMAS J. HOGAN.

Witnesses:

R. H. WHITTLESEY,
F. E. GAITHER.