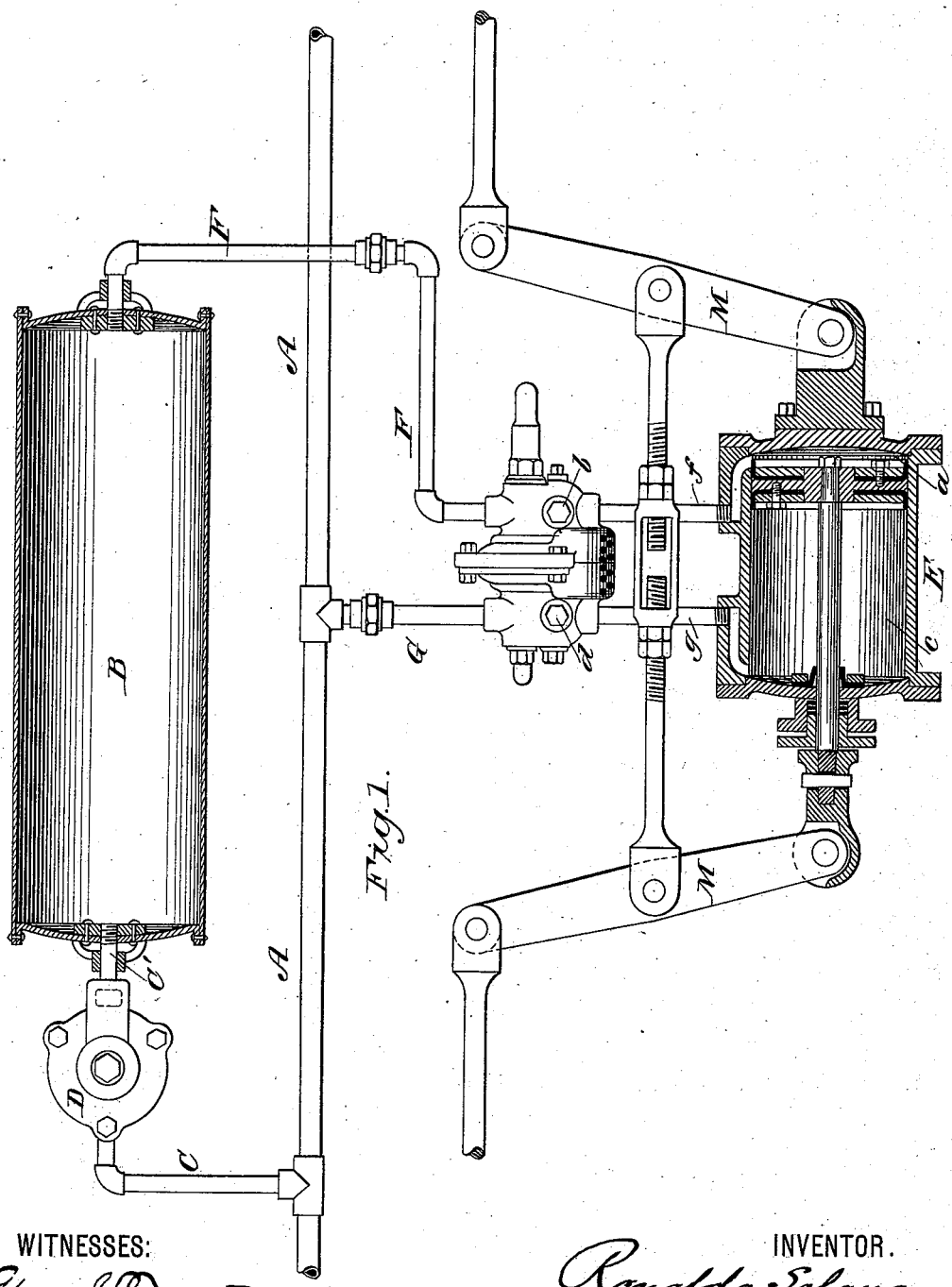
(No Model.) 2 Sheets—Sheet 1.

R. SOLANO.

AUTOMATIC AIR BRAKE.

No. 382,667. Patented May 8, 1888.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

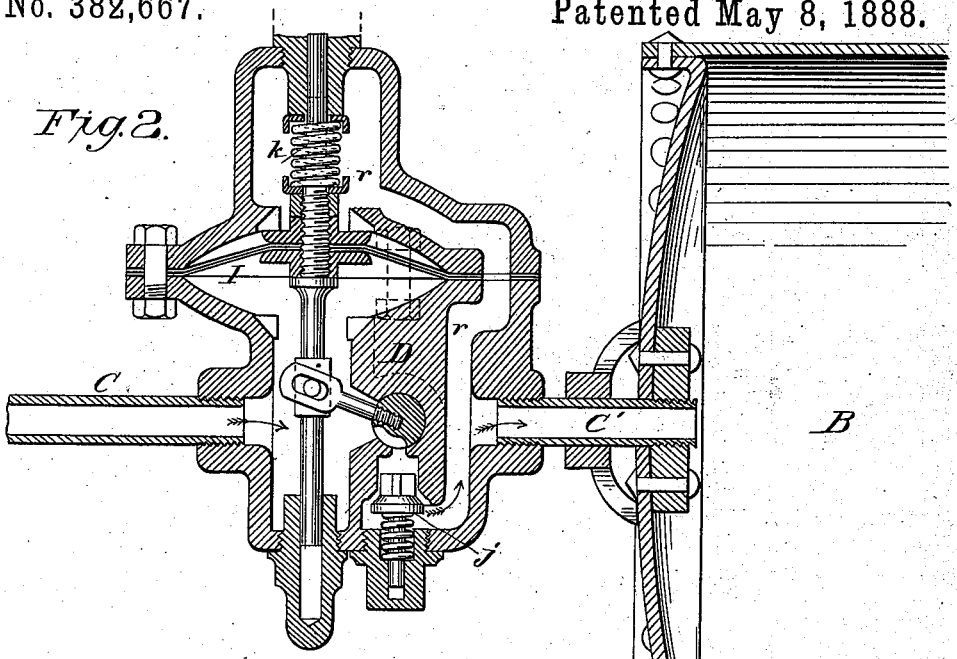


Fig. 4.

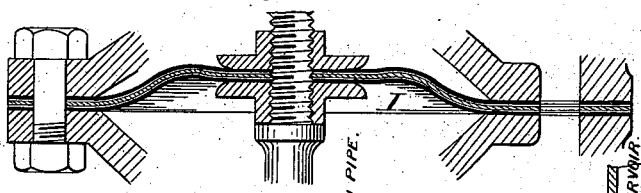
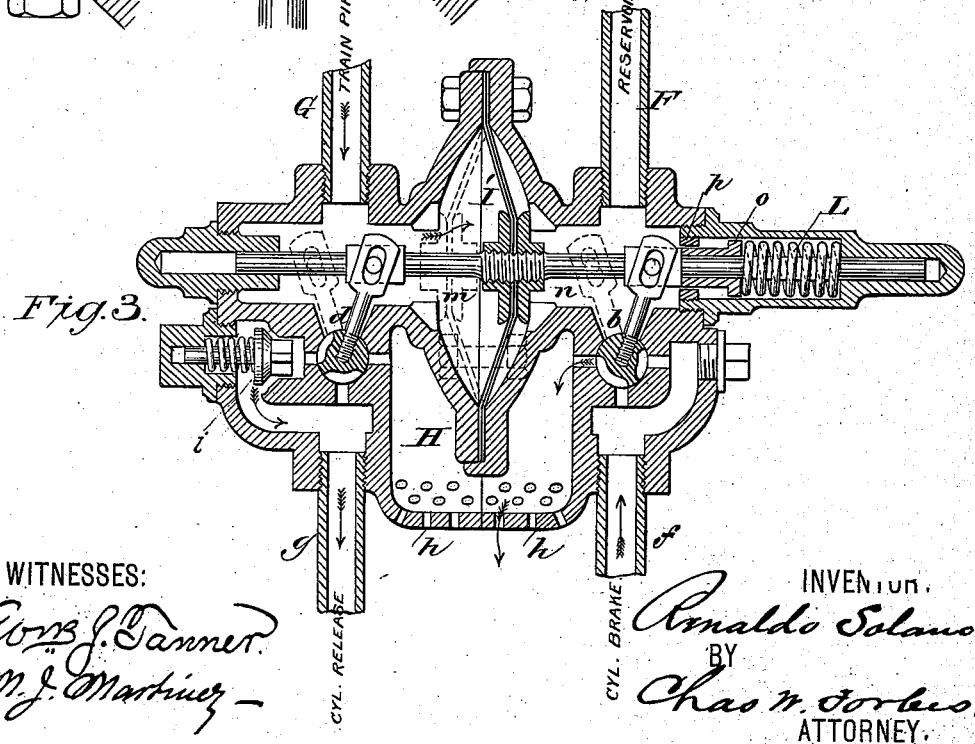


Fig. 3.



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UNITED STATES PATENT OFFICE.

RENALDO SOLANO, OF BROOKLYN, NEW YORK, ASSIGNOR OF TWO-THIRDS TO JOHN W. HOWARD AND DAVID R. MORSE, OF SAME PLACE.

AUTOMATIC AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 382,657, dated May 8, 1888.

Application filed November 5, 1887. Serial No. 251,371. (No model.)

To all whom it may concern:

Be it known that I, RENALDO SOLANO, a citizen of the United States, residing at Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Automatic Air-Brakes, of which the following is a specification.

This invention relates to improvements in fluid-brake apparatus wherein stored pressure is rendered active upon the braking appliances automatically by the reduction or exhaustion of pressure from the train-pipes, and the apparatus herein employed corresponds in several of its features to that described in my application for a patent filed August 11, 1887, Serial No. 246,647.

The object sought by the present invention is that of charging the storage-reservoir direct from the train-pipe through an independent and positive-acting automatic charging-valve, in lieu of charging through the brake-cylinder valve-actuating piston, as described in the said application, or of charging through any part of the brake-cylinder, cylinder-valves, or other mechanism pertaining thereto, as described in various patents heretofore. By this method of charging I embody in the best practicable form the employment of flexible pressure-diaphragms in lieu of pistons for actuating all of the valves, said pistons involving comparatively expensive construction and liability to bind in their cylinders, owing to varying differences of expansion between said cylinders and said pistons under varying climatic temperatures.

The invention therefore consists in charging the storage-reservoirs of the several cars of a train through special automatic valves actuated by diaphragms to open upon restoration of pressure in the train-pipe to the normal (subsequent to brake application) and to close after the train-pipe and reservoir pressures become equal or nearly equal, said closure continuing upon reduction of train-pipe pressure upon said diaphragms, as will hereinafter appear.

The invention also comprises an improved construction of the flexible diaphragms employed herein and adapted for durability.

Referring to the accompanying drawings, in which like letters of reference indicate like parts, Figure 1 is a plan view, partly in section, of the apparatus located upon each car composing a train; Fig. 2, an enlarged sectional view of the reservoir-valve in charging position; Fig. 3, an enlarged sectional view of the brake-cylinder valves, and Fig. 4 an enlarged detail view of the diaphragm employed in either of said valves.

In Fig. 1, A is the main train-pipe, charged from the main reservoir and exhausted by the usual appliances upon the locomotive.

B is one of the auxiliary or storage reservoirs, controllably communicative to said train-pipe through pipe C by valve D, Fig. 2, (shown in plan view in said Fig. 1,) and controllably communicative to the braking side A of the brake-cylinder E through pipes F *f* by the brake-cylinder valve *b*, Fig. 3. The releasing side *c* of said brake-cylinder is controllably communicative to the train-pipe A through the pipes G *g* by the brake-cylinder valve *d*. The brake-cylinder is alternately exhausted during brake application or brake release through said brake-cylinder valves *d* and *b*, respectively, into chamber H, opening to the atmosphere through perforations *h*.

In Fig. 3 the valves are shown in the act of effecting brake release, their normal position being that of mid-stroke, their operation and the function of the check-valve *i* and of the spring L corresponding to that described in the application hereinbefore referred to, and the same will not therefore require detailed description here.

The levers M are suitably connected to the brake-shoes to apply the latter when the brake piston-rod is forced out of the cylinder E. The diaphragm I of the valve D is permanently exposed on the opening side, as shown, to the train-pipe pressure and on its opposite or closing side to pressure in reservoir B through the port and chamber *r*.

The check-valve *j* of the charging-valve D is provided to insure a prompt severance of the passage intercepted by it immediately preceding the termination of the closing stroke of said valve D upon reduction of train-pipe pressure. The spring *k* is designed to assist the closing stroke of the valve D and cause

the same to occur slightly in advance of the equalization of pressures in the train-pipe and reservoir B, and consequently in chambers *m* and *n* of the diaphragm I′, in order that the latter may be properly actuated. It is to be observed that the pipe F may connect at any part of the reservoir, as by a T-connection to the section of pipe C′.

The diaphragms I I′ of the valves D, *d*, and *b* may be constructed, as more fully shown by Fig. 4, of an intermediate layer of flexible pressure-tight material—as rubber—and two protecting-layers cemented on either side thereof, or of any strong or heat-resisting material adapted to withstand the wear and tear of usage, as leather.

In the construction of valve-casings represented the diaphragms are clamped pressure-tight at their margins between the flanges of the separable casings by means of bolts *l*, as common in practice.

The operation of the invention is as follows: The train-pipe A, pipe G, diaphragm-chamber *m*, pipe *g*, and release side *c* of the brake-cylinder are charged to the compressed air or other fluid-working pressure of the main reservoir through the engineer's controlling-valve, (in the usual manner,) the parts assuming the position of active brake release shown by Figs. 1 and 3 until the reservoir B is charged with an equal or nearly equal degree of pressure from the simultaneous flow of train-pipe fluid through pipe and valve C D, said valve D having closed slightly in advance of said equalization. Upon approximate equalization of pressures in chambers *m* and *n* by reservoir-pipe F the diaphragm I′ and valves *b d* assume their position of mid-stroke by aid of spring L locking all the ports, said spring L ceasing to act beyond said position by abutment of the shouldered loose sleeve *o* on bushing *p*. The apparatus is now normal and in readiness to set the brakes with a full degree of application or a limited degree, as set forth in the specification cited, namely: For full application the pressure is released from the train-pipe A by the engineer's valve, the diaphragm I′ automatically shifted to the position shown by dotted lines, and there retained by the reservoir-pressure, (in B,) permitting the latter to enter through the valve *b* to the braking side *a* of the brake-cylinder, the opposite chamber, *c*, whereof discharges its pressure to the atmosphere through valve *d*.

To set the brakes with a given moderate 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 a given intermediate point of stroke. The diaphragm I′ is thereby automatically shifted to the position shown by dotted lines and there retained until the equalization takes place, when the continued reduction on the reservoir side *n* thereof (by expansion into the brake-cylinder) causes the return movement of said diaphragm sufficient to close all port communication and lock the brake-piston between the confined pressures within the cylinder-chambers.

It is to be understood that I do not confine myself to the specific form of mechanism herein employed to charge the storage-reservoir independently, and, furthermore, the same may be practiced in connection with any other form of brake-cylinder controlling-valve than that shown herewith.

Therefore I claim—

1. The combination, with an independent reservoir-charging valve, located as described, of an actuating-diaphragm (or equivalent) permanently exposed on one side to the reservoir-pressure and on its opposite side to the train-pipe pressure, and adapted to operate said charging-valve, for the purposes set forth.

2. The combination, with an independent reservoir-charging valve, located as described, and valve-actuating diaphragm, (or equivalent,) of a closing-spring adapted to close said charging-valve slightly in advance of the equalization of the lesser (reservoir) pressure with the predominating exterior (train-pipe) pressure, as and for the purposes set forth.

3. The combination, with the herein-described oscillating reservoir-charging valve and valve-actuating diaphragm, of a supplemental check-valve intercepting the communication between said charging-valve and the storage-reservoir, adapted to open toward the latter and to check return of pressure therefrom irrespective of said charging-valve movements when train-pipe pressure is reduced, as set forth.

RENALDO SOLANO.

Witnesses:
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WM. J. TANNER.