No. 862,492. PATENTED AUG. 6, 1907.

W. B. MANN.

TRIPLE VALVE FOR AIR BRAKES.

APPLICATION FILED NOV. 28, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

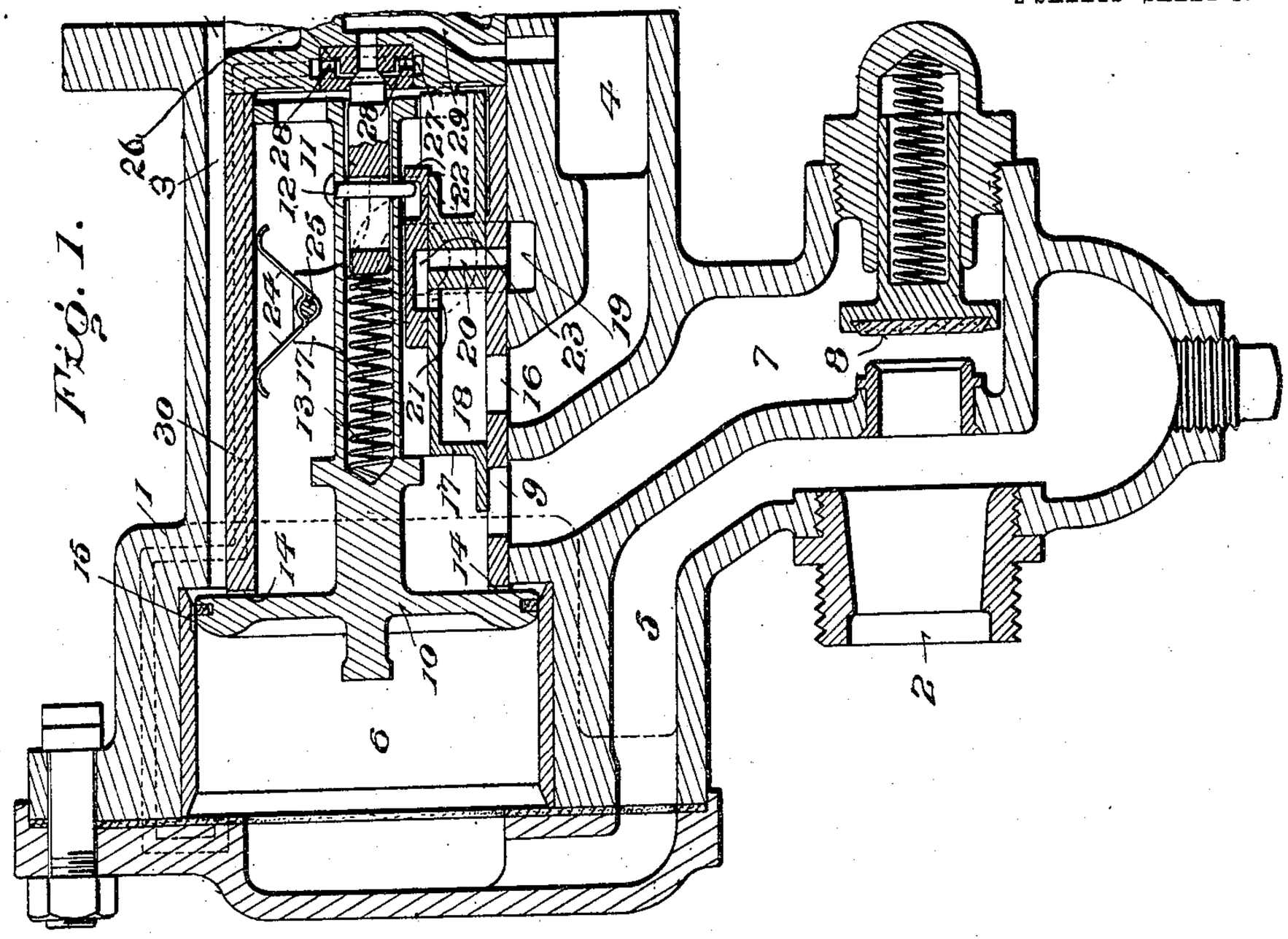
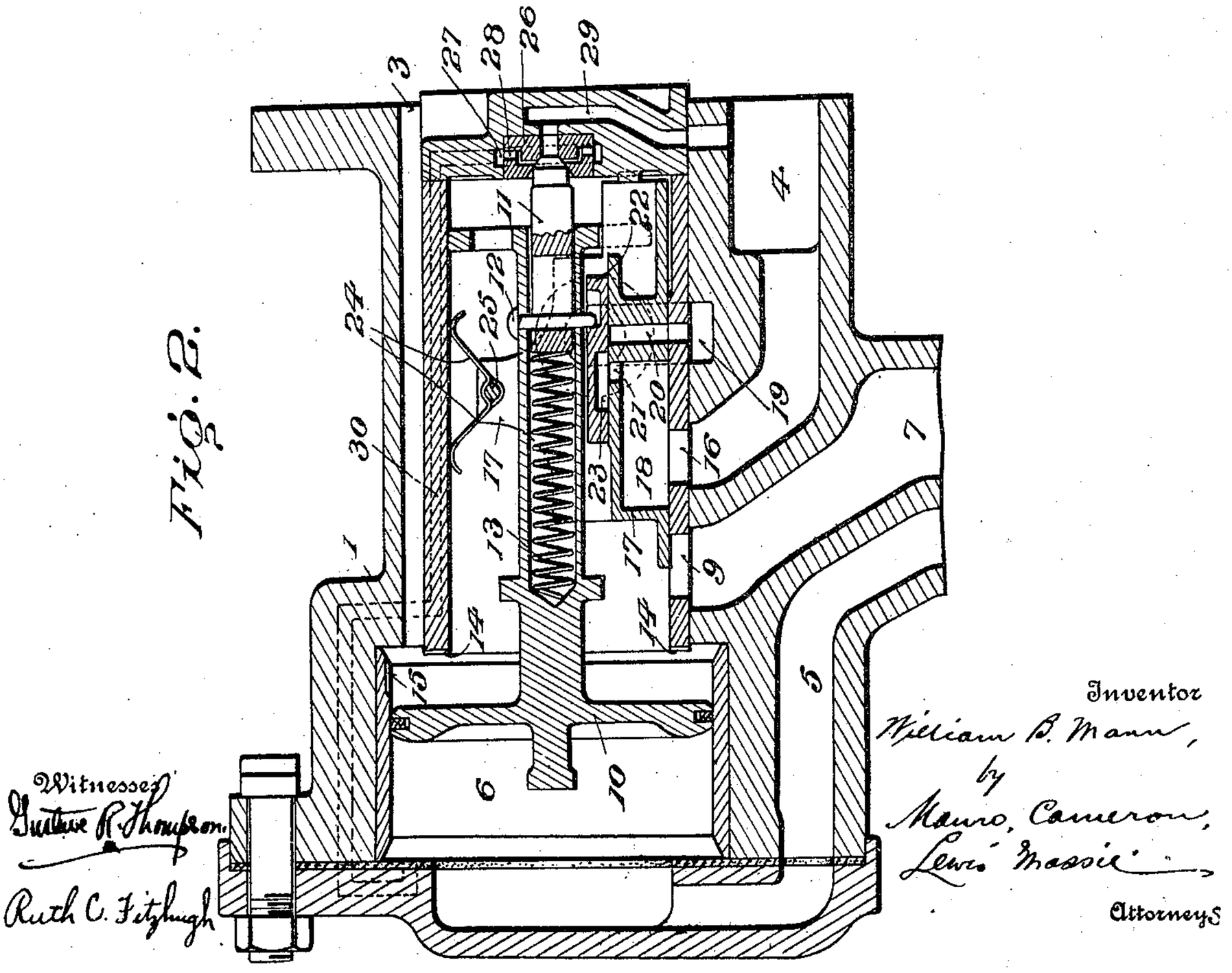


Fig. 2.



Witnesses:
Gustave R. Thompson.
Ruth C. Fitzhugh

Inventor
William B. Mann,
by
Munn, Cameron,
Lewis Massie
Attorneys

No. 862,492. PATENTED AUG. 6, 1907.

W. B. MANN.

TRIPLE VALVE FOR AIR BRAKES.

APPLICATION FILED NOV. 28, 1906.

2 SHEETS—SHEET 2.

Fig. 3.

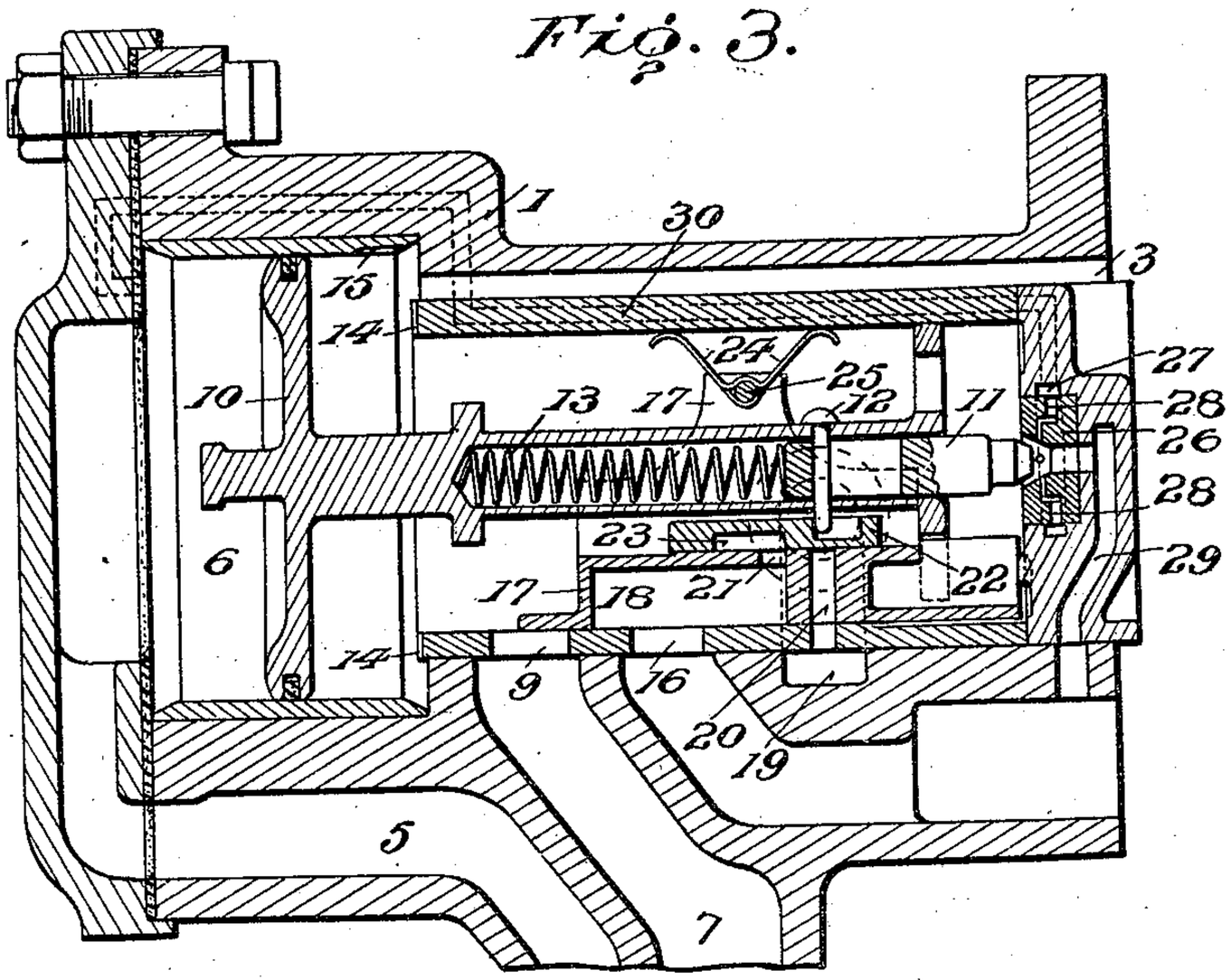
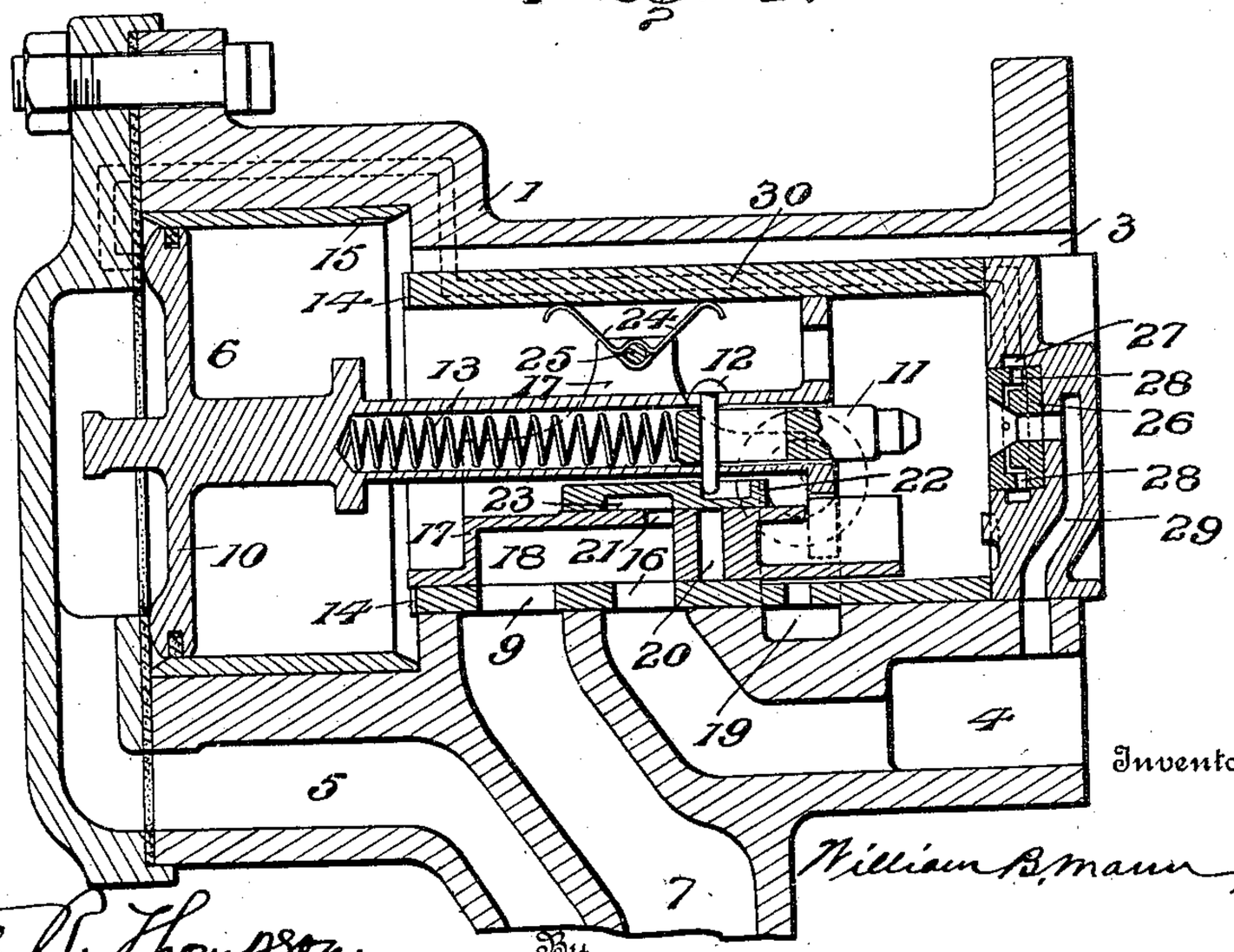


Fig. 4.



Witnesses
Gustave R. Thompson.
Ruth C. Fitzhugh

Inventor
William B. Mann,
By
Mauro, Cameron, Lewis & Massie.
Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM B. MANN, OF BALTIMORE, MARYLAND.

TRIPLE VALVE FOR AIR-BRAKES.

No. 862,492. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed November 28, 1906. Serial No. 345,489.

To all whom it may concern:

Be it known that I, WILLIAM B. MANN, of Baltimore, Maryland, have invented a new and useful Improvement in Triple Valves for Air-Brakes, which improvement is fully set forth in the following specification.

This invention relates to triple-valves for air-brakes, and constitutes an improvement on the construction shown and described in my application Sr. No. 328,576, filed on July 31st, 1906.

In certain classes of railway service, and particularly on short trains, and even with single cars such as electric cars, it is exceedingly desirable to secure a graduated release of the brakes, to the end that stops may be effected at the precise point desired. Moreover, in short trains it is also desirable to secure a serial venting of the train-pipe upon making service application of the brakes, and one means for effecting such serial venting upon service application was disclosed in my aforesaid application.

In the present application, without any increase in the number of parts employed, I secure all of the advantages of a graduated release of the brakes and the serial venting of the train-pipe, while at the same time materially reducing the number of ports employed, and greatly simplifying the operation of the structure as a whole.

The invention is capable of receiving a variety of mechanical embodiments, one of which, for the purpose of illustration, is shown in the accompanying drawings, in which drawings—

Figure 1 is a vertical longitudinal section of the triple-valve with the parts in full release position, and air passing from the train-pipe to the auxiliary reservoir; Fig. 2 is a view similar to Fig. 1 with the parts in the position they assume just after the escape of air for a graduated release; that is, with the graduating valve in position to prevent the passage of air from the auxiliary reservoir to the brake-cylinder, and the release valve in a position to prevent the escape of air from the brake-cylinder to the atmosphere; Fig. 3 is a vertical longitudinal section showing the parts in graduating position; that is, the position which they occupy while air is passing from the auxiliary reservoir to the brake-cylinder for service applications; and Fig. 4 shows the parts in the position which they occupy for emergency application of the brakes.

Referring to the drawings, in which like parts are indicated by like numerals, 1 indicates the valve casing, having a port 2 leading from the train-pipe, a port 3 leading to the auxiliary reservoir, and a port 4 leading to the brake-cylinder. Port 2 is connected by the passage 5 to the piston-cylinder 6, and by the passage 7 to the interior of the valve-chamber via valve 8 and port 9. Situated within the piston-cylinder 6 is the piston 10 whose stem carries the graduating valve 11, held therein by a pin 12 passing through a longitudinal slot in the valve 11, while a heavy spring 13 reacts between the inner end of the graduating valve and an abutment in the hollow piston stem.

The valve chamber is connected to the auxiliary reservoir duct 3 by duct 14 leading from said chamber to an annular space adjacent to the circumferential portion of the piston on its auxiliary reservoir side, which space is in open communication with the duct 3. The feed-in duct 15 is preferably of somewhat greater cross-sectional area than heretofore so that air can pass from the train-pipe side to the auxiliary reservoir side of the piston a little more rapidly than in standard triple valves. The brake-cylinder port 4 is in communication with the valve chamber by way of the port 16, and within the valve chamber is the emergency valve 17, having an enlarged chamber 18 which covers the port 16 in all positions of the valve, which chamber 18 is of such length that when the valve is in emergency position shown in Fig. 4, it will bring the large ports 9 and 16 into full open communication. The atmosphere port 19 is in communication with an escape port 20 formed in emergency valve 17 and extending from top to bottom therethrough. The chamber 18 in the emergency valve is also provided with a port 21, and resting upon the top of the emergency valve 17 is a sliding release valve 22 having a chamber 23 formed therein of such length as to fully connect ports 20 and 21 when the parts are in full release position shown in Fig. 1. This release valve 22 has formed in its upper surface a longitudinal slot or groove which is engaged by the lower projecting end of the pin 12 which connects the graduating valve 11 to the piston stem. The emergency valve 17 is held to its seat by the usual spring 24 reacting between the top of the valve chamber and a pin 25 extending transversely across and between the parallel projecting wings of the emergency valve 17.

The seat of the graduating valve 11 is formed in a block of metal 26, preferably set into the end wall of the valve chamber with an annular space 27 surrounding said block of metal, which annular space is connected by way of ports 28 with the valve seat, the position of the ports 28 with relation to such seat being that the ports are absolutely closed when the graduating valve is on its seat, but are open the instant the valve is removed in any degree from its seat. It will, of course, be understood that the valve-seat forms the entrance end or port of passage 29 leading from the valve-chamber to the brake-cylinder passage 4. The annular space 27 is at all times in free communication with the train-pipe by way of a duct or passage

30, shown in dotted lines, extending through the body of the valve casing from the annular space 27 to the piston-cylinder 6, and on the train-pipe side of said cylinder, so that air can pass via the passage 5, chamber 6, and duct 30 directly to the annular space 27.

From the foregoing description it will be seen that the graduating valve, the release valve and the emergency valve, are all independent of each other, and are all actuated by the movements of the piston, but that by reason of the different degrees of lost motion existing between the piston and the several valves, these valves are all capable of being actuated independently of each other. Thus the emergency valve 17 is never moved except for emergency application of the brakes, as shown in Fig. 4.

With the operating piston in the position shown in Fig. 2 (which is the running position), the release valve 22 is in position to close the connection between ports 20 and 21, and the pin 12 is at the left-hand end of the slot in the graduating valve, so that the vent from the brake-cylinder to the atmosphere is closed and any further movement of the piston to the left will permit air from the train-pipe and the auxiliary reservoir to pass into the brake-cylinder.

For a service application of the brakes, the engineer makes a moderate reduction of train-pipe pressure in the usual well-known manner in standard brakes, when the piston moves from the position shown in Fig. 2 to that shown in Fig. 3, whereupon air from the train-pipe is admitted via the duct 30, the annular space 27 and the ports 28 to the passage 29, and thence to the brake-cylinder, while at the same time auxiliary reservoir air passes by way of the duct 3, the valve chamber and passage 29, to the brake-cylinder. The emergency valve does not move during this operation, the piston moving only far enough to the left to cause the spider on the right-hand end of the piston-stem to impinge upon, but not to move, said emergency valve. The parts remain in the position shown in Fig. 3 until equalization of pressure is established on the two sides of the piston, when upon any slight further lowering of the pressure on the auxiliary reservoir side of the piston due to the continued passage of air to the brake-cylinder, the piston slightly moves from left to right, thereby seating the graduating valve upon its seat and closing the passage of air from the train-pipe to the brake-cylinder, and also from the auxiliary reservoir to the brake-cylinder, but without shifting the release valve 22. When the parts are in this position for making a service application of the brakes, said application may be graduated in the usual manner by again slightly reducing the train-pipe pressure and repeating the operation just described. In each graduating action a small amount of train-pipe air will escape via the duct 30 to the brake-cylinder, thus facilitating the quick serial action of all of the valves in the train.

With the parts in a position to effect a service application of the brakes, it is in many instances found desirable to effect a graduated rather than a full and sudden release of the brakes, and this may be accomplished by the present invention by throwing the engineer's valve to release position, and instantly throwing it from release position to "lap" position. When this is done there is a slight, though not a full, increase in train-pipe pressure, which throws the piston to the position shown in Fig. 1, so as to momentarily compress the strong spring 13 between the graduating valve and the piston, and the pressure from the train-pipe also lifts the charging valve 8 and permits air to pass almost instantly into the valve chamber, from whence it will pass more slowly through the ducts 14 to the circumferential space on the auxiliary reservoir side of the piston, and thence, via the duct 3, to the auxiliary reservoir. It will thus be apparent that there will only be an instant of time before the pressures on the opposite sides of the piston 10 will be approximately equalized, whereupon the stiff spring 13, reacting between the piston and the graduating valve 11, will shift the piston from the position shown in Fig. 1 to that shown in Fig. 2, holding the graduating valve firmly on its seat, but shifting the piston just far enough to move the release valve so as to close communication between ports 20 and 21 in the emergency valve, and thereby close the vent from the brake-cylinder to the atmosphere. This action will permit a small amount of air to escape from the brake-cylinder to the atmosphere, that is, air will escape during the time when the parts remain in the position shown in Fig. 1, but as this is but a very short space of time, it is insufficient to do more than partially release the pressure from the brake-cylinder, the amount of release being dependent upon the time during which the parts remain in the position shown in Fig. 1, and this in turn being dependent upon the amount of increased pressure admitted to the train-pipe before the engineer shifted his valve from release to "lap" position. It will be manifest that this action may be repeated as often as desired until the brakes are fully released. It will also be apparent that during this graduating release of pressure from the brake-cylinder, neither the graduating valve nor the emergency valve is moved, the only valve moved during this action being the release valve 22. On the other hand, it will be understood that during the graduating application of the brakes, the only valve that is moved after the first application is the graduating valve 11.

It will also be perceived that the spring 13 in this structure performs two functions, viz., it acts to hold the graduating valve to its seat at all times until the operating piston has moved far enough to shift the release valve 22 so as to close the vent from the brake-cylinder to the atmosphere, and also acts to seat the graduating valve during the graduating application of the brakes. Moreover, by reason of its strength, this spring operates not only to seat the graduating valve, but operates also to shift the operating piston 10 from right to left so as to move the release valve 22 to close the vent from the auxiliary reservoir to the atmosphere at all times when there is equalization of pressure on the train-pipe and auxiliary reservoir sides of said piston. The adjustment of the strength of this spring, so as to enable it to overcome the friction of the parts and effect these movements, constitutes an important feature of the present invention, since without this adjustment the graduated release of the brakes could not be effected. Furthermore, the prompt and effective action of this spring 13 is to a considerable extent due to the provision for prompt equalization of pressures on opposite sides of the

piston 10; this is secured through the quick recharging duct 7, valve 8 and port 9, and also by reason of the enlargement of duct 15.

When a full release of the brakes is desired, the engineer admits full train-pipe pressure to the train-pipe by way of the engineer's valve, and this quickly throws the piston and the connected parts to the position shown in Fig. 1, in which position they remain for a very considerable time, sufficient for the brake-cylinder pressure to be vented through the ports 20 and 21 to the atmosphere. In this instance the difference in pressures on the opposite sides of the piston 10 will be quite considerable, and while the pressures in the piston-cylinder 6 and the valve-chamber will be equalized almost instantly, the area of the piston exposed to the pressure in the valve-chamber is considerably less than that exposed to pressure in the piston-cylinder 6, and it is only when pressure has leaked in the circumferential space by way of the ports 14 and 15 that there will be an equalization of pressure through the entire area of both sides of the piston. Until this occurs the strong spring 13 has remained compressed, and just before equalization occurs the reaction of this spring tends to shift the piston, and with it the release valve 22, into the position shown in Fig. 2, which is the normal running full release position. Should any air leak into the brake-cylinder while the parts are in this position, it could not escape by way of the release ports, but it is manifest that any small amount of leakage that would thus occur would be taken care of by the usual leak ports provided in brake-cylinders for this purpose.

It will be observed that the valve herein described is strictly a "triple" valve, being composed of but three valves, viz., the graduating valve, the emergency valve and the release valve; that each of these valves is capable of movement entirely independent of the others, while all three of the valves are operated by the usual valve-operating piston.

It will also be observed that with this structure serial venting of the train-pipe may be obtained upon service application of the brakes; that the usual graduating application of the brakes is secured with the usual movements of the engineer's valve; that a graduating release of the brakes is readily secured, and that the quick serial venting of the train-pipe to the brake-cylinder for emergency applications is also secured.

It will be further observed that all of these desirable features are obtained without in any way increasing the complication or cost of the construction, thereby also greatly contributing to the durability of the structure and reducing the cost of repairs.

What is claimed is:

1. In a triple-valve, a valve-casing having train-pipe, brake-cylinder and auxiliary reservoir ports, a conduit leading from the train-pipe to the brake-cylinder, and a graduating valve simultaneously controlling the passage of air to the brake-cylinder from both the train-pipe and the auxiliary reservoir.

2. In a triple-valve, a valve-casing having train-pipe, brake-cylinder and auxiliary reservoir ports, a conduit leading from the train-pipe to the brake-cylinder port, and a graduating valve simultaneously controlling the passage of air through said conduit and said brake-cylinder port.

3. In a triple-valve, a valve-casing having train-pipe, brake-cylinder, auxiliary reservoir and brake-cylinder-vent ports, a conduit leading from the train-pipe to the brake-cylinder port, a graduating valve simultaneously controlling said conduit and said brake-cylinder port, a release valve controlling said vent port, and a valve-operating piston independently operating each of said valves.

4. In a triple-valve, a valve-casing having train-pipe and auxiliary reservoir ports and a plurality of passages leading from the train-pipe to the brake-cylinder, a graduating valve controlling one of said passages, an emergency valve controlling the other of said passages, and a single valve-operating piston operatively connected to each of said valves.

5. In a triple-valve, a valve-casing having train-pipe, auxiliary reservoir and brake-cylinder vent ports, and a plurality of conduits leading from the train-pipe to the brake-cylinder, a graduating valve controlling one of said conduits, an emergency valve controlling the other of said conduits, a release valve controlling said brake-cylinder vent port, and a single valve-operating piston connected to said valves and operating them independently of each other.

6. In a triple-valve, a valve-operating piston having a full release and an emergency position, and a normal running position intermediate said full release and emergency positions, a graduating valve and a release valve operated by said piston, and a spring reacting between said graduating valve and said piston and tending to shift the piston to said intermediate position upon equalization of pressure on opposite sides of the piston, and thereby shifting said release valve to closed position.

7. In a triple-valve structure, a graduating valve, a brake-cylinder release valve, a valve-operating device seating the graduating valve and throwing the release valve to release position when the train-pipe pressure exceeds that in the auxiliary reservoir, and means actuating said device to close the release-valve without unseating the graduating valve upon equalization of train-pipe and auxiliary reservoir pressures.

8. In a triple-valve for air-brakes, a brake-cylinder, a release-port, a release-valve controlling the said port, and means actuating said valve to open said port when release pressure is admitted to the train-pipe and to close said port upon equalization of train-pipe and auxiliary reservoir pressures.

9. In a triple-valve for air-brakes, a graduating valve, a brake-cylinder release valve, a valve-operating piston operatively connected to said valves to close the graduating valve and open the release valve when release pressure is admitted to the train-pipe, and means actuating said piston to close said release valve upon equalization of train-pipe and auxiliary reservoir pressures.

10. In a triple valve, a valve casing, a graduating valve and a brake-cylinder release valve in said casing, and a valve-operating device exposed to train-pipe and auxiliary reservoir pressures and closing said graduating valve and opening said release valve when train-pipe pressure exceeds the auxiliary reservoir pressure, and closing said release valve upon equalization of train-pipe and auxiliary reservoir pressures.

11. In a triple-valve, a valve casing, a graduating valve and a brake-cylinder release valve in said casing, a valve-operating device exposed to train-pipe and auxiliary reservoir pressures and closing said graduating valve and opening said release valve when train-pipe pressure exceeds the auxiliary reservoir pressure, and closing said release valve upon equalization of train-pipe and auxiliary reservoir pressures, and means permitting a quick equalization of train-pipe and auxiliary reservoir pressures.

12. In a triple-valve, a valve-casing, a graduating valve and a brake-cylinder release valve in said casing, a valve-operating piston also in said casing and operatively connected to said valves to close the graduating valve and open the release valve when releasing pressure is admitted to the train-pipe, means permitting a quick equalization of pressures on the train-pipe and auxiliary reservoir sides of said piston when releasing pressure is admitted to the train-pipe, and a spring actuating said piston to close said release valve without opening said graduating valve when such equalization of pressures occurs.

13. In a triple-valve, a valve-casing, a graduating valve and a brake-cylinder release valve in said casing, a valve-operating piston also in said casing and operatively connected to said valves to close the graduating valve and open the release valve when releasing pressure is admitted to the train-pipe, means permitting a quick equalization of pressures on the train-pipe and auxiliary reservoir sides of said piston when releasing pressure is admitted to the train-pipe, and a spring reacting between the graduating valve and said piston whereby the latter is shifted to close said release valve while the graduating valve is held closed when such equalization of pressures occurs.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM B. MANN.

Witnesses:

JOHN B. MCGRAW,

AUGUSTUS W. BRADFORD.