No. 672,057. Patented Apr. 16, 1901.

G. H. FRASER & J. N. WEIKLY.

CUT-OFF BRAKE VALVE.

(Application filed Jan. 3, 1899.)

(No Model.)

FIG. 2.

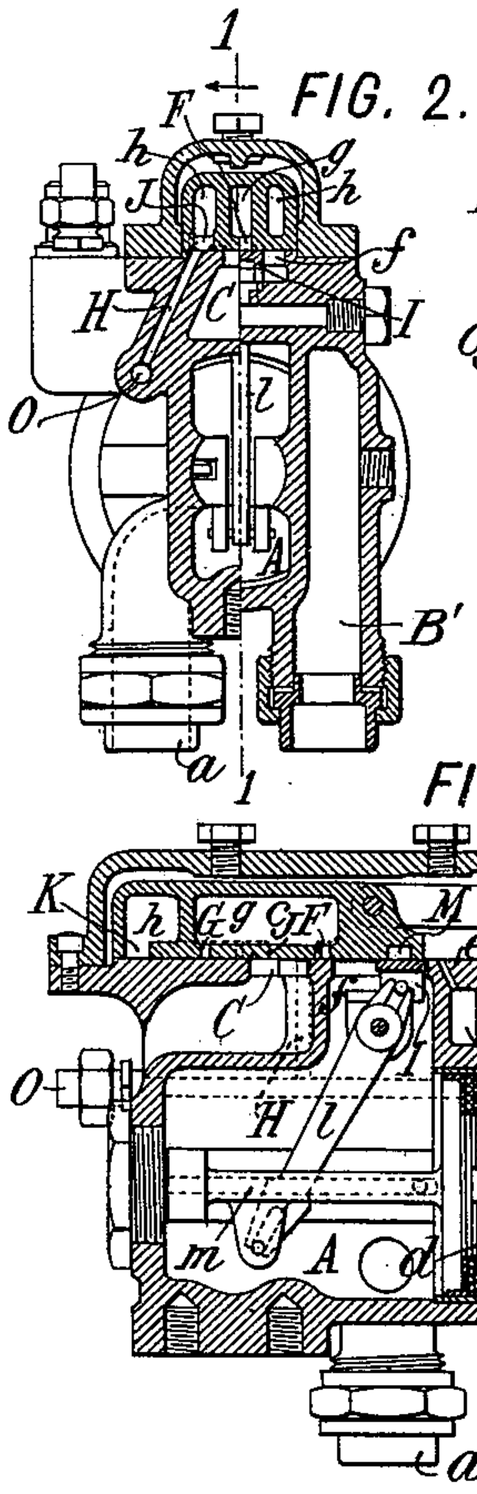

FIG. 1.

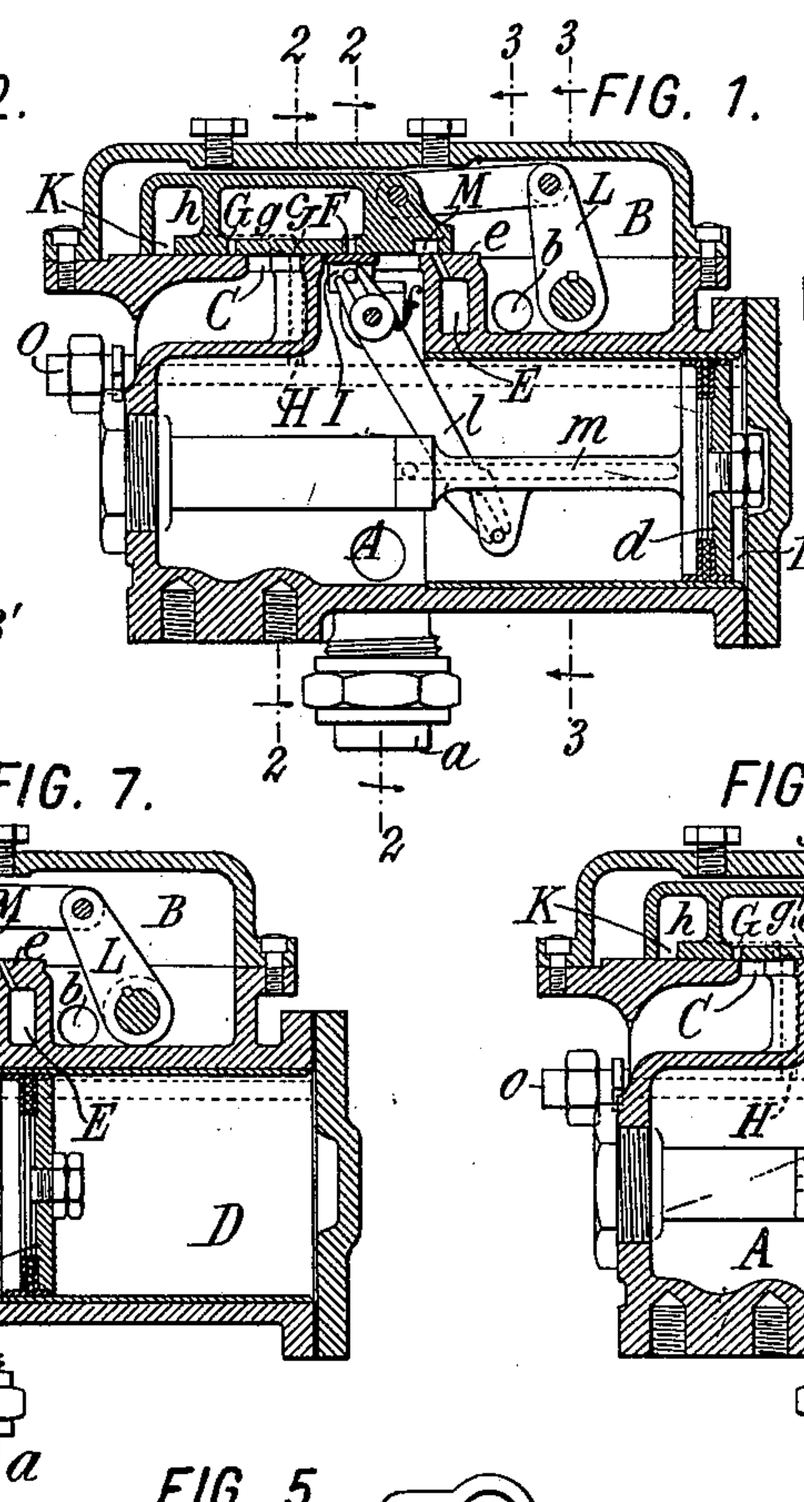

FIG. 3.

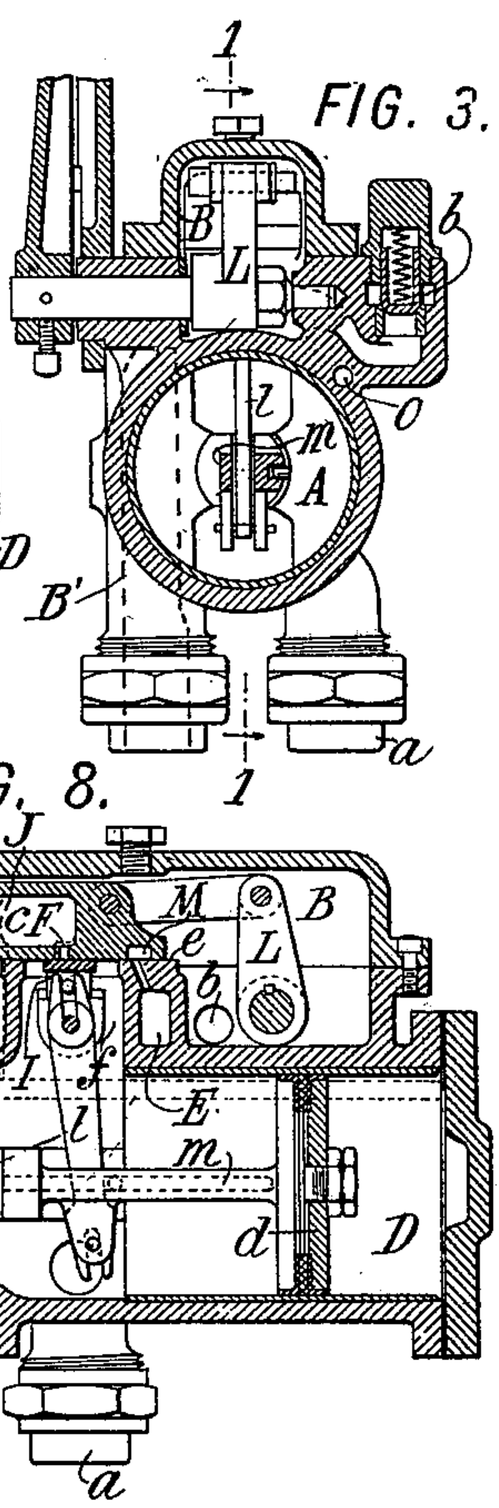

FIG. 7.

FIG. 8.

FIG. 11.

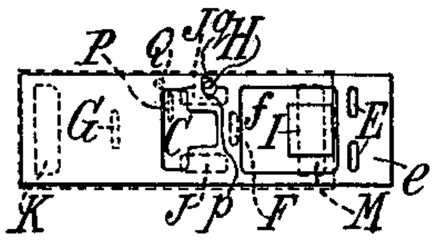

FIG. 5.

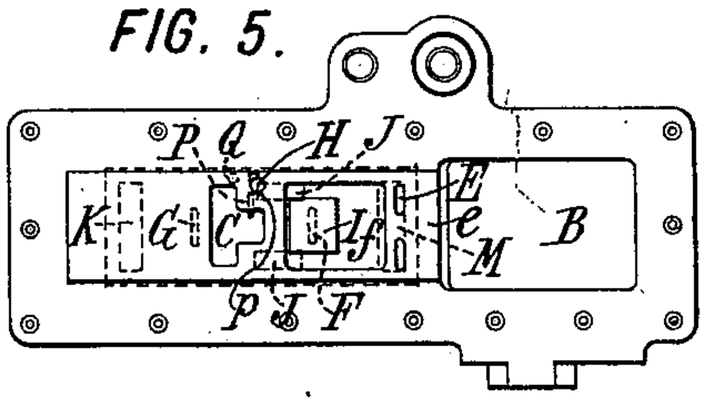

FIG. 4.

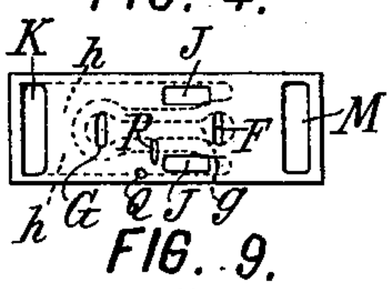

FIG. 12.

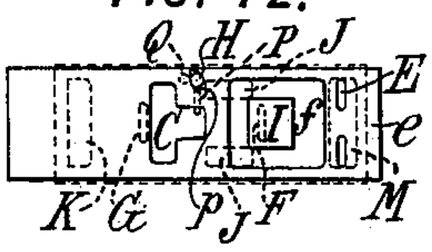

FIG. 9.

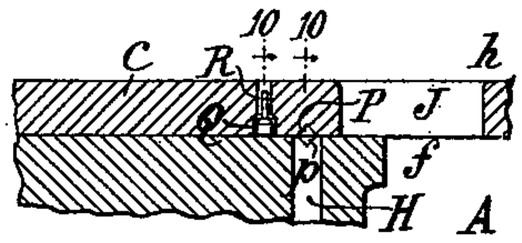

FIG. 13

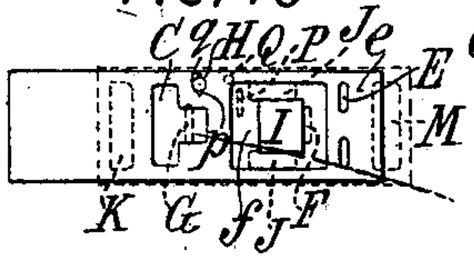

FIG. 6.

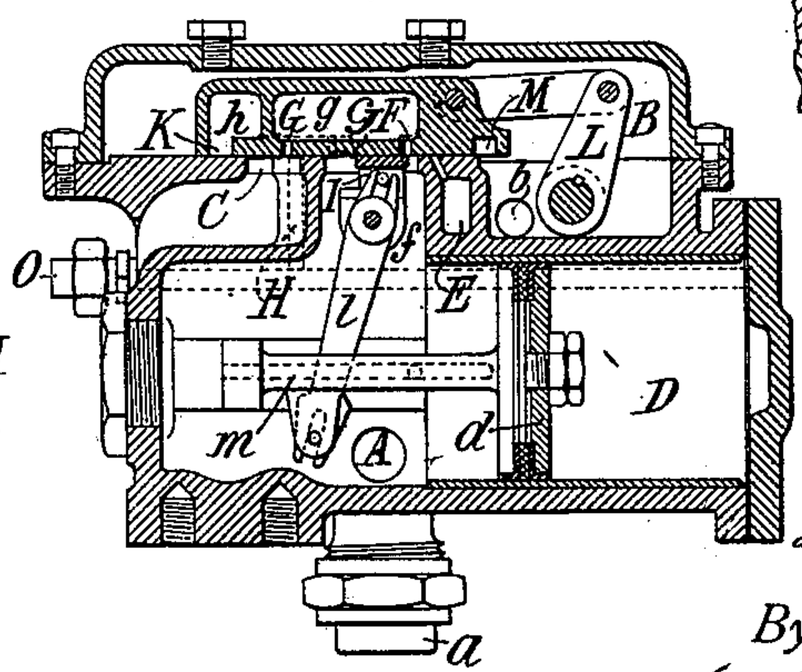

FIG. 10.

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UNITED STATES PATENT OFFICE.

GEORGE HOLT FRASER, OF BROOKLYN, NEW YORK, AND JAMES N. WEIKLY, OF JERSEY CITY, NEW JERSEY; SAID WEIKLY ASSIGNOR TO SAID FRASER.

CUT-OFF BRAKE-VALVE.

SPECIFICATION forming part of Letters Patent No. 672,057, dated April 16, 1901.

Application filed January 3, 1899. Serial No. 701,090. (No model.)

To all whom it may concern:

Be it known that we, GEORGE HOLT FRASER, residing in the borough of Brooklyn, county of Kings, city and State of New York, and JAMES N. WEIKLY, residing in Jersey City, in the county of Hudson and State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Cut-Off Brake-Valves, of which the following is a specification.

This invention relates to fluid-pressure brakes and the like, and especially to engineers' or controlling valves therefor, and aims to provide certain improvements therein.

The invention for convenience will be described as applied to an engineer's valve (shown in patent granted to Vaughn and McKee, No. 504,290, dated August 29, 1893) of the type commonly known as the "New York brake-valve," although it will be understood that it may be applied to other valves than that taken as a convenient example for illustration. In valves of this type it is usual to exhaust from the train-pipe with the slide-valve during ordinary application; but to prevent waste of air a cut-off has generally been employed which is adapted to move forward during application and will eventually close the application-port and stop discharge of air should the engineer leave this port open sufficiently long for the cut-off to reach it. This cut-off is essentially a part of the valve-seat, but is movable from its running position, in which it affords an exact gage to the valve movement necessary to start application up to a point for shutting off further release of train-pipe pressure at the extreme limit between graduated application and emergency application, during which movement its position is unknown, so there is no definite point at which application would begin after the cut-off has left the normal position, the cut-off being moved by a piston, at one side of which ordinary train-pipe pressure is carried and at the other side of which the varying pressure incident to application is exerted. Ports are provided for maintaining an equilibrium in the cut-off cylinder and train-pipe during running or slow release for exhausting the cut-off cylinder at quick release and for isolating it during application and lap. While this construction automatically prevents waste of air during a continued holding of the slide-valve at application, it necessitates continual advancing of the slide-valve in case a continuing or increasing application of the brakes is desired, and it renders indeterminate the extent of movement incident to application at other than initial applications, a condition of affairs which quickly destroys the reliance of the engineer on his ability to effect graduated application and causes him to regularly resort to emergency applications as the only ones which he can be sure will apply the brakes at all times, the result being a tremendous waste of air and unnecessarily violent braking and the necessity for keeping the valve at quick release for so long a time to restore pressure in the train-pipe that main-reservoir pressure is liable to be carried in the train-pipe and the advantages of the excess-pressure valve are lost. This invention aims to provide an improved discharge-valve in which the advantages of the automatic cut-off can be availed of and its disadvantages avoided. To this end in carrying out the invention the automatic cut-off is arranged to operate during application and restore itself to the initial position as soon as the main valve is thrown to lap, so that whenever the engineer desires to hold the brakes and throws his valve to lap for this purpose he can be sure of making a further reduction of pressure in the train-pipe by throwing the valve to the same application position as that which started the original reduction. Thus the engineer can always count on the extent of movement necessary to start an application, and under no circumstances will he be required to resort to emergency applications when only a service application is required. This is accomplished in the type of valve shown by an arrangement of ports and valve-faces, preferably operated by the slide-valve, which preserves an equilibrium of pressure between the cut-off cylinder and the train-pipe compartment during running, closes the cut-off cylinder from escape of pressure during application, and releases pressure from the cut-off cylinder while the valve is at lap. Thus the cut-off remains in its normal position ordinarily by reason of the bal-

ancing of pressure on its opposite faces; but as soon as train-pipe pressure is lowered the cut-off begins to move under the expansion of the pressure in the cut-off cylinder and continues to creep up on the valve while the latter stands at application, so that it will close off discharge from the train-pipe if the slide-valve is not returned to lap, while as soon as the slide-valve is thrown to lap pressure from the cylinder will be discharged and the train-pipe pressure will throw the cut-off back to its initial position ready for another application. When another application is started, the port will feed train-pipe pressure into the cylinder and then confine it therein, so that as the train-pipe pressure diminishes that confined in the cut-off cylinder can expand and operate the cut-off again. The cut-off cylinder and train-pipe chamber are in equilibrium at the time of starting an application and are then isolated, so that any diminution in train-pipe pressure permits the cut-off to become operative.

In the accompanying drawings, Figure 1 is a longitudinal section of a New York brake-valve equipped with the preferred form of the present invention, the view being cut on the line 1 1 in Figs. 2 and 3 and looking in the direction of the arrows, showing the valve in the running position. Fig. 2 is a cross-section thereof cut on the planes of the line 2 2 in Fig. 1 and looking in the direction of the arrows. Fig. 3 is a cross-section cut on the lines 3 3 of Fig. 1 and looking in the direction of the arrows. Fig. 4 is a face view of the slide-valve. Fig. 5 is a plan view of the valve-seat, showing the slide-valve in dotted lines in the running position. Fig. 6 is a section similar to Fig. 1, showing the slide-valve in the application position and the cut-off advancing to automatically stop application. Fig. 7 is a similar view showing the valve in quick release, the cut-off being approximately at its extreme cut-off position and just starting to return. Fig. 8 is a sectional view showing the valve at lap and the cut-off returning toward the initial position. Fig. 9 is a fragmentary enlarged longitudinal section through the cut-off ports of the valve and seat. Fig. 10 is an enlarged fragmentary cross-section through these ports on the lines 10 10 in Fig. 9 looking in the direction of the arrows. Fig. 11 is a diagrammatic view of the valve-seat, showing the valve in dotted lines in the quick-release position corresponding to Fig. 7. Fig. 12 is a similar view showing the valve in the lap position corresponding to Fig. 8, and Fig. 13 is a similar view showing the valve in the application position corresponding to Fig. 6.

Referring to the drawings, the general construction and operation of the type of engineer's valve shown will now be described.

A represents the train-pipe chamber, from which the pipe *a* leads to the brake system. B is the main-reservoir pressure-chamber, from which the excess-valve *b* controls feed to the train-pipe; B′, a duct through which it receives main-reservoir pressure. C is the discharge-port. *c* is the slide-valve in the chamber B. D is the cut-off cylinder, in which the piston *d* works between the train-pipe and cut-off pressures. E represents the feed-ports in the valve-seat *e*. F is the application-port in the valve, and *f* the reciprocal port in the seat. G is the discharge-port in the valve coacting with the exhaust-port C. *g* is the central valve-chamber. H is the cut-off port in the seat. *h* is the side valve-chamber. I is the cut-off seat. J represents the emergency-ports. K is the emergency outlet-port. L is the valve-lever. *l* is the cut-off shifter. M is the feed and slow-release port, and *m* the stem of the piston D. These parts are of well-known construction, and in their usual operation the valve *c* is slid along the seat from the quick-release position, (shown in Fig. 7,) the running position, (shown in Fig. 1,) the lap position, (shown in Fig. 8,) the graduating-application positions, as shown in Fig. 6, and the emergency position, (not shown,) in which the valve is moved to the right until ports J and K open free communication between the train-pipe and the discharge C. In quick release the port *f* is in free communication with the chamber B, all other parts being closed, except the cut-off port H, which is then open to air through port J, which extends back from it to the discharge-port C, as seen in Fig. 11. Air rushes into the train-pipe to release the brakes and force back the piston *d*, so that the cut-off will occupy its initial position, the air being forced out of the cut-off cylinder by the rising pressure in the train-pipe chamber. From quick release the valve is moved to the running position, in which the port M opens communication between the excess-pressure port E and the port *f*, so that feed to the train-pipe must be past the reducing-valve *b*. In this position the cut-off port H is open through port J to the train-pipe chamber, as seen in Figs. 1, 2, and 5, so that uniform pressure exists at each side of the piston *d* and the cut-off remains passive at its initial position. For storage of air for the cut-off cylinder D a small reservoir is usually connected to the duct O; but this is only to provide sufficient air-space so that there may be enough air for expansion in the cylinder D without requiring that such space be formed in the valve-shell itself. As the valve *c* moves from running to lap, the cut-off port H is closed, and this port is kept closed in valves of this type at lap and all succeeding positions of application, so that the air-pressure is confined in cylinder D, where it may expand when the train-pipe pressure in chamber A diminishes. Such expansion operates the cut-off I. At application the port F, which normally stands over the cut-off I, opens at the front edge of the cut-off, and the port G opens into the discharge C, the feed-port M closing. This permits an escape of air from

the chamber A through the valve-chamber *g* to the exterior, the extent of opening of the port F or the duration of its opening determining the reduction of pressure, and consequently the degree of brake application. As soon as the reduction commences in the chamber A the cut-off starts forward under the pressure in cylinder D and quickly automatically stops reduction in chamber A, thus preventing waste of air. A further reduction can be obtained by advancing the valve again in front of the cut-off, and by continuing to advance it as the cut-off advances the engineer may keep reducing train-pipe pressure until the cut-off meets the front edge of the port *f*, whereupon no further reduction can be made unless the valve is thrown to emergency. From the time the cut-off begins to move the engineer has no means of knowing at what point further release of train-pipe pressure will begin, because he does not know where the cut-off stands, except when he is first starting an application after full release. Should he wish to hold the brakes at any point and return the valve to lap, for this purpose his cut-off may be in any position at this time, or it may be gradually advancing, so that for a further application he has no knowledge of where to throw the valve to again effect a graduated reduction of train-pipe pressure. The usual forward movement failing to produce any result by reason of the advanced position of the cut-off, and a further advance being equally barren of effect for the same reason, the user instead of feeling ahead until he can get a reduction, if the position of the cut-off is such that this is possible, will by reason of the urgency of the case and the lack of time at once throw the valve to emergency, this being the only position of which he can be positively sure.

In the emergency position the ports J, chamber *h*, and port K afford free escape from port *f* to discharge C, and the ports J are independent of the cut-off I, being at the sides thereof. Although an emergency application is very wasteful of air and generally unnecessarily severe, it is common practice to resort to this in valves of this class, by reason of the lack of confidence resulting from failure to get expected results from the graduating positions after an initial application.

This invention aims to combine, with an automatic cut-off for preventing waste, means insuring a definite position for the valve for all successive reductions, so that the engineer may always know when the valve is moved to application that it will at once reduce the train-pipe pressure. This may be accomplished in many ways; but for the type of valve shown the simple construction which will now be described is preferred. This construction consists in providing means for discharging pressure from the cut-off cylinder as soon as the slide-valve moves to lap, so that whenever the brake system stands at lap the cut-off will assume the initial position by reason of the pressure in the chamber A forcing the piston *d* outward. As soon as the slide-valve is moved from lap either to running or toward application positions pressure will be admitted to cylinder D, ready for again operating the cut-off, and while the valve is at application this pressure will be isolated in the cylinder, so that it can expand to equalize with the train-pipe pressure, and thus control the cut-off throughout application.

Preferably a port P is provided as a groove in the face of the slide-valve for communicating when the valve is at lap with the port H of the seat at one end and with the discharge-port C at the other end, so that at lap the cylinder will be open to the outer air for discharging all its pressure. To insure that such discharge shall only be at the lap position, the port P is tapered at its end and coincides with a notch *p* at the side of the port H, the two being so proportioned that but a slight movement will be necessary to throw them into or out of communication. The port H being in position to coincide with one of the ports J when the valve is at running position, the cylinder D will be recharged from the train-pipe as soon as the valve is returned to running position; but after the valve has stood at lap, where pressure has escaped from the cylinder D through the port P, it will be necessary to recharge the cylinder with train-pipe pressure before again going to application. For this purpose a port Q is formed in the valve *c*, and a notch *q* for coacting with this port is formed in the side of the port H, the two being so proportioned and located that when the slide-valve is moved forwardly from lap sufficiently to close exit through the port P the port Q will open and remain open until the valve is moved almost sufficiently to start application, closing just before application begins. The port Q is in communication with the train-pipe chamber A, as shown, by extending through the valve-face into the side chamber *h*, so that train-pipe pressure entering the port J and chamber *h* can pass to the cylinder D up to the time application is about to start. All during application the port H is closed, so that the air admitted just prior to application will suffice to operate the piston *d* to effect automatic cutting off in case of a needlessly-prolonged application. In this way the cut-off cylinder is alternately charged and discharged as the valve moves from and toward lap, so that the cut-off is always operated by the train-pipe pressure exhausting just before application starts, the loss of air due to unnecessary prolonged application is avoided, and the only waste of air is the exhaust from the cut-off cylinder to restore the cut-off when the valve is at lap.

In order to avoid any backflow of air from the cut-off cylinder into the port Q, the latter may be provided with a loose check-valve R, seating against backflow on a shoulder *r* in

the port and having a flattened lower face riding on the seat *e* of the valve. This check-valve will always permit a flow to the port H; but in case the pressure in the port should be greater than that in the port Q the check-valve will be closed while crossing the port H and prevent backflow. This expedient is sometimes desirable, but is not necessary to the successful operation of the invention.

The operation will be so readily understood from the foregoing description that further description thereof is rendered unnecessary, except to say that while in the running position the ports stand as shown in Fig. 5, and the act of throwing the valve to application will carry the port P past the port H so quickly that virtually no exhaust will take place from the cylinder D, and that if any does take place it will only be such as can be restored by the port Q, which has a longer period of coincidence with the port H than has the port P. Neither of these ports, however, in going to application acts to any material extent, because of the quickness of travel of the slide-valve when thrown to application; but should it be thrown slowly the port Q will compensate for any release by the port P before application is reached, so that the cutoff will be in proper condition to act during application. The diagrams Figs. 11, 12, and 13 and the dotted lines in Fig. 5 will clearly show the relations of the parts during different positions.

It will be seen that this invention provides improvements in automatic cut-off valves which can be variously and advantageously employed and that, as described, the improvements can be applied to exhaust-valves of the type used as an example without material change in the construction of the parts, the means shown for carrying out the invention simply requiring the drilling of a hole and forming of a groove in the slide-valve and, if desired, the formation of the two reciprocal notches in the sides of the port. It will be understood, however, that the invention is not limited to the type of valve shown, nor to the particular details of construction, arrangement, or application taken as an example for illustrating the invention, since the improvements can be availed of in whole or in part in connection with any valve and according to such construction, arrangement, and application as circumstances or the judgment of those skilled in the art may dictate without departing from the spirit of the invention.

What is claimed is—

1. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe compartment, a discharge-port, a valve for controlling the discharge, and a cut-off automatically stopping discharge while said valve is at application position, and means restoring the cut-off to its initial position when the valve is placed at its lap position.

2. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe chamber, a discharge-port, an engineer's valve movable to and from an application position, a cut-off automatically controlling said valve while train-pipe pressure is being reduced, and means rendering said cut-off inoperative when such reduction terminates, irrespective of increase of train-pipe pressure.

3. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe chamber, a discharge-port, a valve for controlling train-pipe pressure, a cut-off controlling said valve, a fluid-pressure chamber controlling said cut-off, means supplying pressure to said chamber, and means releasing such pressure when reduction of train-pipe pressure ceases, irrespective of train-pipe pressure.

4. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe chamber, a discharge-port, a valve controlling discharge, a cut-off automatically controlling discharge when said valve is open, a cut-off chamber, a piston between said chambers operated by the pressures therein and operating said cut-off, and means operated by said valve releasing pressure in said cut-off chamber after discharge through said valve ceases and before release commences, whereby said piston may move the cut-off to its initial position, and means feeding train-pipe pressure to said chamber when said valve is again moved toward service position to reduce train-pipe pressure, whereby said piston can again operate said cut-off to automatically terminate such reduction.

5. In fluid-pressure brakes and the like, an engineer's valve having a train-pipe chamber, an exhaust-port, a valve proper movable from running position to lap and application positions for feeding, holding and releasing train-pipe pressure, a cut-off movable from an initial position to terminate discharge when said valve is at application position, a fluid-pressure chamber, a piston therein operating said cut-off, and means feeding train-pipe pressure to said fluid-pressure chamber when said valve is in the running position, in combination with means releasing the pressure in said fluid-pressure chamber when said valve is in the lap position, whereby said cut-off may then be restored to its initial position.

6. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe chamber, a discharge-port, a valve proper therefor movable toward and from application position, a cut-off movable from an initial position to control said valve proper, a fluid-pressure chamber for operating said cut-off, a port in said valve proper feeding train-pipe pressure to said fluid-pressure chamber while the valve proper is in running position, and closing when said valve is moved toward application position, and a second port in said valve proper feeding train-pipe pres-

sure to said fluid-pressure chamber after said first port has closed and before application begins.

7. For engineers' brake-valves and the like, the improved cut-off for controlling reduction of train-pipe pressure consisting of a member movable to close and open discharge from the train-pipe, pressure-operated means moving said member toward the cut-off position while train-pipe pressure is being reduced, means moving said member to the inactive position while train-pipe pressure is stationary, and means again moving said member to the cut-off position while train-pipe pressure is being further reduced.

8. In fluid-pressure brakes and the like, an engineer's valve having a train-pipe chamber A, discharge-port C, cut-off cylinder D, valve *c*, and cut-off I closing said valve, in combination with a port H for said cylinder D, a port J in said valve supplying train-pipe pressure to said cylinder when the valve is at running position, and a port P in said valve releasing pressure from said cylinder when said valve is at lap position.

9. In fluid-pressure brakes and the like, an engineer's valve having a train-pipe chamber A, discharge-port C, cut-off cylinder D, valve *c*, and cut-off I closing said valve, in combination with a port H for said cylinder D, a port J in said valve supplying train-pipe pressure to said cylinder when the valve is at running position, and a port Q in said valve supplying train-pipe pressure to said cylinder when said valve is between lap and application positions.

10. In fluid-pressure brakes and the like, an engineer's valve having a train-pipe chamber A, discharge-port C, cut-off cylinder D, valve *c*, and cut-off I closing said valve, in combination with a port H for said cylinder D, a port J in said valve supplying train-pipe pressure to said cylinder when the valve is at running position, a port P exhausting pressure from said cylinder when said valve is at lap position, and a port Q supplying pressure to said cylinder when said valve is advanced from lap toward application positions.

11. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe chamber, a discharge-port, a cut-off cylinder, a cut-off, means feeding pressure to each side of said cylinder, means causing a variation in pressures in said cylinder to operate said cut-off, and a slide-valve, in combination with a port in said valve for supplying pressure to said cylinder, and a check-valve for preventing backflow of pressure therefrom.

12. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe compartment, a discharge-port, a valve for controlling the discharge, means automatically stopping discharge while said valve is at application position, and means automatically restoring said discharge-stopping means to an inactive position when the valve is placed at its lap position.

13. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe chamber, a discharge-port, an engineer's valve movable to and from application position, a cut-off automatically controlling said valve while train-pipe pressure is being reduced, and means automatically rendering said cut-off inoperative when such reduction terminates, irrespective of increase of train-pipe pressure.

14. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe chamber, a discharge-port, a valve for controlling train-pipe pressure, a cut-off controlling said valve, a fluid-pressure chamber controlling said cut-off, means supplying pressure to said chamber, and means automatically releasing such pressure when reduction of train-pipe pressure ceases, at the termination of application.

15. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe compartment, a discharge-port, a valve for controlling the discharge, and a cut-off automatically stopping discharge while said valve is at application position, and means holding the cut-off at a predetermined position when the valve is placed at its lap position, irrespective of the length of application.

16. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe compartment, a discharge-port, a valve for controlling the discharge, and a cut-off automatically stopping discharge while said valve is at application position, and means for automatically moving said cut-off to its extreme position when the valve is placed at its lap position.

17. In fluid-pressure brakes and the like, an engineer's valve comprising a train-pipe compartment, a discharge-port, a valve for controlling the discharge, and a cut-off automatically stopping discharge while said valve is at application position, means automatically restoring the cut-off to its initial position when the valve is placed at its lap position, and means for automatically feeding pressure for operating said cut-off to stop discharge of said valve when said valve is again moved toward the service position.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

GEORGE HOLT FRASER.
JAMES N. WEIKLY.

Witnesses as to Fraser:
FRED WHITE,
THOMAS F. WALLACE.
Witnesses as to Weikly:
GARRETT H. VREELAND,
J. HAWEY SWENARTON.