(No Model.) 2 Sheets—Sheet 1.

R. SOLANO.

AUTOMATIC AIR BRAKE.

No. 376,970. Patented Jan. 24, 1888.

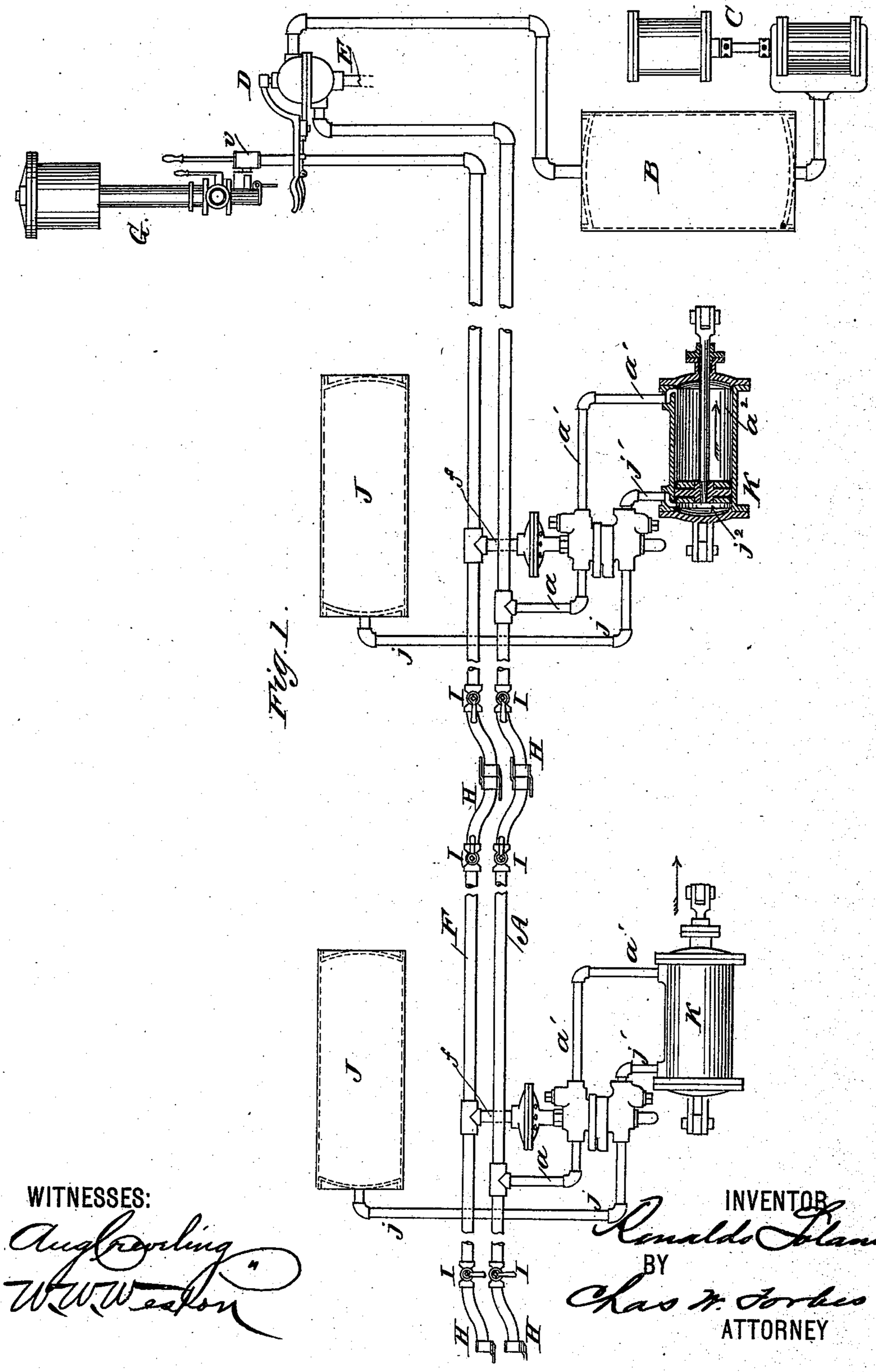

Fig. 1.

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Fig. 2.

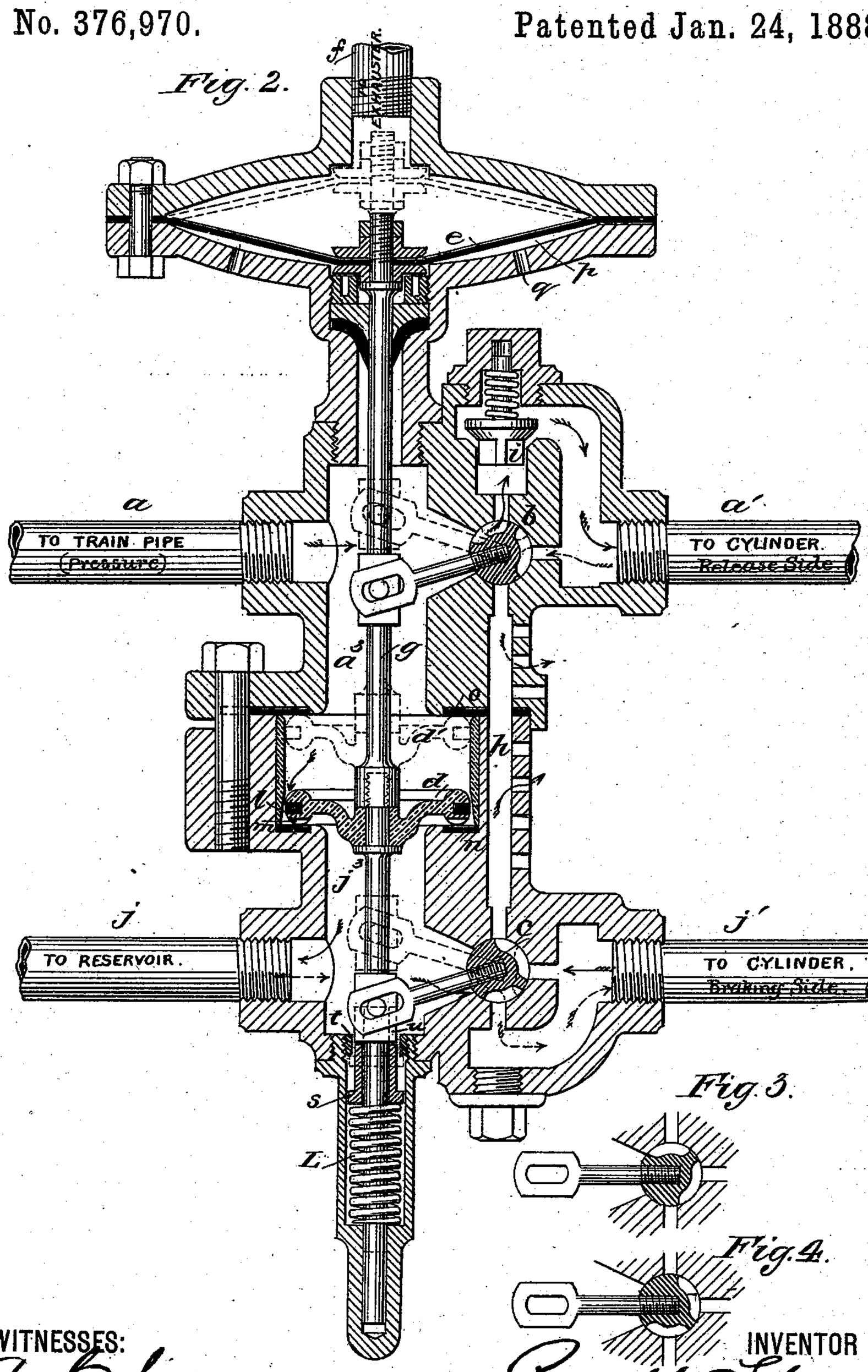

Fig. 3.

Fig. 4.

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RENALDO SOLANO, OF BROOKLYN, ASSIGNOR TO HOWARD & MORSE, OF NEW YORK, AND DAVID R. MORSE, OF BROOKLYN, NEW YORK.

AUTOMATIC AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 376,970, dated January 24, 1888.

Application filed August 11, 1887. Serial No. 246,646. (No model.)

To all whom it may concern:

Be it known that I, RENALDO SOLANO, a citizen of the United States, residing in the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Automatic Air-Brakes, of which the following is a specification, that will enable others skilled in the art to which my invention appertains to understand and use the same, reference being had to the accompanying drawings, in which—

Figure 1 is a plan showing diagrammatically the general organization of an apparatus embodying my invention, applicable to the cars and locomotive of a train; Fig. 2, an enlarged sectional view of the automatic brake-valves, and Figs. 3 and 4 detail views showing said valves at mid-stroke.

This invention relates to the class of fluid-brake apparatus in which stored pressure is rendered active upon the braking appliances automatically by the reduction of pressure in the train-pipes.

The invention consists in a method by which the control of the engineer is extended to a variable degree of brake application predetermined by noting the reduction of pressure indicated by the train-pipe gage, the produced effect corresponding to that described in my application for a patent filed July 5, 1887, Serial No. 243,317. The actuating mechanism for the brake-cylinder valves in the present instance is balanced between the opposing pressures—namely, the stored pressure and the train-pipe pressure—so that the reduction of either shall actuate the said valves, and that a given reduction of train-pipe pressure may be employed to predermine the extent of brake-stroke by limiting both the period of cylinder-exhaust and the period of braking-pressure application simultaneously on opposite sides of the brake-piston.

In Fig. 1, A is the pressure train-pipe, receiving its charge from the main reservoir B and air-compressor C, under control of the engineer's operating valve D, located usually upon the locomotive, the escape-pipe E affording alternate means of discharging pressure from said train-pipe A when the operating-valve D is moved for that purpose. F is a vacuum train-pipe from which the atmospheric pressure normally contained therein is withdrawn by means of the ejector G, the latter being of any well-known construction.

The vacuum train-pipe F and diaphragms *e*, Fig. 2, are employed as an independent means for operating the brake-cylinder valves, and are made a part of the subject-matter of a separate application to be filed. The said train-pipes are provided at their junctions between the cars with the usual flexible pipe-couplings, H, and are also provided at these points with cocks I, those rearmost of the train being kept closed.

J J are the auxiliary or storage reservoirs provided to each brake apparatus, located beneath the several cars, and K the brake-cylinders, the latter being of ordinary double-acting construction, as shown by the sectioned cylinder, and connected to the brake-levers so as to apply the brake when the pistons move in the direction indicated by arrows.

Referring to Fig. 2, the several pipes *a a' j j'* and the pipe *f* correspond to those similarly designated in Fig. 1, and the connections of the same will therefore be understood. By the arrangement of valve-ports shown the train-pipe pressure (of chamber a^3) and the storage-reservoir pressure (of chamber j^3) are alternately connective to the corresponding sides of the brake-cylinder—namely, the release side a^2 and the braking side j^2, respectively—the common exhaust-port *h* relieving the disconnected side in each instance by communication to the atmosphere. The valves *b* and *c* are cylindrical and of sufficient length to give the required area of ports, and, having a small diameter, oscillate, by the shifting movement of the piston *d* or diaphragm *e* and valve-stem *g*, with minimum friction. The check-valve *i* is provided to prevent back-pressure from the cylinder-chamber a^2 from filling the train-pipe *a* when pressure is reduced in the latter and during the shifting movement of the valve *b*. The brake-cylinder valves are here shown in the position whereby brake release is effected and the storage-pressure recharged, the opposite or braking position being indicated by the dotted lines, the corresponding movements of the fluid currents be-

ing indicated by the full lined and dotted arrows, respectively. The normal position of the brake-cylinder valves is that of mid-stroke, which is assumed after the equalization of pressures upon the valve-piston *d*, which event is incident to the termination of a predetermined braking stroke or to the completion of the storage-reservoir-charging operation, the action of a spring, L, hereinafter described, returning the piston *d* in the latter instance. The valve-piston *d* fits its cylinder air-tight, separating the train-pipe chamber a^3 from the reservoir-chamber j^3, excepting at the position of downstroke, at which time the enlarged portion of the cylinder at *l* and piston-passages *m* opposite the packing *n* permit the pressure restoration. The packings *n o* are designed to act as cushions to terminate the valve-piston stroke.

The retarding spring L insures against passage of the downward valve-stroke beyond mid-position during the return movement of the piston *d*, incident to the automatic limitation of brake-stroke. The washer *s* of the spring L slides loosely on the valve-stem *g* and abuts against the block *n*, except when disengaged therewith by the retention of its shoulder against the adjustable bushing *t*, through which its sleeve part moves. It is to be understood, however, that the spring L is not an essential feature of the apparatus, the return movement aforesaid of the valve-piston *d* being otherwise arrested at mid-stroke by the cessation of storage-pressure reduction through the valve *c* at the moment of cut off.

The operation of the invention is as follows: The train-pipe A, pipe *a*, valve-chamber a^3, cylinder-pipe *a'*, and release side a^2 of the brake-cylinder are charged to the air or other fluid-working pressure of the reservoir B through the engineer's valve D, the parts assuming the position shown by Fig. 2 until the reservoir J is charged, and subsequently the position of mid-stroke. To set the brake with full application, the pressure is released from the train-pipe A by the engineer's valve, the valve-piston *d* automatically shifted to the position *d'*, and there retained by the reservoir-pressure, permitting the latter to enter through the valve *c* to the braking side j^2 of the brake-cylinder, the opposite chamber, a^2, thereof discharging its pressure to the atmosphere through valve *b*. To set the brakes with a limited application, the train-pipe (A) pressure is reduced to a degree known to correspond with the reduction of the storage-pressure by expansion when the brake-piston has reached the desired intermediate point of stroke. The valve-piston *d* is thereby automatically shifted to the position *d'*, and there retained until the equalization takes place, when the continued reduction on the reservoir side j^3 causes the return movement of said valve-piston, sufficient to close all port-communication and lock the brake-piston between the confined pressures within the cylinder-chambers.

The brake-release is effected in either of the aforesaid instances by the restoration of train-pipe pressure from the main reservoir B.

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

In an automatic fluid-brake system, the method described of first reducing the controllable pressure to a desired degree, which allows the opposite stored air to act until reduced by expansion below the controllable pressure; second, closing communication of the stored and controllable pressure with the brake-cylinder, which retains the respective pressures therein, the valve-piston being arrested and held by the action of an auxiliary resisting-pressure and the stored air on one side and the controllable pressure on the other, and, third, exhausting either fluid-pressure from the brake-cylinder, so that the opposite fluid-pressure has full effect.

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Witnesses:
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