(No Model.) 2 Sheets—Sheet 1.

J. M. HURST.

FLUID PRESSURE BRAKE.

No. 563,770. Patented July 14, 1896.

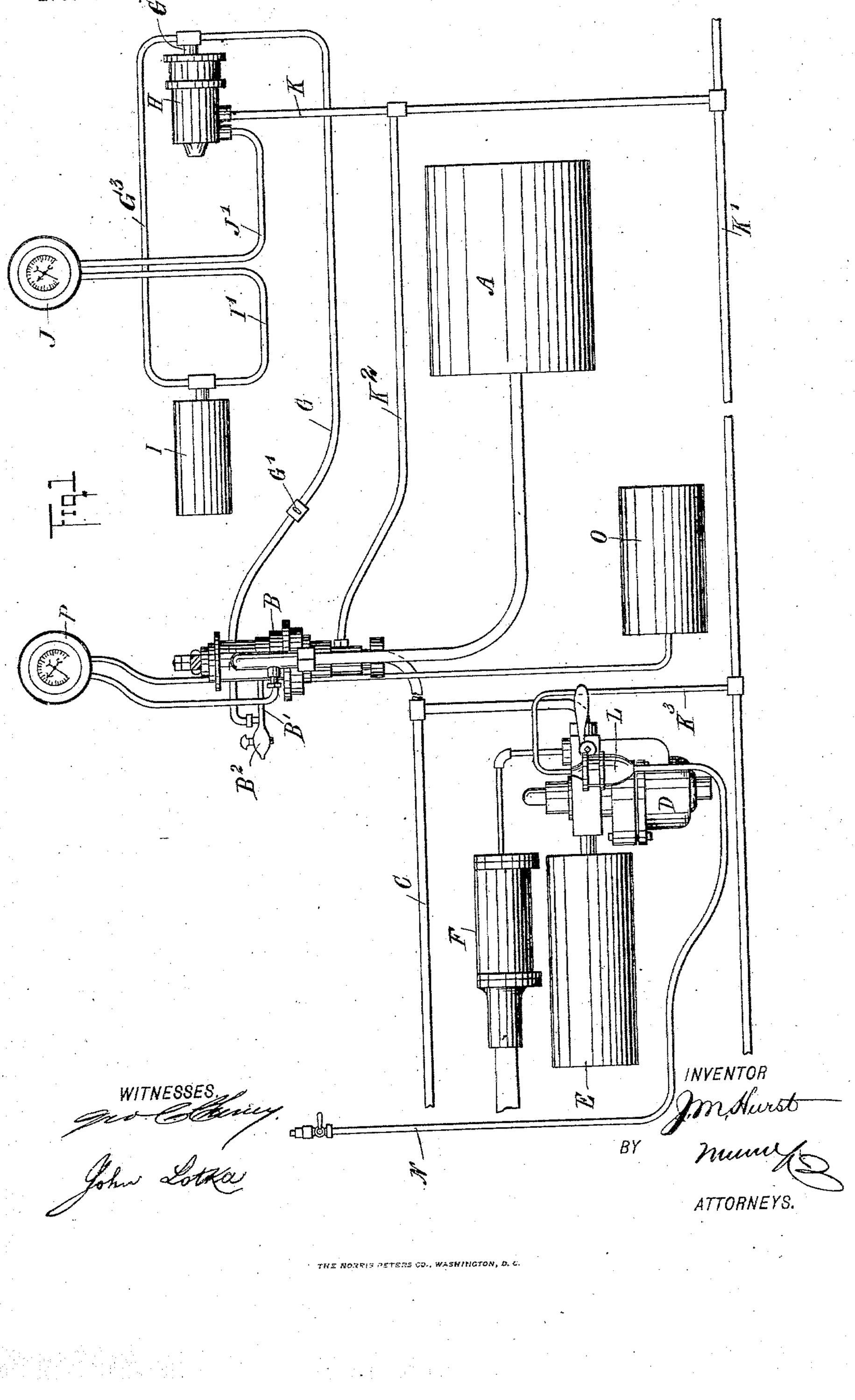

Fig. 1.

WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

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Fig 2

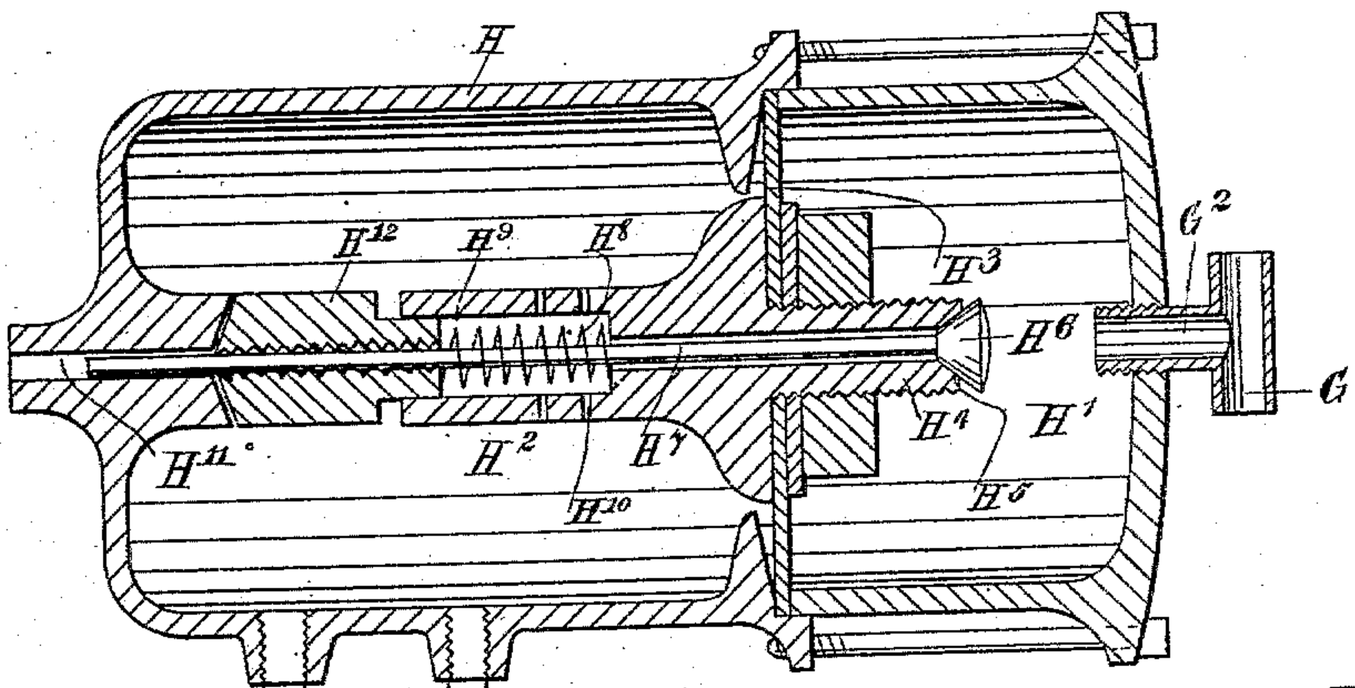


Fig 3

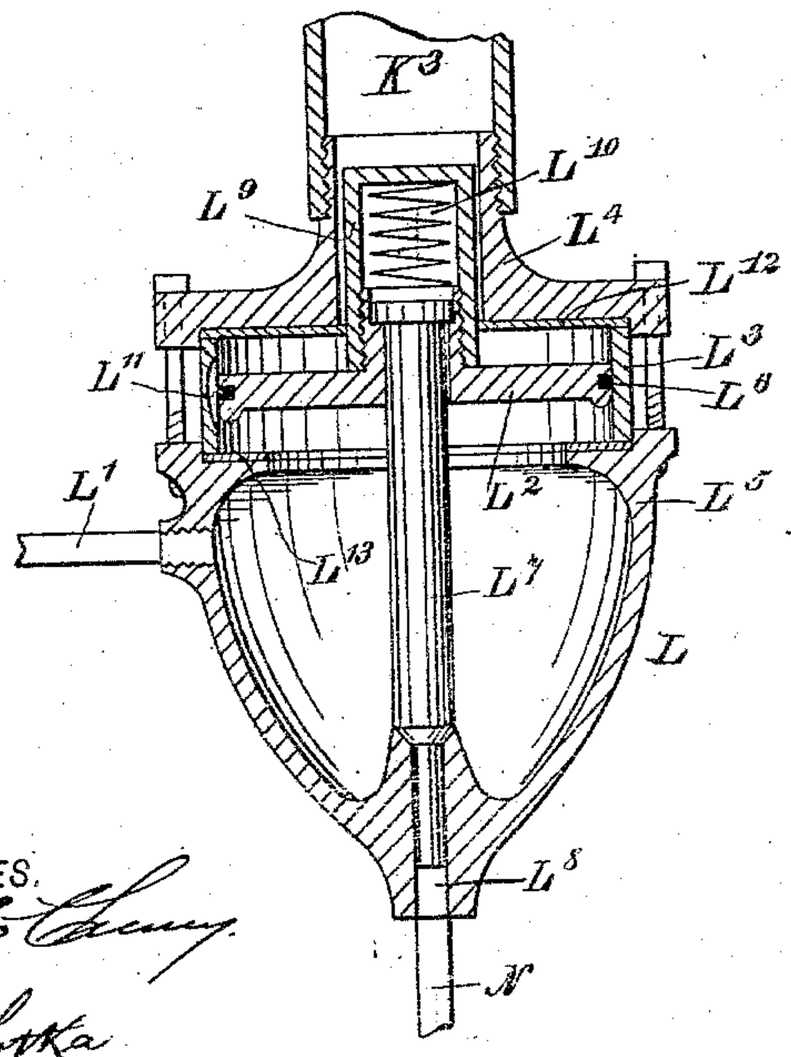
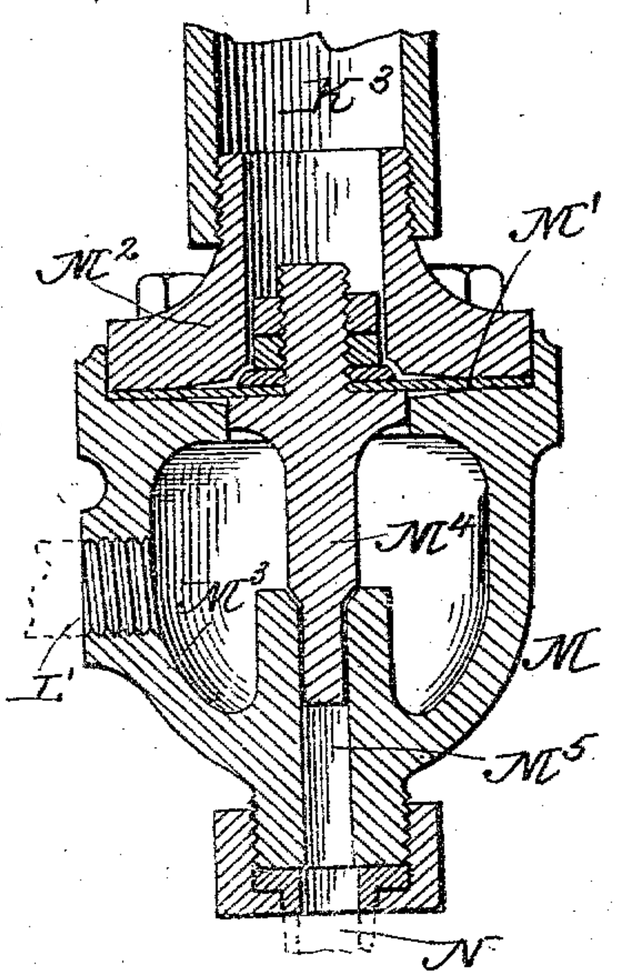


Fig 4



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FLUID-PRESSURE BRAKE.

SPECIFICATION forming part of Letters Patent No. 563,770, dated July 14, 1896.

Application filed September 5, 1895. Serial No. 561,486. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. HURST, of Salt Lake City, in the county of Salt Lake and Territory of Utah, have invented certain new and useful Improvements in Fluid-Pressure Brakes, of which the following is a full, clear, and exact description.

My invention relates to fluid-pressure brakes; and it has for its object to give the engineer full control of the pressure in the brake-cylinders, that he may increase or decrease the pressure therein at will, and recharge the train while the brakes are set, and to utilize the air which, according to the present practice, is allowed to escape to the atmosphere from the preliminary exhaust-port of the engineer's brake-valve.

The invention comprises a retaining-valve and a retaining-reservoir connected to the said preliminary exhaust-port, and also connections from the brake-cylinders to the said retaining-valve.

The present invention is described, but not claimed, in my patent, No. 547,351, dated October 1, 1895. I also make use in the present invention of the air discharged from the train-pipe exhaust-port of the engineer's brake-valve, as set forth in the above-named patent.

The invention will be fully described hereinafter, and the features of novelty pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a diagrammatic side elevation showing the several parts of my improved brake mechanism and their connections. Fig. 2 is an enlarged vertical section of the retaining-valve. Fig. 3 is a like view of the interposed valve which is employed in conjunction with the triple valve, as set forth in my patent above referred to; and Fig. 4 is a similar view of a modified construction of the interposed valve.

On the locomotive is arranged the usual main reservoir A, adapted to contain the compressed air supplied from the air-pump (not shown) and to deliver said air to the engineer's brake-valve B. P is the usual double-pressure gage, having one hand to indicate the pressure in the main reservoir and another hand to indicate the pressure in the train-pipe C. The connections of these parts with the engineer's brake-valve are well known, and therefore have not been illustrated in detail.

O is an auxiliary reservoir, which is known as the brake-valve reservoir.

So far the parts are, or may be, of the usual construction.

According to my invention, a pipe B′ is connected to the preliminary exhaust-port of the engineer's brake-valve, said pipe terminating in a petcock B^2, and connecting with another pipe G, which has a branch or nipple G^2, connected to the retaining-valve H, and another branch G^3, connected to the retaining-reservoir I. This valve and reservoir usually are located on the engine, although they may be disposed at any other convenient place.

The retaining-valve H, as illustrated in Fig. 2, is divided into two compartments H′ and H^2 by means of a movable partition H^3, which may be in the nature of a piston or of a diaphragm, as shown. The diaphragm at its center supports a pipe H^4, projecting into both compartments and formed at the end located within the compartment H′ with a seat H^5, adapted to receive a valve H^6. The nipple G^2 is connected to the compartment H′, so that the said compartment communicates with the preliminary exhaust-port of the engineer's brake-valve. The valve H^6 is rigidly secured to a stem H^7, which extends loosely through the pipe H^4, and on the said stem is coiled a spring H^8, contained in an enlarged portion H^9 of the pipe H^4. Ports H^{10} lead from the interior of the said enlarged portion into the compartment H^2 of the retaining-valve. A double-pressure gage J, similar in construction to the pressure-gage P, is connected by a pipe J′ with the compartment H^2 of the retaining-valve and by a pipe I′ with the retaining-reservoir I. To the opposite end of the stem H^7 from the valve H^6 is rigidly secured a valve H^{12}, adapted to be seated on the end of the valve-casing H. The outer end of the stem H^7 projects into an exhaust-aperture H^{11}, whereby the compartment H^2 of the retaining-valve communicates with the atmosphere when the valve H^{12} is unseated.

A whistle may be provided on the pipe G, as indicated at G′, for the purpose of giving a signal when air is passing through the said pipe. From the exhaust-port of the train-pipe C on the engineer's brake-valve B extends a pipe K^2, from which a branch pipe K leads to the compartment H^2 of the retaining-valve. Thus it will be seen that one compartment of the retaining-valve is connected to the preliminary exhaust-port of the engineer's brake-valve B, and the other compartment to the train-pipe exhaust-port. The pipe K also communicates with an auxiliary train-pipe K′, which I term a "retaining-pipe." From this retaining-pipe a branch pipe K^3 extends to a valve L, which is connected to the exhaust-port of the triple valve D by means of a pipe L′, so that the said valve L is interposed between the retaining-pipe and the triple valve.

The interposed valve L, like the retaining-valve H, is divided into two compartments by a movable transverse wall, which may be a diaphragm, as shown in Fig. 4, or a piston, as shown in Fig. 3. The piston L^2 is mounted to slide in a ring or sleeve L^3, held between the cap L^4 and the body L^5 of the interposed valve. (See Fig. 3.) The compartment above the piston L^2 is connected to the retaining-pipe K′ by means of the pipe K^3, and the lower compartment is connected to the exhaust-port of the triple valve D by means of the pipe L′. The piston L^2 is provided with an elastic packing-ring or snap-ring L^6, having a sufficient frictional engagement with the ring L^3 to prevent the piston from changing its position under the influence of gravity.

The piston L^2 is fitted to slide on a piston-rod L^7, seated at its lower end on an exhaust-opening L^8, connected with a pipe N, which normally is open to the atmosphere. The piston-rod L^7 fits into a cap L^9, which forms a part of the piston L^2 and contains a spring L^{10}, having a tendency to force the rod L^7 down on its seat, it being understood that the lower end of the said rod acts as an exhaust-valve. On the inside of the ring L^3 is cut a small leakage-groove L^{11} to allow air to pass by the piston L^2 when there is an excess of pressure of two pounds or less on either side of the piston. If the difference is more than two pounds, the groove L^{11} will not suffice to equalize the pressure, but the piston L^2 will be forced toward the weaker side to the end of its stroke, forming an air-tight joint against one of the gaskets L^{12} and L^{13}, arranged, respectively, in the cap L^4 and in the upper part of the body L^5.

In regard to the relative dimensions of the parts I would observe that it is preferable to have the same relation between the sizes of the auxiliary reservoir E and the brake-cylinder F as between the retaining-pipe K′ and the train-pipe C, and the same relation is also preferable in regard to the brake-valve reservoir O on the engine, the retaining-valve H, and the retaining-reservoir I.

The operation of the herein-described apparatus is as follows: When the engineer wishes to retain the brakes set, he must close the cock B^2 before making the application. When the engineer, in applying the brakes, operates the engineer's brake-valve B, air is allowed to escape from the peliminary exhaust-port of the said valve through the pipes B′ and G G^2 (sounding the whistle G′) into the compartment H′ of the retaining-valve H, and through the pipe G^3 into the retaining-reservoir I. The spring H^8 of the retaining-valve may have a resistance of about three pounds to the square inch relatively to the diaphragm H^3, so that when there is an excess of pressure of more than three pounds in the compartment H′ the spring H^8 will yield and permit the diaphragm H^3 to move toward the compartment H^2. At the same time the valve-seat H^5 will be moved away from the valve H^6, which remains stationary, so that air can flow from the compartment H′ through the pipe H^4 into the enlarged part H^9 of said pipe, and thence through the ports H^{10} into the compartment H^2. As this compartment, by means of the pipe K, communicates with the retaining-pipe K′, it follows that the pressure in the compartment H′ can at no time remain more than three pounds greater than in the compartment H^2. The air discharged from the preliminary exhaust-port is utilized to produce counter-pressure on the diaphragm H^3 of the retaining-valve and to control the release of the brakes, in a manner more fully described hereinafter.

During the application of the brakes air passes from the main or train pipe exhaust-port of the engineer's brake-valve B through the pipes K^2 and K to the retaining-pipe K′, and also to the compartment H^2 of the retaining-valve H. At the same time the usual flow of air takes place from the auxiliary reservoir E of each car to the brake-cylinder F of each car. The air discharged into the retaining-pipe K′ produces a pressure in the upper compartments of the interposed valves L and forces the pistons L^2 down on the lower gasket L^{13}.

It will be understood that the compartments H′ and H^2 of the retaining-valve H are charged with air of about the same pressure.

When it is desired to release the brakes, the engineer turns the brake-valve B into the release position, thereby recharging the train-pipe C and the auxiliary reservoirs E on the cars with air. At the same time, owing to the well-known change in the position of the triple valve D, air is allowed to flow from the brake-cylinders F of each car to the exhaust-port of the triple valve and through the pipe L′ into lower compartment of the interposed valve L. The pressure in said lower compartment will cause the piston L^2 to rise to the position shown in Fig. 3, in which the

compartments or chambers of the interposed valve communicate through the medium of the leakage-groove L^{11}. The pressure in the upper compartment of the interposed valve prevents the valve L^7 from becoming unseated, and the leakage-grooves L^{11} permit the pressure to become equalized in all the brake-cylinders, as with the position of the interposed valve shown they are all in communication with the retaining-pipe K'. The engineer then opens the petcock B^2. If this cock is opened but shortly, the brakes will be partially released. This is effected in the following manner: The pressure in the pipe G and compartment II of the retaining-valve being reduced in consequence of the opening of the cock B^2 and the escape of air from the said compartment and from the reservoir I, there will be a preponderance of pressure in the compartment II^2, which will move the diaphragm II^3 and unseat the valve II^{12}, so that a corresponding amount of air in pounds (not in quantity) will escape to the atmosphere through the port II^{11} in the end of the compartment II^2. Thus the pressure in the retaining-pipe K' will be reduced correspondingly, and the pistons L^2 of the interposed valves L will move upward from the position illustrated by Fig. 3 and into contact with the upper gasket L^{12}, so that the communication between the two compartments of the interposed valve is interrupted.

The rising movement of the piston L^2 causes the valve L^7 to become unseated, thereby allowing a corresponding amount of air in pounds to flow from each brake-cylinder F through the port L^8 of the interposed valve L, connected thereat to the pipe N and to the atmosphere. The gage J on the engine will show the reduction of the pressure in the brake-cylinder.

It will be understood that by the use of the above-described device the engineer is enabled to control the pressure in the auxiliary reservoirs E and in the brake-cylinders F, and the air which in the present brake apparatus is lost in replenishing the said auxiliary reservoirs is retained. Furthermore, the pressure in all the brake-cylinders of the train is equalized, and I save both the air which in the usual brakes is allowed to escape from the preliminary exhaust-port of the engineer's brake-valve B and also the air escaping from the main train-pipe exhaust-port of the said valve B, and utilize this exhaust-air to retain the air in the brake-cylinders and to control the pressure therein.

The provision of the reservoir I and the retaining-valve II also enables the engineer to partly release the brakes by slightly opening the cock B^2, and thus making the required reduction of pressure from the compartment II' of the retaining-valve II. I would also observe that by providing the reservoir I and the retaining-valve II, I am enabled to employ the arrangement hereinbefore described on a train composed partly of cars equipped with my improved brake apparatus and partly with cars provided with air-brakes of other systems. In such a case, when the brakes are applied and it is desired to retain the exhaust-air, the cock B^2 is closed, as above described, and a certain amount of air will escape from each car through the train-pipe C into pipe K^2; but as only a part of the cars have retaining-pipes K', more air will enter the pipes K^2 K' K^3 and compartment II^2 of the retaining-valve II than the said pipes and valve can hold at the intended pressure, and in consequence thereof the valve II^{12} will be moved off its seat and the superfluous air from the cars not equipped according to my invention will escape through the outlet II^{11}.

In case the train should part into two sections, breaking the retaining-pipe K' and allowing the air to escape therefrom, the pressure in the compartment II^2 of the retaining-valve would be reduced correspondingly and the diaphragm H^3 would move so as to unseat the valve H^6, allowing the surplus of air to pass from the compartment H' to the compartment H^2, so that when the train sections would be again coupled together there would be only an excess of pressure of three pounds or less in the compartment H'.

I desire it to be understood that various changes may be made in the construction and arrangement of the several parts without departing from the nature of my invention, which consists in the particular connections and combinations defined in the claims.

As illustrated by Fig. 4, the interposed valve M is constructed with a diaphragm M', held between the cap M^2 and the body M^3 of the interposed valve. The compartment above the diaphragm M' is connected to the retaining-pipe K' by means of the pipe K^3, and the lower compartment is connected to the exhaust-port of the triple valve D by means of the pipe L'. To the diaphragm is secured, so as to move in unison therewith, a rod M^4, having guided movement in the outlet or exhaust opening M^5, which leads to the pipe N. This rod, like the rod L^7 in Fig. 3, is adapted to close or open the said exhaust-port M^5. The operation of this form of interposed valve is substantially the same as that described hereinbefore with reference to the construction shown in Fig. 3.

Having thus described my improvement in fluid-pressure brakes, I claim as my invention and desire to secure by Letters Patent—

1. A fluid-pressure brake, provided with a retaining-pipe having a valved connection to the preliminary exhaust-port of the engineer's brake-valve, and another connection to the brake-cylinders, substantially as described.

2. A fluid-pressure brake, provided with a comparted retaining-valve, one chamber whereof is connected to the preliminary exhaust-port of the engineer's brake-valve, to receive the exhaust fluid therefrom, and a connection from the other chamber of the re-

taining-valve to the brake-cylinders, substantially as described.

3. A fluid-pressure brake, provided with a comparted retaining-valve, one chamber whereof is connected to the preliminary exhaust-port of the engineer's brake-valve to receive the exhaust fluid therefrom, a retaining-reservoir connected to said chamber, and a connection from the other chamber of the retaining-valve to the brake-cylinders, substantially as described.

4. A fluid-pressure brake provided with a retaining-pipe connected to the train-pipe exhaust-port of the engineer's brake-valve to receive the exhaust fluid therefrom, a connection between the retaining-pipe and the exhaust-port of the triple valve, a valve interposed in said connection and controlling the exhaust from the brake-cylinder, and a retaining-valve having a movable partition dividing it into two compartments, one of which is connected to the retaining-pipe, and the other to the preliminary exhaust-port of the engineer's brake-valve, substantially as described.

5. A fluid-pressure brake, provided with a retaining-valve having a movable wall or partition dividing it into two compartments, a connection from one of the said compartments to the preliminary exhaust-port of the engineer's brake-valve, a connection from the other compartment to the main train-pipe exhaust-port of the engineer's brake-valve, and a connection from the said second compartment or the retaining-valve to the brake-cylinders, substantially as described.

6. A fluid-pressure brake, provided with a retaining-valve having a movable wall or partition dividing it into two compartments, a connection from one of the said compartments to the preliminary exhaust-port of the engineer's brake-valve, a connection from the other compartment to the main train-pipe exhaust-port of the engineer's brake-valve, an exhaust-valve located in the said second compartment and controlled by the movement of the said wall or partition, a retaining-pipe also connected to the said second compartment, and a valve interposed between the said retaining-pipe and the exhaust-port of the triple valve and controlling the exhaust from the brake-cylinder, substantially as described.

7. A fluid-pressure brake, provided with a comparted retaining-valve, one chamber whereof is connected to the preliminary exhaust-port of the engineer's brake-valve to receive the exhaust fluid therefrom, an escape-cock interposed between the said preliminary exhaust-port and the retaining-valve, and a connection from the other compartment of the retaining-valve to the brake-cylinders, substantially as described.

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Witnesses:
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E. A. VAIL.