(No Model.) 2 Sheets—Sheet 1.

H. R. MASON.

QUICK RELEASE VALVE FOR AIR BRAKES.

No. 493,436. Patented Mar. 14, 1893.

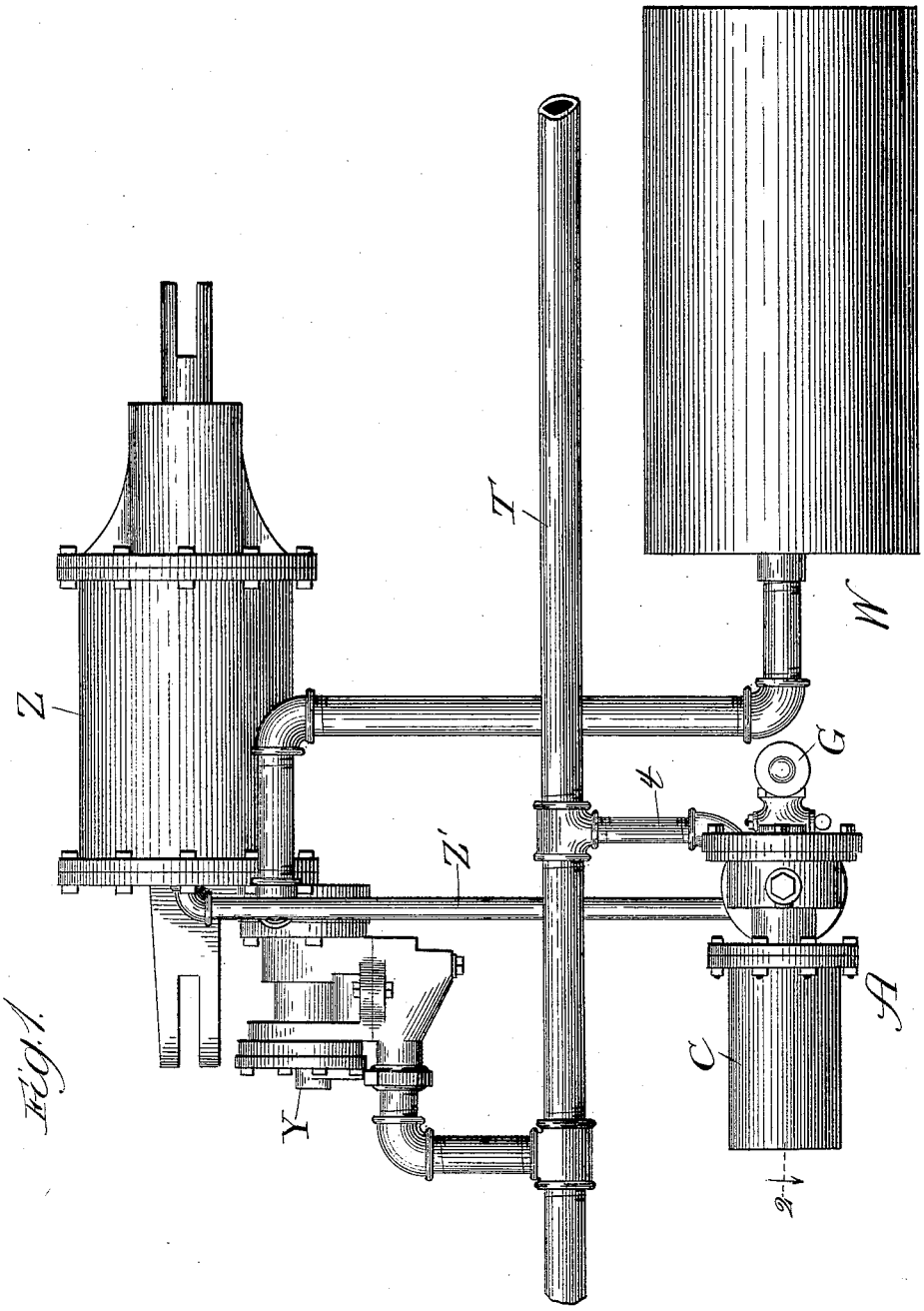

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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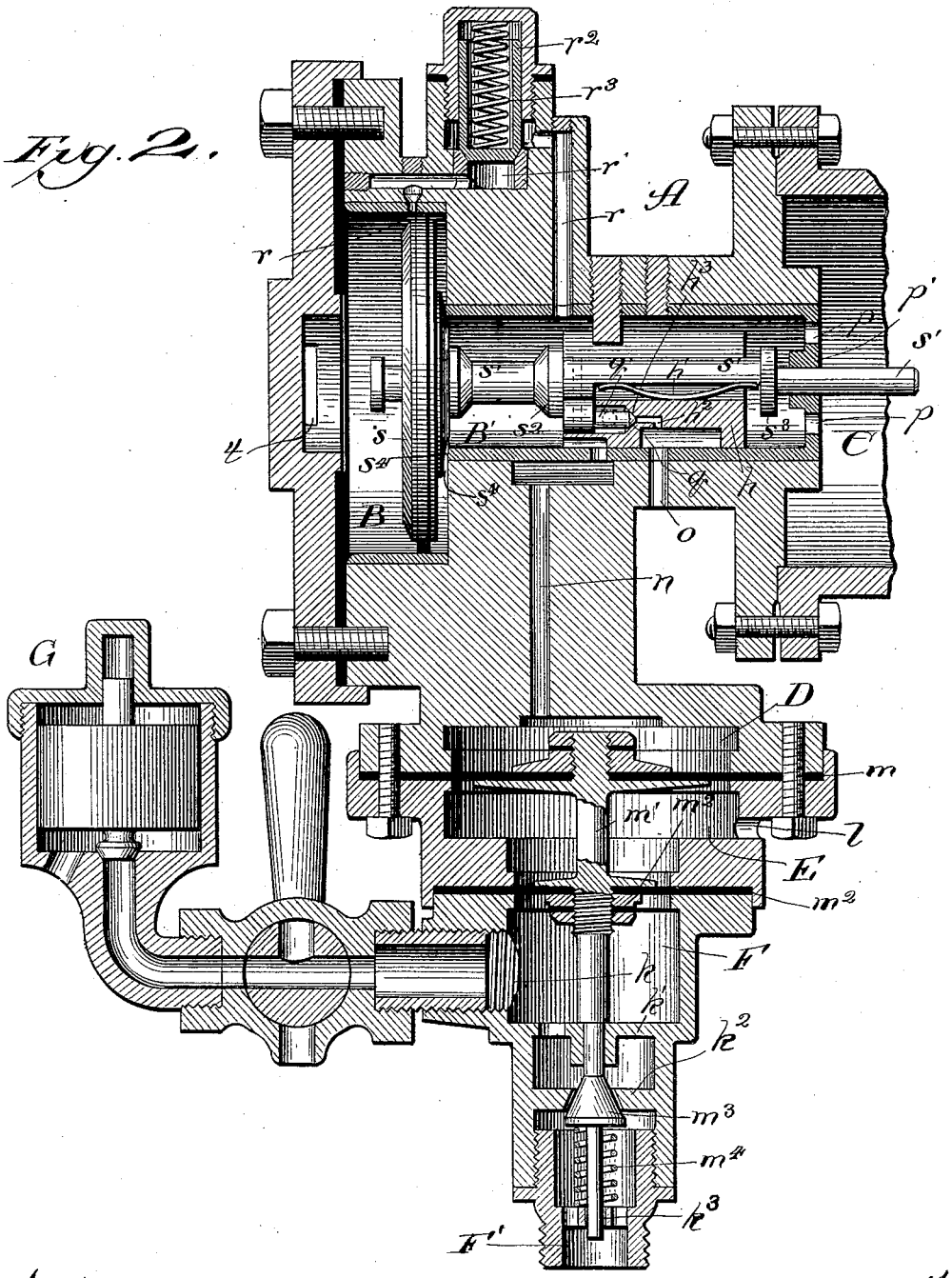
Fig. 2.



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UNITED STATES PATENT OFFICE.

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QUICK-RELEASE VALVE FOR AIR-BRAKES.

SPECIFICATION forming part of Letters Patent No. 493,436, dated March 14, 1893.

Application filed February 11, 1892. Serial No. 421,177. (No model.)

To all whom it may concern:

Be it known that I, HARRY R. MASON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Quick-Release Valves for Air-Brakes, of which the following is a specification.

My invention relates to an improvement in quick-release valve-mechanism operating, independent of the triple-valve, to release brakes by venting air from the brake-cylinder when pressure is raised in the train-pipe.

Two patents for quick-release valves for air-brakes, numbered 467,038 and 467,111, respectively, were granted to me January 12, 1892; and my present object is to provide certain changes in the construction of the valve-mechanisms described and claimed in those patents, to the end of improving upon the same and producing what I believe to be a more durable valve device for the same purpose.

In the drawings: Figure 1 is a broken plan view, showing my improvement in connection with other features of an air-brake system forming part of the equipment of a railway-car; and Fig. 2, an enlarged broken section of my improved device, the section being taken on line 2 of Fig. 1 and viewed in the direction of the arrow.

T is a main train or brake-pipe; W, an auxiliary reservoir; Y, a triple-valve; and Z, a brake-cylinder. These devices communicate through pipes, as shown, and as they are of well-known construction and perform functions well-known in the art, they require no detailed description in the present connection.

A is the valve-casing of my improved quick-release valve device. In the casing is a chamber formed with an enlarged part, B, and reduced part, B′, said enlarged and reduced parts being virtually two inter-communicating chambers. The chamber B communicates through a passage, and pipe *t*, with the train pipe of the brake system. In the chamber B is a valve or piston, *s*, upon a stem *s′*, which extends longitudinally and centrally through the chamber B′. The piston *s* fits closely, and moves against, the circular wall of the chamber B, to prevent leakage between opposite sides of the piston. Extending from the chamber B to the chamber B′ is a passage, *r*, cored or drilled in the casing A. The piston *s*, under pressure exerted against it from the train pipe through the passage *t*, is forced to the position shown in Fig. 2, wherein it abuts against the end of the chamber B. The passage *r* enters the chamber B just forward of the piston *s*, when the latter is driven backward to the said position. In the passage *r* is a chamber, *r′*, for a check valve, r^2, controlled by a spring, r^3, of slight resistance, which seats the said valve normally in the direction of the chamber B. Communicating with the chamber B′, through passages *p*, is a reservoir chamber, C. The function of the chamber C is to co-operate with the chamber B′ in the sense of affording a larger receiver for air under pressure than, owing to the nature of the construction of the device, can be afforded by the chamber B′ alone. To all intents and purposes, therefore, the chambers B′ and C are one. The stem *s′* reciprocates through a guide, *p′*, between the chambers B′ and C. Extending from the chamber B′ at the location shown is an exhaust passage, *o*, communicating with the outside air. In line with the port of the passage *o*, in the chamber B′, is the port of a passage, *n*, affording communication between the chamber B′ and a chamber, D. The chamber D is closed by a flexible diaphragm, *m*, from the center of which extends a stem, *m′*. The diaphragm *m* divides the chamber D from a chamber, E, which latter communicates through an opening, *l*, with the outside air. On the side of the chamber E opposite the diaphragm-chamber D is a chamber or passage, F, which is divided from the chamber E by a flexible diaphragm, m^2. The stem *m′* extends centrally through the diaphragm m^2 and through a guide, *k′*, in the opposite side of the chamber F. Beyond the bearing *k′* is a valve-seat, k^2, through which the stem *m′* extends, and at which it is provided with a valve, m^3, which seats in the direction of the chamber F. Beyond the said valve-seat k^2 is a guide, k^3, for the end portion of the stem *m′*. On the stem *m′* and confined between the guide k^3 and valve m^3 is a spring, m^4. Beyond the guide k^3 is a passage, F′, which communicates through a suitable pipe Z′ with the brake-cylinder, at the same end of the latter as that with which the triple valve mechanism communicates.

Extending from the chamber F is an outlet, k, which leads to the outside air. Through the guides k' and k^3 are openings, so that the chamber F and passage F′ form a continuous outlet passage from the brake-cylinder to the outside air controlled by the check-valve m^3. Upon the stem s' in the chamber B′ is a slide-valve, h, which is located between stops s^2 and s^3 on the said stem, and is a trifle shorter than the distance between those stops, in order to permit the stem s' to have limited independent motion with relation to the slide-valve. The slide-valve is adapted to afford alternate communication between the chamber B′ and passage n, and between the passage n and outlet o, and is held to its seat by a spring, h', interposed between the slide valve and stem s'. Extending through the slide-valve h is a small outlet passage, h^2, having a valve-seat, h^3, formed therein, for a graduating-valve, q. The graduating-valve is upon a stem, q', connected to and movable with the stem s'. The passage affords communication between the chamber B′ and outside-air when the valve q is opened. The valve q is closed by movement of the stem s' in the direction of causing its stop s^2 to engage the slide-valve, and opened by movement of the stem s' in the contrary direction.

In operation when the train pipe T is filled with pressure to release brakes, air enters the chamber B from the train pipe through the pipe t and forces the piston s to the position shown in Fig. 2. This backward movement of the piston s opens communication between the train-pipe and the passage r, closes communication between the passage n and outlet passage o, closes the valve q, and opens communication between the chambers B′ and D through the passage n. Air from the chamber B flows through the passage r, opens the check-valve r^2, against the slight resistance of the spring r^3, and flows into the chamber B′, filling the latter, the chamber C and the diaphragm chamber D. The pressure thus exerted against the diaphragm m drives the latter outward, carrying with it the stem m' against the resistance of the spring m^4, and opens the valve m^3, to afford an unobstructed passage for air from the brake-cylinder to the outside atmosphere through the outlet k. When pressure is vented from the train pipe, and consequently from the chamber B, the superior pressure then existing in the expansion chambers B′ and C forces the piston s forward, closing the passage r, and dragging the slide-valve h, to cause the latter to close communication between the chamber B′ and passage n, and open communication between the passage n and outside air, to vent pressure from the chamber D. As before described when in its backward position, shown in Fig. 2, the piston s abuts against the end of the chamber B′, in order therefore that the pressure exerted from the chamber B′ may be against the entire area of the rear surface of the piston s, a recess, s^4, is provided upon the rear face of the piston at the edge of the wall of the chamber B′ for the passage of air. The forward movement, described, of the piston s and its stem s', opens the graduating-valve q, and permits air to escape from the chambers B′ and C through the passages h^2 and o. When the pressure in those chambers is thus reduced slightly below the train-pipe pressure, the latter moves the piston s backward until the stop s^2 engages the slide-valve and the valve q is closed. Any further reduction in train-pipe pressure will cause the piston s to be driven forward until the pressure in the chambers B′ and C is again reduced below the train-pipe pressure, when the valve q will be closed again. When pressure is vented from the chamber D, as described, the spring m^4 moves the stem m' and diaphragm m, and closes the valve m^3, thus shutting off the escape of pressure from the brake-cylinder to the outside air.

In practice the exposed surface of the flexible diaphragm m is larger than that of the diaphragm m^2, so that the escaping pressure from the brake-cylinder exerted against the diaphragm m^2, supplemented by the force of the spring m^4, will not be sufficient to counteract the pressure exerted against the diaphragm m from the chamber D, and to close the valve m^3. The spring m^4 may be made of any desired resistance, so that it may be just capable of moving the stem m' and diaphragms m m^2 when the chamber D is exhausted of pressure, or whereby it may raise the stem and close the valve m^3 when pressure is reduced to only a limited extent in the chamber D.

It is desirable, to obtain the best results in the use of my improved mechanism, that it shall operate to open or shut off the escape of pressure from the brake cylinder through the passage F′ F and k, in advance of the operation of the triple-valve mechanism.

My improved quick release mechanism may be constructed to operate under very slight variations in train pipe pressure, depending only upon the frictional resistance of the piston s against the wall of the chamber B and the slide valve h on its seat. Owing to the construction shown and described no stuffing boxes are required to prevent leakage. This is an advantage for the reason that it is difficult to prevent wear and consequent leakage of a stuffing box, and at the same time to prevent the stuffing box, and stem passing through it, from presenting more friction than is desirable.

I have shown a pressure-retaining valve, G, at the outlet opening k, for the purpose of holding back a certain amount of pressure when it is not desired that all the pressure shall be vented from the brake-cylinder. The function and operation of the pressure-retaining valve are well-known in the art, and it requires no detailed description in the present connection.

While I have shown and described a check-

valve r^2 in the passage r, this may, if desired, be omitted, and the passage r may be sufficiently small to prevent a material retrogression of pressure from the chamber B′ to the train-pipe before the piston s is moved.

Though I prefer to provide the two flexible diaphragms m and m^2, with a chamber E between them open to the surrounding atmosphere, the diaphragm m^2 and chamber E, could, if desired, be dispensed with, and the device still be operative.

While I have shown and described the valve s as a piston, it may be any form of abutment or diaphragm which will be movable under differential pressure, and by its movement govern the operation of the other valve mechanism as set forth.

I do not confine my invention to the use of the exact form of valves employed, as they may be changed in character without changing their functions. The general form of the whole device may also be changed without departing from the spirit of my invention as defined by the claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In combination with the train-pipe and brake-cylinder of a brake-system, a quick-release valve-device, independent of the triple-valve mechanism, provided with a brake-cylinder exhaust-passage, a valve governing the exhaust through said passage controlled by a diaphragm movable by differential pressure, an expansion chamber, and valve mechanism interposed between the train pipe and expansion chamber, and operated by differential pressure, to direct pressure to or vent it from one side of said diaphragm, whereby the valve in said exhaust-passage is closed when the train-pipe pressure is reduced and opened when said pressure is raised, substantially as and for the purpose set forth.

2. In combination with the train-pipe and brake-cylinder of a brake-system, a quick-release valve-device, independent of the triple-valve mechanism, provided with a brake-cylinder exhaust-passage, a valve governing the exhaust through said passage, a diaphragm connected with said valve, moved in one direction, by the force of air-pressure directed against it, to open said valve, a spring acting, counter to said air-pressure, against the diaphragm, when the air-pressure is released, to close said valve, an expansion chamber, and valve mechanism interposed between the train-pipe and expansion-chamber operated by differential pressure to direct air to or vent it from one side of said diaphragm, whereby the valve in said exhaust-passage is opened when the train-pipe pressure is increased, and closed when the train-pipe pressure is reduced, substantially as and for the purpose set forth.

3. In combination with the train-pipe and brake-cylinder of a brake-system, a quick-release valve-device, independent of the triple-valve mechanism, provided with an expansion-chamber communicating with the train-pipe, a brake-cylinder exhaust passage, a diaphragm chamber, a passage between the said expansion and diaphragm-chambers, a diaphragm-chamber exhaust passage, a valve governing the exhaust through the brake-cylinder exhaust passage, controlled by movement of a diaphragm at the said diaphragm-chamber, valve-mechanism governing communication between the expansion and diaphragm chambers and between the diaphragm chamber and outside air, the said valve-mechanism being connected with and operated by a piston movable by differential pressure and interposed between the train-pipe and expansion-chamber, substantially as described.

4. In a brake-system, the combination, with the train-pipe and brake-cylinder, of quick-release valve-mechanism, independent of the triple-valve, comprising valve casing, provided with an expansion chamber communicating with the train-pipe to receive pressure therefrom, an exhaust passage from the brake-cylinder to the outside air, a valve governing the exhaust through said passage, controlled by valve-mechanism having a piston movable by differential pressure and interposed between the train-pipe and expansion chamber, a small passage for the escape of pressure from the expansion chamber to the outside air, and a valve governing the escape of pressure through said small passage, controlled by the said interposed movable piston, substantially as and for the purpose set forth.

HARRY R. MASON.

In presence of—
M. J. FROST,
W. N. WILLIAMS.