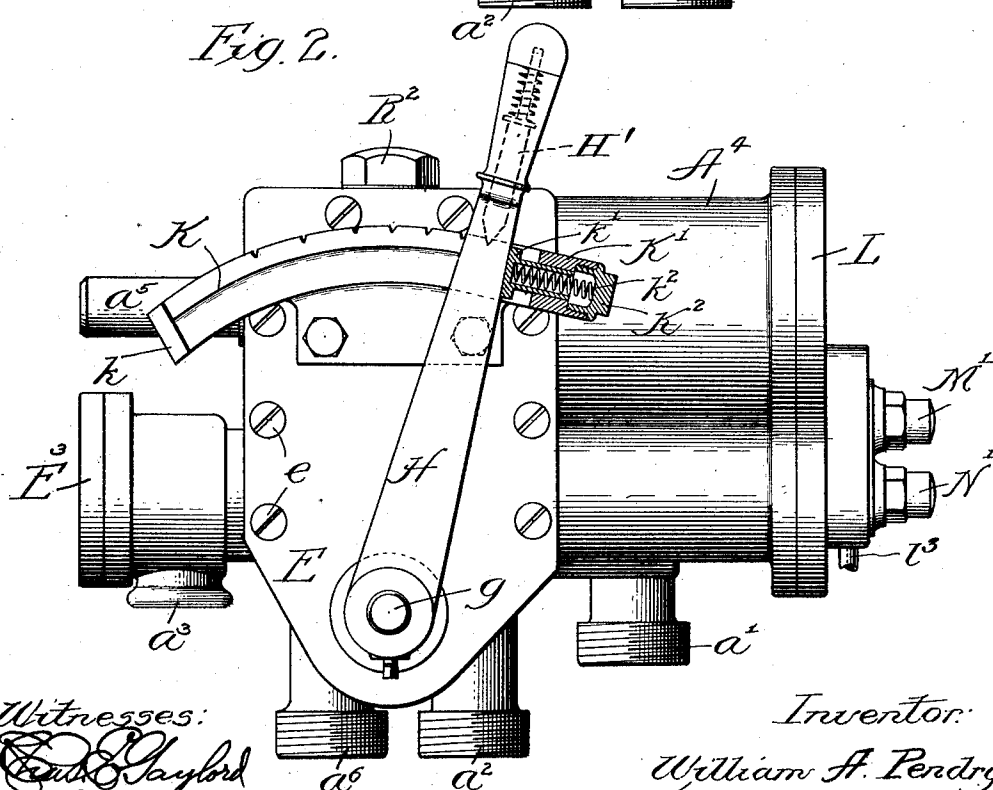
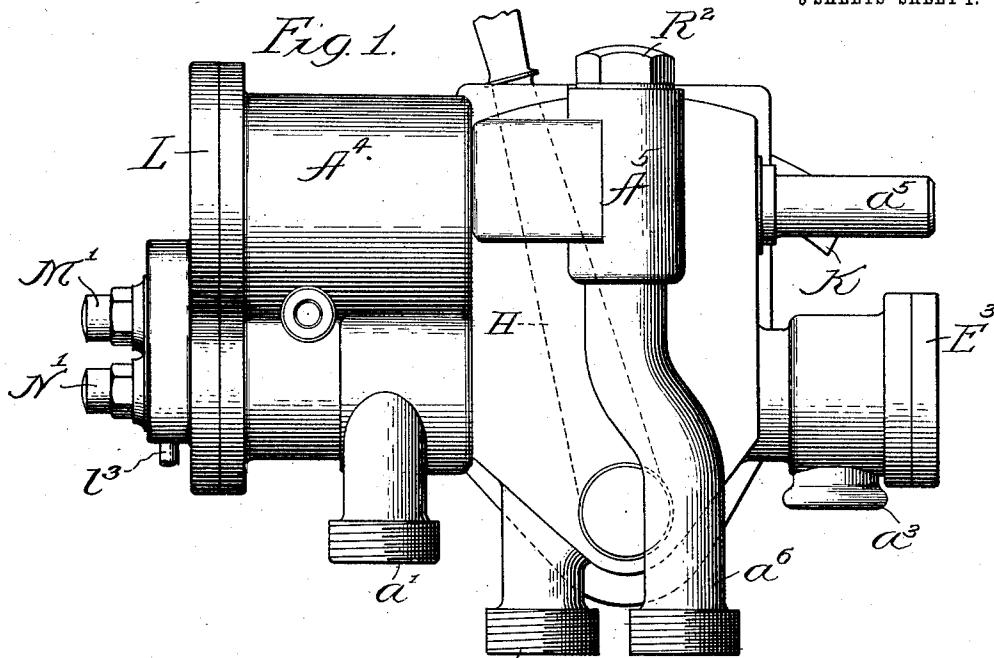


W. A. PENDRY.
ENGINEER'S VALVE.
APPLICATION FILED OCT. 8, 1909.

1,006,498.

Patented Oct. 24, 1911.

3 SHEETS-SHEET 1.



Witnesses:

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Chas. H. Bull

Inventor:

William A. Pendry.
By Sheridan, Wilkinson & Scott.
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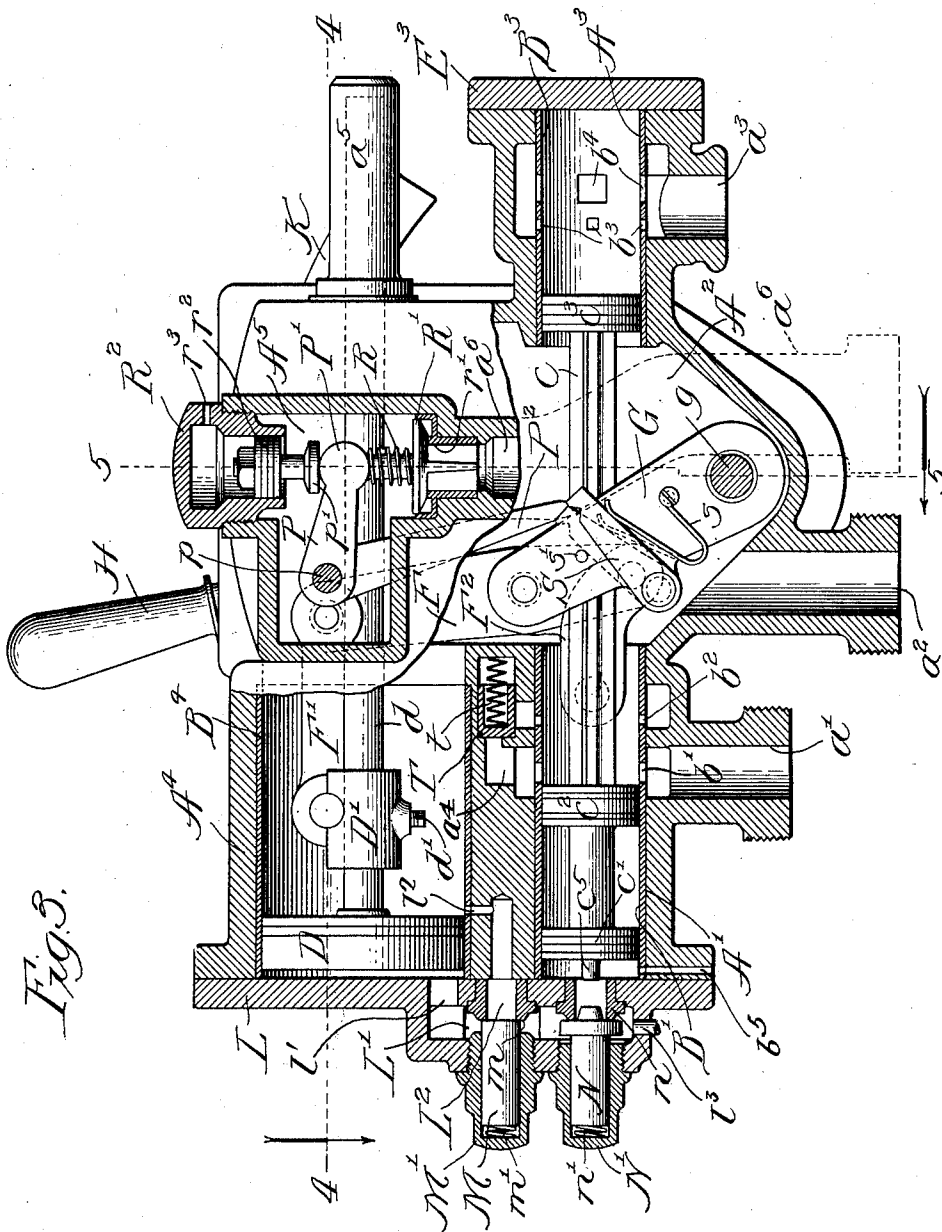


Fig. 3.

Witnesses:
Chas. Gaylord.
Chas. H. Buell.

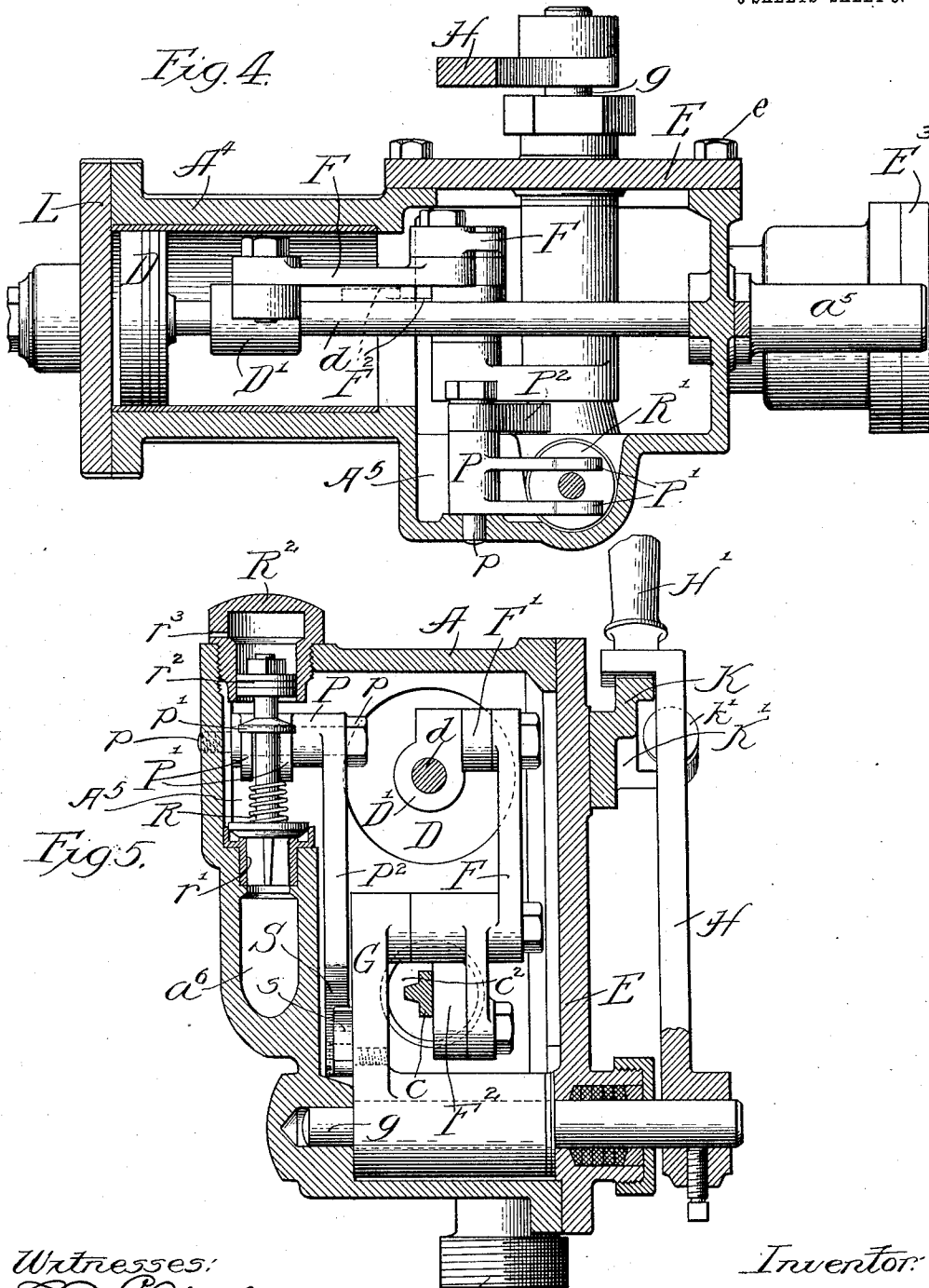
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3 SHEETS—SHEET 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. PENDRY, OF DETROIT, MICHIGAN.

ENGINEER'S VALVE.

1,006,498.

Specification of Letters Patent.

Patented Oct. 24, 1911.

Application filed October 8, 1909. Serial No. 521,693.

To all whom it may concern:

Be it known that I, WILLIAM A. PENDRY, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Engineers' Valves, of which the following is a specification.

My invention relates in general to automatic air brakes, and more particularly to improvements in engineers' valves.

In the operation of the usual automatic compressed air railway brakes, after an application of the brakes, and it is desired to release the brakes, the train pipe pressure is increased, which releases the brakes first on the engine and tender and successively on the cars of the train, the brakes on the last car being the last released. When the train is running on a down grade, this releasing operation is objectionable as the release of the brakes on the cars frequently results in the train being broken in two, owing to the strain exerted upon the couplings by the weight of the locomotive and tender after the brakes have been released thereon and before the brakes have been released on all of the cars of the train.

The primary object of my invention is to provide an engineer's valve which will effect the release of the brakes on the cars on a train prior to releasing the brakes on the locomotive and tender.

A further object of my invention is to provide an improved engineer's valve, which will, by a single operation, simultaneously apply the brakes on the cars of a train and on the locomotive, but which will release the brakes on the locomotive only by an operation subsequent to that which releases the brakes on the cars in the train.

A still further object of my invention is to provide an improved engineer's valve, which will be simple in construction, comparatively economical in manufacture, and efficient in operation.

My invention will be more fully described hereinafter with reference to the accompanying drawings, in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is an elevational view of one side. Fig. 2 is an elevational view of the other side, a portion being shown in section. Fig. 3 is a longitudinal vertical section, a portion being shown in section in a different

plane from the rest. Fig. 4 is a horizontal section on line 4—4, Fig. 3. Fig. 5 is a transverse section on line 5—5, Fig. 3.

The same reference characters are used to designate the same parts in the several figures of the drawings.

Reference character A designates the casing in which the valve mechanism is located and which is mainly formed of an integral casting having therein valve cylinders A' and A³, a chamber A² in free communication with the train pipe, and a balancing piston cylinder A⁴. The casing is provided with a coupling a' which is adapted to be connected with the main reservoir and which communicates with the valve cylinder A'. A second coupling a² is adapted to be connected with the train pipe and communicates with the train pipe chamber A².

A third coupling a³ communicates with a branch train pipe leading to the brake apparatus on the locomotive and tender. This coupling a³ communicates with a passage-way leading to a chamber A⁵ formed in the casing A and in open communication with the chamber A² therein. The valve cylinder A³ is provided with an exhaust outlet a³.

Located in the valve cylinder A' is a bushing B' having a series of ports b' extending therethrough and communicating with an annular passage surrounding the bushing and with which the coupling a' communicates. A second circular series of ports b² extend through the bushing B' and communicate with an annular passage surrounding the bushing.

Located in a small cylinder, which communicates with the annular passage around the ports b², is a reducing valve T provided with a spring t which normally seats the valve against the end of a passage a⁴ leading from the annular passage around the circular series of ports b'.

A bushing B³ is located in the valve cylinder A³, and is provided with two circular series of ports b³ and b⁴ which extend through the bushing and communicate with a surrounding annular passage from which the exhaust opening a³ extends.

Mounted to reciprocate within the bushing B' is a piston valve comprising two pistons c' and c² which are connected by means of a piston rod c with a piston valve c³ located within the bushing B³.

A balancing piston D is located within the cylinder A⁴ and is connected to a piston

rod d which extends through the train pipe chamber A^2 and into a tubular guide a^5 projecting from the end of the casing A . A collar D' surrounds the piston rod d and is secured thereto in any suitable manner, as by means of a clamp screw d' . A link F' is pivotally connected at one end to the collar D' and at its other end pivotally connected to the upper end of a floating lever F . The lower end of the floating lever F is pivotally connected to one end of a link F^2 , the opposite end of such link being pivotally connected to the rod c of the piston valves.

A short rock shaft g extends transversely through the bottom of the chamber A^2 , one end being supported in the adjacent wall of the casing A , while its opposite end is supported in the plate E which closes the chamber A^2 , such plate E being secured to the casing A in any suitable manner, as by means of screws e . A crank arm G is fixed upon the rock shaft g and is pivotally connected to the floating lever F intermediate of its ends, as indicated at g' . The end of the rock shaft g which projects through the plate E has fixed thereon an operating lever H provided with a handle to permit it to be manually operated. The lever H is provided with a spring actuated detent H' which engages notches formed in a sector K fixed upon the plate E and relatively to which the lever H moves in operating the piston valves.

A bell crank lever P is fulcrumed upon a post p located within the chamber A^5 and supported by the adjacent wall of the casing A . The shorter arm of the bell crank lever P' is bifurcated and straddles a valve rod R , a collar p' being provided around the valve rod R above the bifurcated end P' of the bell crank lever. The lower end of the valve rod R carries a valve R' which coöperates with a valve seat r' surrounding the passageway leading from the chamber A^5 to the coupling a^5 of the locomotive branch train pipe. The portion of the valve rod R on the opposite side of the collar p' from the valve R' is provided with a balancing piston r^2 which fits within a cylinder formed in a cap R^2 closing an opening leading to the interior of the chamber A^5 . The space within the cap R^2 above the piston r^2 communicates at all times with the atmosphere through a port r^3 . The longer arm P^2 of the bell crank lever depends within the chamber A^2 in the casing A and terminates adjacent the path of movement of the crank arm G . A pawl S is pivotally mounted upon the crank arm G in the plane of the arm P^2 of the bell crank lever and is normally forced against a stop s' on the crank arm G by means of a spring s .

L indicates an end plate of the casing which serves as a head for the piston cylinder A^4 and as a head for the piston valve

cylinder A' . A passage L' is provided in the head L and communicates through a port l' with the end of the cylinder A^4 . A passage L^2 extends from the passage L' a short distance between the valve cylinder A' and piston cylinder A^4 , such passage L^2 communicating with the interior of the cylinder A^4 through a port l^2 in the bushing B^4 within the cylinder. The port l^2 is spaced from the end of the cylinder a distance slightly greater than the width of the piston D . A valve seat m is located in alignment with the passage L^2 and is supported in the adjacent wall of the head L .

A valve M is mounted to reciprocate in a cap M' removably secured within the outer wall of the passage L' . A spring m' is interposed between the valve M and the surrounding cap, the tension of which normally retains the valve M in contact with the seat m . A circular valve seat n extends through the head of the piston valve cylinder A' and projects into the passage L' . A valve N is supported within a cap N' removably supported in the outer wall of the passage L' , a spring n' being interposed between the valve and outer end of the cap for normally retaining the valve in contact with the seat n . A stud c^5 is supported by the end of the piston valve in alignment with the valve N which is adapted to unseat such valve when the valve mechanism is thrown into an extreme release position. An exhaust port b^5 extends from the end of the piston valve cylinder A' adjacent the cylinder head L . The passage L' communicates with a conduit l^3 leading to a supplemental reservoir.

The operation of my improved engineer's valve is as follows:

Running position.—The operating lever is moved toward the right in Fig. 3 until the piston o^2 occupies a position intermediate of the series of ports b' and b^2 , thereby connecting the main reservoir through the annular passage around the ports b' , the passage a^4 , reducing valve T and ports b^2 with the train pipe chamber A^2 , and thence directly with the train pipe through the coupling a^2 . The pressure in the train pipe is consequently reduced below that in the main reservoir to an extent corresponding to the reducing valve T . The piston valve c^3 occupies a position intermediate of the train pipe chamber and exhaust ports in this position of the valve.

Service application.—In order to effect a service application of the brakes, the hand lever H is moved toward the right in Fig. 3, thereby oscillating the shaft g and rocking the crank arm G thereon. This movement of the crank arm is transmitted to the floating lever F , and as the upper end of such floating lever is held immovable by reason of the pressure to which the balancing piston

D is exposed, the lever oscillates about its upper end as a fulcrum, thereby moving the valve rod *c* toward the right through the medium of the connecting link *F*². This movement of the valve rod moves the piston valve *c*² so as to cut off the communication between the ports *b*² and the train pipe, and coincidentally moves the piston valve *c*³ to a position in which the ports *b*³ are uncovered. Train pipe pressure then passes from the chamber *A*² through the ports *b*³ to the atmosphere until the reduction thereof is such that the pressure of the supplemental reservoir acting upon the outer surface of the piston D moves the latter against the reduced train pipe pressure toward the right. This movement of the piston D oscillates the floating lever *F* about its pivotal connection *g*¹ with the crank arm *G*, thereby moving the piston valves toward the left, so that the piston valve *c*³ covers the ports *b*³, cutting off further discharge of train pipe pressure, such movement of the valves being insufficient, however, for the valves *c*² to uncover the ports *b*². In order to apply the brakes with greater force, the hand lever is moved toward the right another notch, thereby moving the piston valve *c*³ sufficiently to uncover the exhaust ports *b*³ which remain uncovered until the additional reduction in train pipe pressure is such that the expansion of the pressure in the supplemental reservoir will move the piston D toward the right, and thereby again move the valve *c*³ to close the exhaust ports *b*³. The hand lever may be moved toward the right a number of times to effect a succession of reductions in train pipe pressure, the necessary movement of the hand lever being indicated by the notches in the segment *K*. Pressure is exhausted simultaneously from the branch train pipe leading to the locomotive brakes, inasmuch as the reduction of pressure in the chamber *A*² results in the valve *R*¹ lifting and permitting the pressure from the locomotive branch train pipe to freely pass through the passageway leading from the coupling *a*⁶ into the chamber *A*². The under surface of the piston *r*² is substantially equal in area to the surface of the valve *R*¹ above the annular valve seat *r*¹, thereby relieving the load upon the valve *R*¹ and balancing the same, so that it will quickly open immediately upon the pressure in the chamber *A*² falling below that in the passageway *a*⁶. Upon an equalization of pressure between the branch locomotive train pipe in the chamber *A*², the valve *R*¹ at once engages its seat *r*¹. The capacity of the supplemental reservoir is of such a size that the expansion of the air therein will exert a sufficient pressure on the outer surface of the piston D to move the same against a predetermined reduction in the train pipe pressure to which the inner surface of the

piston D is exposed. After each movement of the hand lever, the valve *c*³ remains open until the predetermined reduction in train pipe pressure has been effected, after which the preponderance of pressure to which the outer surface of the piston D is exposed from the supplemental reservoir will move the piston D toward the right and thereby cause the piston valve *c*³ to close the exhaust ports *b*³.

Emergency application.—For an emergency application of the brakes, the hand lever is moved toward the right (Fig. 3) until it engages the stop *k* at the end of the segment *K* and held in such position. This movement of the hand lever moves the valve *c*³ to the right of the series of ports *b*⁴, through the medium of the rock shaft *g*, crank arm *G*, floating lever *F*, link *F*² and valve rod *c*. Train pipe pressure then quickly exhausts to the atmosphere from the chamber *A*² through the ports *b*⁴. The position of the piston valve *c*¹ relatively to the ports *b*¹ is such that when the piston valve *c*³ occupies a position to the right of the ports *b*⁴, the valve *c*¹ will still occupy a position intermediate of the ports *b*¹ and the exhaust port *b*⁵, thereby preventing waste of pressure from the main reservoir. During the emergency application of the brakes, the pressure is exhausted from the branch pipe leading to the locomotive brake apparatus simultaneously with the exhaust of pressure from the train pipe, owing to the automatic lifting of the valve *R*¹ in the manner above described in connection with the service application.

Release position.—In order to release the brakes either after a service or emergency application, the hand lever *H* is moved toward the left into the position shown in Fig. 3, when it engages the spring stop *k*¹ at the end of the segment *K* (see Fig. 2). This return of the hand lever reciprocates the valve rod *c* toward the left (Fig. 3), through the intermediate connections, until the pin *c*⁵ engages and unseats the valve *N*, whereupon pressure is exhausted from the supplemental reservoir through the passage *L*¹, valve seat *n*¹ and exhaust port *b*⁵. The pressure to which the outer surface of the piston D is exposed is consequently reduced, while the pressure to which its inner surface is exposed is increased, by reason of the free passage of main reservoir pressure through the ports *b*¹ into the chamber *A*². The piston D is consequently quickly moved to its normal position at the left-hand end of the cylinder *A*⁴, during which the piston rod is automatically moved sufficiently toward the left to permit the check valve *N* to close, thereby discontinuing any further exhaust of pressure from the supplemental reservoir. When the hand lever *H* engages the spring stop *k*¹, the pawl *S* has engaged the lower end of the

arm P^2 of the bell crank lever and has been oscillated thereby against the tension of the spring s' to the position shown in Fig. 3. No pressure has, therefore, been exhausted from the branch train pipe leading to the locomotive brakes, and the locomotive brakes consequently have remained applied while the brakes have been released on the cars of the train. After the release of the brakes on the cars, the hand lever H is moved still farther toward the left in Fig. 3, that is, toward the right in Fig. 2, so as to force outwardly the spring actuated stop k' against the tension of the spring k^2 . This further movement of the hand lever H permits the pawl S to pass the lower end of the arm P^2 of the bell crank lever into the position shown by dotted lines in Fig. 3. The pressure upon the hand lever H is then discontinued so that the spring stop k' turns the lever slightly to the right in Fig. 3 and to the position shown in Fig. 2. This movement of the hand lever oscillates the crank arm G and with it the pawl S. The pawl S oscillates the bell crank lever so that the valve R is lifted through the engagement of the bifurcated end P' of the bell crank lever with the collar p' on the valve rod R. The main reservoir pressure then quickly passes from the chamber A^2 , through the chamber A^5 , past the valve R, and through the coupling a^6 to the locomotive train pipe, thereby releasing the brakes on the locomotive and tender. The pawl S continues to engage the lower end of the bell crank lever while the hand lever H is moved to running position, so that both the train pipe leading to the cars on the train and the branch train pipe leading to the locomotive and tender brakes are in communication with the main reservoir through the passage controlled by the reducing valve T. The further movement of the hand lever H toward the right in Fig. 3 causes the pawl S to pass out of engagement with the lower end of the bell crank lever so that the bell crank lever is not again oscillated by the pawl S until the parts have been again moved into the position shown in dotted lines in Fig. 3, which occurs after the release of the brakes on the cars of the train. After the pressure from the main reservoir has passed directly through the ports b' to the train pipe chamber A^2 and thence to the train pipe and locomotive branch train pipe long enough to release the brakes, the hand lever is moved toward the right (Fig. 3) a distance sufficient to move the piston valve c^2 from a position at the left of the ports b' to a position intermediate of the ports b' and b^2 , thereby connecting the train pipe with the main reservoir through the reducing valve only.

From the foregoing description, it will be observed that I have invented an improved engineer's valve which will, by a single op-

eration, effect the application of the brakes on the cars, and also on the locomotive, but which will only release the brakes on the locomotive by an operation separate from and subsequent to the operation which releases the brakes on the cars of the train. It will, therefore, be evident that I have invented an improvement which will enable the engineer to retain the brakes set upon the locomotive and tender until after the brakes have been released on the cars, thereby obviating the objection to the serial release of the brakes on the locomotive and cars, due to the weight of the locomotive tending to break the couplings owing to its weight when on a down grade.

While I have illustrated and described my invention for delaying the release of the locomotive brakes until after the release of the brakes on the cars in connection with my improved engineer's valve covered by application Serial No. 489,423, filed April 20, 1909, yet it is to be understood that my invention may be applied to other forms of engineers' valves, and I, therefore, do not wish to be understood as being limited in the application of my present invention to any particular form of engineers' valves.

While I have illustrated and described my invention with more or less detail, yet it is to be understood that I do not consider my invention to be restricted to any specific embodiment, but may be expressed in any physical forms coming within the terms of my claims.

I claim:

1. An engineer's valve comprising valve mechanism for connecting the train pipe with the exhaust or with the main reservoir to apply or release the brakes, a supplemental valve controlling the connection of the main reservoir with the locomotive brake apparatus, and manually operated means for first actuating said valve mechanism and subsequently actuating said supplemental valve.

2. An engineer's valve comprising valve mechanism for connecting the train pipe with the exhaust or with the main reservoir to apply or release the train brakes, supplemental means controlling the connection of the main reservoir with the locomotive brake apparatus, and operating means for first actuating said valve mechanism and subsequently actuating said supplemental means.

3. In an engineer's valve, the combination with a valve casing communicating with the train pipe, main reservoir, exhaust, and locomotive branch train pipe, of valve mechanism controlling the communication between the train pipe and exhaust and main reservoir to effect the application and release of the brakes on the cars, a supplemental valve for controlling the connection

of the main reservoir with the locomotive brake apparatus, and manually operated means for first actuating said valve mechanism and subsequently actuating said supplemental valve.

4. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of valve mechanism for controlling the connection of said chamber with the main reservoir and with the exhaust, a valve controlling the communication between said chamber and the locomotive brake apparatus, and means for actuating said valve mechanism to connect said chamber with the main reservoir and for subsequently actuating said valve to connect said chamber with the locomotive brake apparatus.

5. In an engineer's valve, the combination with a casing comprising a chamber in communication with the train pipe, of valve mechanism for controlling the connection of said chamber with the main reservoir and with the exhaust, a passageway leading from said chamber to the locomotive brake apparatus, a valve controlling said passageway and seating toward the locomotive brake apparatus, means actuating said valve mechanism, and connections operated by said means to lift said valve after said valve mechanism has connected said chamber with the main reservoir.

6. In an engineer's valve, the combination with a casing in communication with the main reservoir, exhaust port, train pipe and locomotive branch train pipe, of valve mechanism for simultaneously connecting the train pipe and locomotive branch train pipe with the exhaust port and directly connecting the train pipe with the main reservoir, a separate valve for controlling the communication of the main reservoir with the locomotive branch train pipe, and means for actuating said valve mechanism to connect the main reservoir with the train pipe and sub-

sequently actuating said separate valve for connecting the main reservoir with the locomotive branch train pipe.

7. In an engineer's valve, the combination with a casing in communication with the main reservoir, exhaust port, train pipe and locomotive branch train pipe, of valve mechanism for simultaneously connecting the train pipe and locomotive branch train pipe with the exhaust port and directly connecting the train pipe with the main reservoir, a separate valve for controlling the communication of the main reservoir with the locomotive branch train pipe, a hand lever for operating said valve mechanism, a second lever for unseating said valve, and means actuated by said hand lever to oscillate said second lever and unseat said valve subsequently to the movement of said valve mechanism into position to connect the train pipe with the main reservoir.

8. In an engineer's valve, the combination with a casing in communication with the main reservoir, exhaust port, train pipe and locomotive branch train pipe, of valve mechanism for simultaneously connecting the train pipe and locomotive branch train pipe with the exhaust port and directly connecting the train pipe with the main reservoir, a separate valve for controlling the communication of the main reservoir with the locomotive branch train pipe, a hand lever for operating said valve mechanism, a bell crank lever for unseating said valve, a pawl carried by said hand lever and adapted to engage said bell crank lever to unseat said valve after said hand lever has moved the valve mechanism into position to connect the train pipe with the main reservoir.

In testimony whereof, I have subscribed my name.

WILLIAM A. PENDRY.

Witnesses:

GEO. L. WILKINSON,
HARRY S. GAITHER.