(No Model.) 2 Sheets—Sheet 1.

L. E. HOWARD.

ENGINEER'S BRAKE VALVE.

No. 523,937. Patented July 31, 1894.

Fig. 1.

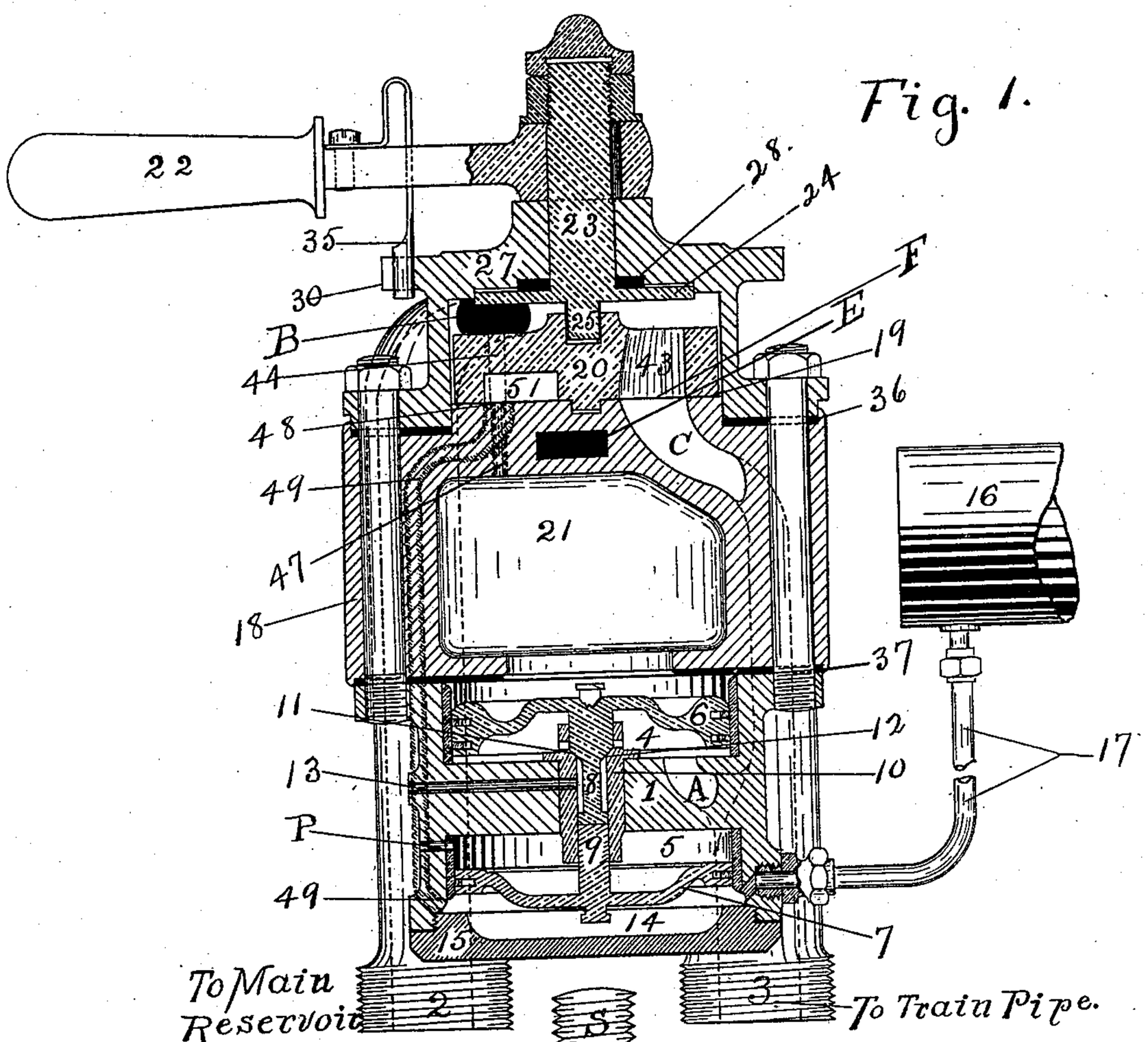
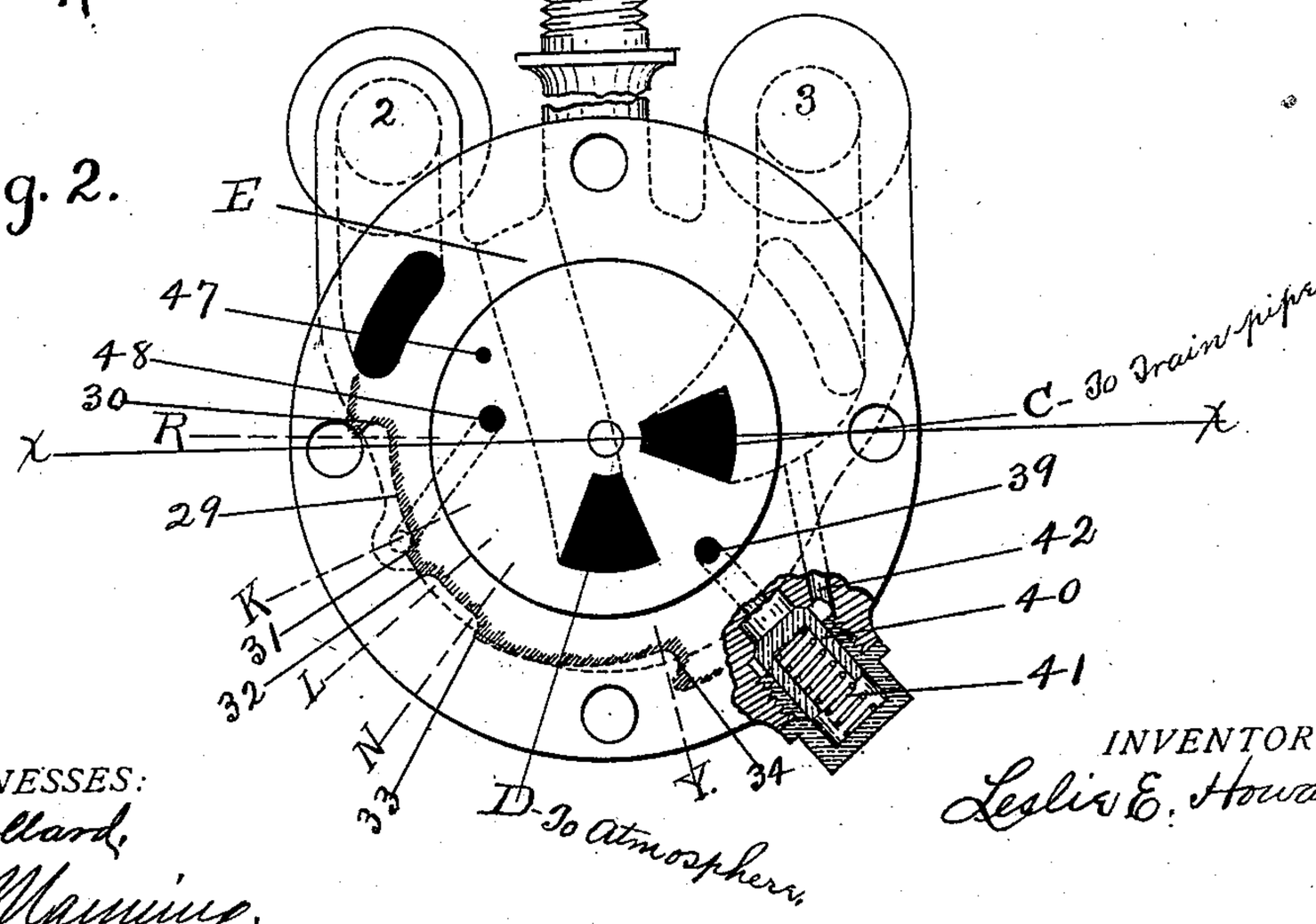


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

L. E. HOWARD.

ENGINEER'S BRAKE VALVE.

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Fig. 3.

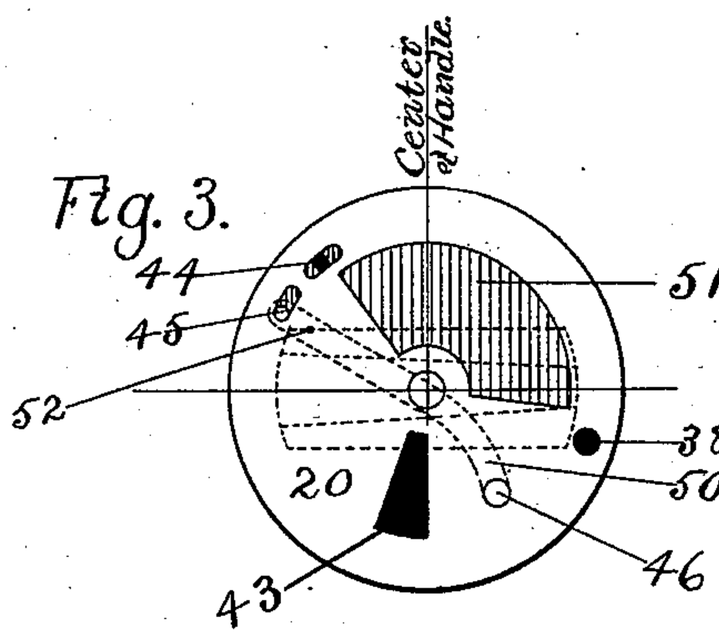


Fig. 4.

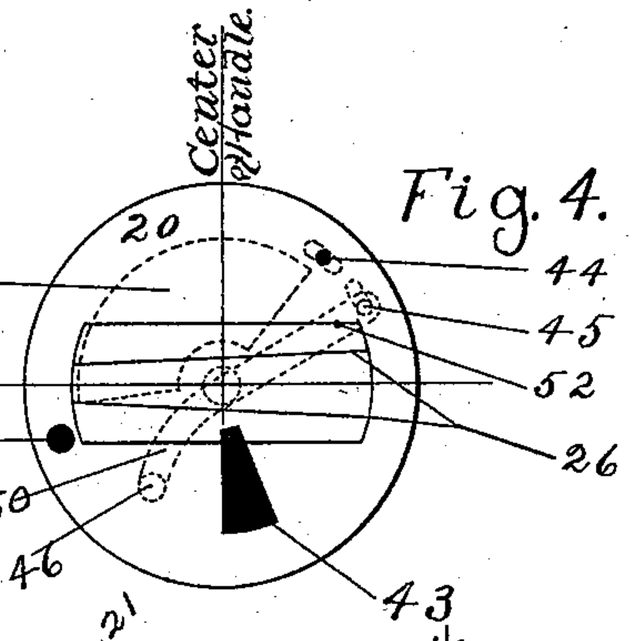


Fig. 5

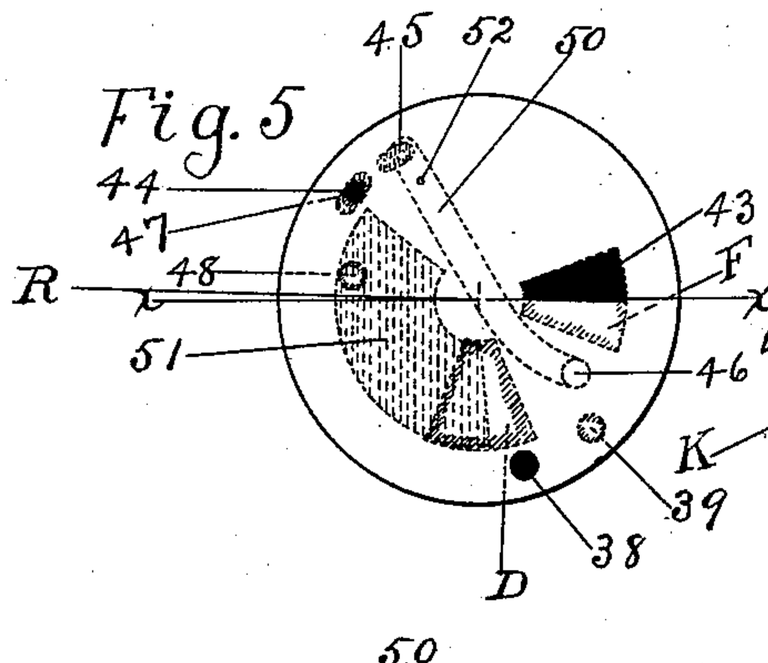


Fig. 6.

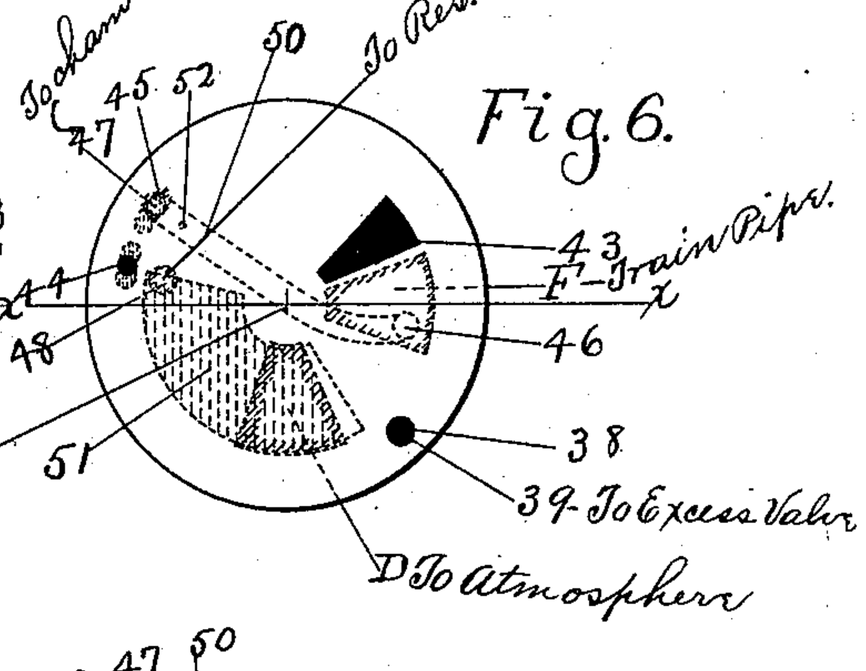


Fig. 7.

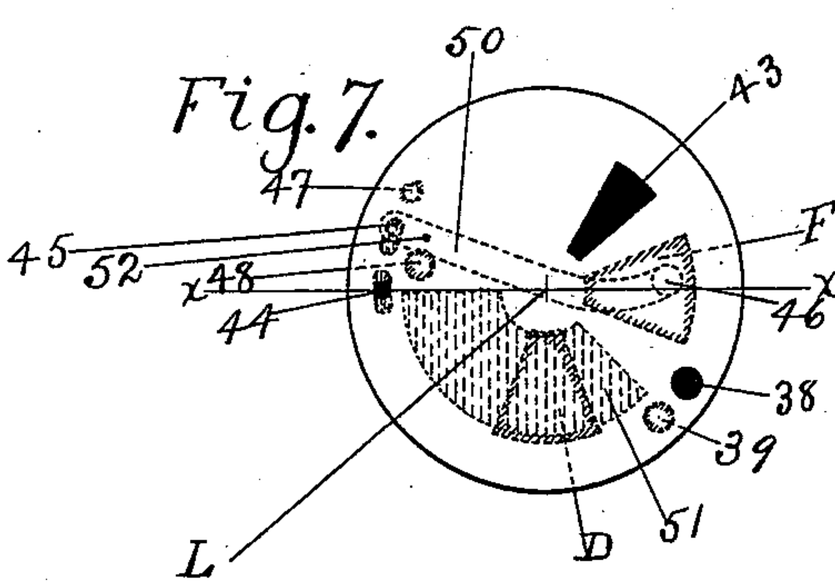


Fig. 8.

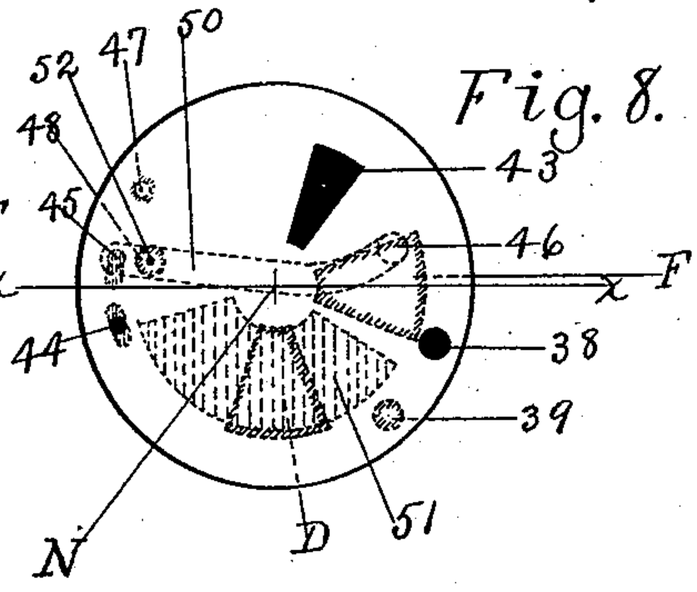
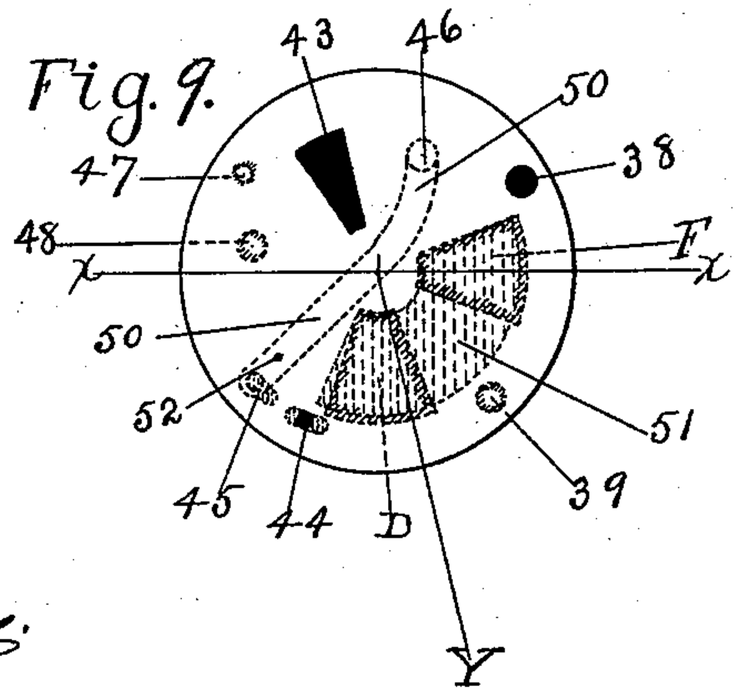


Fig. 9.



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ENGINEER'S BRAKE-VALVE.

SPECIFICATION forming part of Letters Patent No. 523,937, dated July 31, 1894.

Application filed January 12, 1894. Serial No. 496,618. (No model.)

To all whom it may concern:

Be it known that I, LESLIE E. HOWARD, a citizen of the United States, and a resident of Watertown, Jefferson county, State of New York, have invented certain new and useful Improvements in Engineers' Brake-Valves, of which the following is a specification.

My invention relates to valves for automatically regulating the flow of fluid under pressure, from a main air reservoir or other source of supply, to a train or brake pipe, and its discharge into the atmosphere from the train pipe to apply the brakes.

I have found in practice that when an opening of sufficient size is made in one end of a train of fifty connected cars, the pressure at the end nearest the opening will be about three pounds lower than at the other end. If the opening is suddenly closed the pressure soon equalizes, thus raising the pressure in the end the opening is in, or front end, one and one-half pounds. This rise in pressure is sufficient to release the brakes in the forward end of the train and causes great annoyance.

The object of my invention is to provide for a full opening of the discharge valve until the desired reduction is obtained in the front end of the train pipe, and then the gradual closing of the discharge valve to allow the pressure in the train pipe to equalize without increasing the pressure in the front end.

A further object of my invention is to prevent the waste of air occasioned by the discharge valve remaining open longer than is necessary to fully apply the brakes, and also to regulate the size of the opening controlled by the discharge valve according to length of train, or volume of train pipe, and preventing the "emergency" application of the brakes on very short trains.

The improvement claimed is hereinafter set forth and described.

In the accompanying drawings, Figure 1 is a longitudinal section through line *x. x.* of Fig. 2. Fig. 2 is a plan, or top view with cap or casing 27 removed to more clearly show the arrangement of ports in rotary valve seat 19. Fig. 3 is a bottom or face view of rotary regulating or controlling valve 20. Fig. 4 is a top view of the same valve 20. Figs. 5, 6, 7, 8 and 9 show the positions of the ports in rotary valve 20, in reference to the ports in its seat 19, in the various positions hereinafter described.

Similar figures and letters refer to similar parts throughout the drawings.

In the practice of my invention I provide a lower casing 1 with suitable pipe connections 2 and 3, preferably threaded at their lower ends to engage with union fittings on the main reservoir pipe, and the train pipe respectively, but which may be arranged to attach to said pipes in any other convenient manner, and provided with a suitable stud S. or other convenient means for attaching. Casing 1 is also provided with two cylinders or chambers, 4 and 5 arranged one above the other in such a manner that the movable abutments 6 and 7 (which may be pistons with suitable packings as shown, or flexible diaphragms) shall move freely in chambers 4 and 5 respectively, in such a manner that the stems 8 and 9 of abutments 6 and 7 shall butt against each other in guide piece 10, when pressures are applied tending to move them toward each other. Abutment 6 moving freely in chamber 4 has connected to it a stem 8 on which is formed a valve 11, stem 8 being designed to move freely in guide piece 10, and in guide piece 10 is formed a valve seat 12 against which valve 11 closes, said valve 11 controlling the flow of air from chamber 4 through passage 13 to the atmosphere. Port F. controls C. which is an air passage connecting train pipe 3 with the rotary valve seat 19 at F. as shown by dotted lines. C. has a branch A. connecting train pipe with chamber 4 underneath abutment 6. Movable abutment 7 is arranged to work freely in chamber or cylinder 5 in lower part of casing 1 and carries on its upper side a stem 9 working in guide piece 10 and arranged so that pressure being applied on its under side will cause it to lift stem 8 and abutment 6, thus allowing air to flow past discharge valve 11 to the atmosphere through passage 13. Chamber 14 on the under side of abutment 7 is closed to the atmosphere by cap 15, but is always in communication with reservoir 16 through suitable pipe and connections 17, the object of reservoir 16 being to provide a larger volume or space than could be conveniently formed in casing 1 or cap 15 thus allowing the pressure in chamber 14 to

rise more gradually than if a smaller chamber or reservoir were used. Chamber 5 on upper side of abutment 7 is open to the atmosphere through passage P.

18 is an intermediate casing on the upper side of which is formed a suitable seat 19 for the rotary controlling or regulating valve 20. Chamber 21 forms an enlargement to the chamber above abutment 6. A separate reservoir might be used in some cases.

20 is a controlling or regulating valve working on seat 19 and is operated by lever handle 22, actuating stem 23 carrying at its lower end a disk 24 with a taper key or tenon 25 on its under side, designed to engage with a taper recess or mortise 26 in top side of rotary valve 20. (See Fig. 4.) The arrangement of the ports in valve 20 is shown in Fig. 3 which shows the under side of valve 20.

51 is a recess or cavity and in certain positions of valve 20, serves to connect different ports of valve seat 19. Port 43 passes directly through valve 20, and allows air under pressure to flow from upper side of 20 directly into C. through port F. of seat 19. Port 44 passes directly through valve 20 to its upper side, and is enlarged on the under side of valve into a recess or cavity as shown. Port 38 also passes directly through valve 20 and allows air from above 20 to flow into port 39 in a certain position to be described. Ports 45 and 46 are connected by a duct or passage 50 and only open to the under side of valve 20. Port 52 opens into duct 50 connecting thereby with 46, but when air is flowing through port 52, port 45 (also connected to 46 by duct 50 as shown) is not opposite any port of seat 19, and is consequently "blanked." A plain slide valve is used in place of rotary valve 20 when preferred.

27 is an upper closed casing forming a suitable support and guide for stem 23, and provided with suitable packing 28 to prevent air leaking past stem 23. Casing 27 is also provided with a passage B. connecting by a similar passage through intermediate casing 18 with main reservoir connection 2, (as shown by dotted lines) and by means of which main reservoir pressure is constantly maintained in casing 27 above rotary valve 20, and its flow into train pipe controlled as hereinafter described. Casing 27 is also provided with a quadrant or guide 29 with suitable notches or stops 30, 31, 32, 33, and 34 (see Fig. 2) formed thereon, designed to engage with spring latch 35 of handle 22 thus determining the position of valve 20 on its seat 19, and controlling the movements of the several parts of the valve mechanism in a manner presently to be described.

Lower casing 1, intermediate casing 18 and upper casing or cap 27 are firmly held together by suitable bolts and nuts as shown, gaskets 36 and 37 being used to secure tight joints.

The operation of the valve is as follows: In release position latch 35 of handle 22 is against quadrant stop 30. Fig. 2 and center line of handle coincides with line R. (see Figs. 2 and 5) and charging port 43 of valve 20 is directly opposite port F., and allows the compressed air above 20 to flow through F. into C. (connecting with train pipe connection 3) and through branch A into the chamber 4 underneath abutment 6. Also in this position cavity 51 of rotary valve 20 connects port 48 (Fig. 2.) with port D. which opens to the atmosphere through passage E. (as shown by the dotted lines) and allows the air under pressure in chamber 14 to escape through passage 49, (shown by dotted lines) port 48, (controlling 49) cavity 51 and port D. to the atmosphere. This is the position for releasing the brakes, and in this position chamber 14 is emptied of air under pressure, chamber 21 is charged with air at main reservoir pressure, and if handle 22 be left long enough in notch 30, the train pipe will be charged with air at pressure of main reservoir. In the "position while running" handle 22 is moved until latch 35 is against notch or stop 31, and center line of handle 22 coincides with line "K" (Figs. 2 and 6) and the position of valve 20 on its seat is as shown in Fig. 6 and port 38 is directly opposite port 39 and air can only flow into train pipe from main reservoir by passing through ports 38 and 39, lifting valve 40 (which is loaded by spring 41 and designed to maintain a determined excess pressure in main reservoir over the train pipe pressure) and passing through passage 42 into train pipe. Ports 48 and D. are connected by cavity 51, the same as in "release position." Port 47 leading to chamber 21 is opposite cavity 45 which connects through duct 50 with port 46 of rotary valve, and 46 is opposite F., and allows the pressure in chamber 21 to equalize with that in C. and (through branch A) also with the pressure in chamber 4 underneath abutment 6, which is always connected to the train pipe. In "lap position" spring latch 35 of handle 22 is against stop 32 (Fig. 2) and center line of handle coincides with line L. (Figs. 2 and 7). In this position all ports and passages are "blanked" and the several parts of the valve mechanism remain inactive, air at pressure of the train pipe being "trapped" in chamber 21. In "service" position, which is the position for applying the brakes, spring latch 35 of handle 22 is against stop 33 (see Fig. 2) and center line of handle coincides with line N. Figs. 2 and 8 and port 47 leading to chamber 21 is blanked, shutting off all communication to chamber 21, and port 48 (connecting through passage 49 with chamber 14 as shown by dotted lines) is opposite small port 52 of rotary valve. Port 46 is opposite F., thus allowing air from the train pipe to flow from C. through port F., port 46, duct 50 and port 52 through port 48 and passage 49 (as shown by the dotted lines) into chamber 14 causing movable abutment 7 to rise, lifting discharge valve 11 and abutment 6. Handle 22 is held in "service position" until the pressure in chamber

14 is as great as is desired to reduce pressure in train pipe; for instance it may be desired to reduce the train pipe pressure five pounds, when air will be allowed to flow from C. through port F., port 46, duct 50, port 52 and through port 48, passage 49 and into chamber 14, until a pressure of five pounds is attained in chamber 14, when handle 22 is moved back to "lap position."

The five pounds pressure in chamber 14 will force upward abutment 7 which in turn will lift stem 8, abutment 6 and opens discharge valve 11, and air will flow from the train pipe through its branch "A" past valve 11, and through passage 13 to the atmosphere, and will continue to flow until it has reduced sufficiently in pressure to allow the pressure trapped in chamber 21 to force down abutments 6 and 7 against the combined pressures in chamber 14, and in chamber 4 underneath abutment 6, thus closing discharge valve 11. It is obvious that moving handle to service position again, and allowing more air to flow into chamber 14, would cause a corresponding further reduction of train pipe pressure.

The graduation automatically of the opening of the discharge valve for short or long trains is accomplished as follows: Air is only allowed to flow into chamber 14 very slowly, and for this purpose port 52 is made of a certain size to accomplish this end. On long trains the pressure in 14 (moving abutments 7 and 6 in such a manner as to open discharge valve 11) will rise much faster than the train pipe pressure can reduce, allowing the abutments 7 and 6 to move full stroke and open discharge valve 11 wide. On very short trains the pressure will reduce in the train pipe much more rapidly because the volume of the train pipe is smaller, and this rapid reduction prevents the discharge valve 11 from opening full stroke. In "emergency position" handle 22 is moved until latch 35 is against stop 34 (Fig. 2) and center line of handle coincides with line "Y" (Figs. 2 and 9). In this position port F. (controlling passage C.) and port D. (connecting directly with the atmosphere through passage E. as shown by the dotted lines) are connected by the cavity 51 in rotary valve 20, and allow a large quantity of air to suddenly escape from the train pipe to the atmosphere. This action is necessary to secure the "emergency action" in the generally recognized forms of "quick action triple valves" and secures a sudden reduction in the train pipe pressure of fifteen or twenty pounds, as may be desired.

I am aware that George Westinghouse and Frank Moore in their Letters Patent No. 401,916, dated April 23, 1889, claim a combination of a movable abutment fitted to work in a chamber, and connected to a discharge valve controlling exhaust of air from the train pipe, and operated by reducing the pressure of a supplemental reservoir connected to one side of the abutment, said abutment having the train pipe pressure on its other side. In their device the desired action is secured by reducing the pressure on the side of the abutment opposite to the side exposed to train pipe pressure. In the device herein described any such reduction of the pressure in chamber 21 would be fatal to the action desired, and the pressure in 21 must be maintained at its initial pressure (at beginning of the application) or the discharge valve cannot close. Also their device when left long enough in "service position" to empty the supplemental reservoir of air under pressure, will allow all the air to escape from the train pipe to the atmosphere; while in my device if handle 22 is left in "service position" air will flow from train pipe into chamber 14 (as already described) and train pipe pressure will reduce until a point is reached where the combined pressures in chamber 4 underneath abutment 6, and in chamber 14, are less than the pressure trapped in chamber 21, and the pressure in 21 will close discharge valve by moving abutments 6 and 7 as before described.

Having thus described my invention, what I desire to secure by Letters Patent is—

1. In an engineer's brake valve the combination of a discharge valve from the train pipe, connected to a movable abutment exposed on one side to train pipe pressure and on the other side to pressure from a supplemental reservoir—a second movable abutment exposed on one side to atmospheric pressure and on the other side to pressure from a second supplemental reservoir, and a stem leading from the second movable abutment to the stem of the exhaust valve from train pipe, and a valve with suitable ports for varying the pressure in second supplemental reservoir, and also controlling an equalizing port between the chambers on the opposite sides of the first movable abutment, and controlling a direct supply port, a feeding port, and an exhaust port, substantially as set forth and described.

2. In an engineer's brake valve containing an exhaust valve actuated by a movable abutment in a direction to close said valve, the combination with the exhaust valve of a second movable abutment operated by fluid pressure for the purpose of opening said exhaust valve, and suitable ports and passages in the main brake valve to admit or discharge air from the chamber containing the second movable abutment in order to actuate said abutment, substantially as set forth and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 9th day of January, 1894.

LESLIE E. HOWARD.

Witnesses:
A. P. MASSEY,
M. J. MORKIN.