No. 847,317. PATENTED MAR. 19, 1907.

F. L. CLARK.

RECHARGING VALVE FOR AIR BRAKES.

APPLICATION FILED OCT. 18, 1902.

2 SHEETS—SHEET 1.

Fig. 1

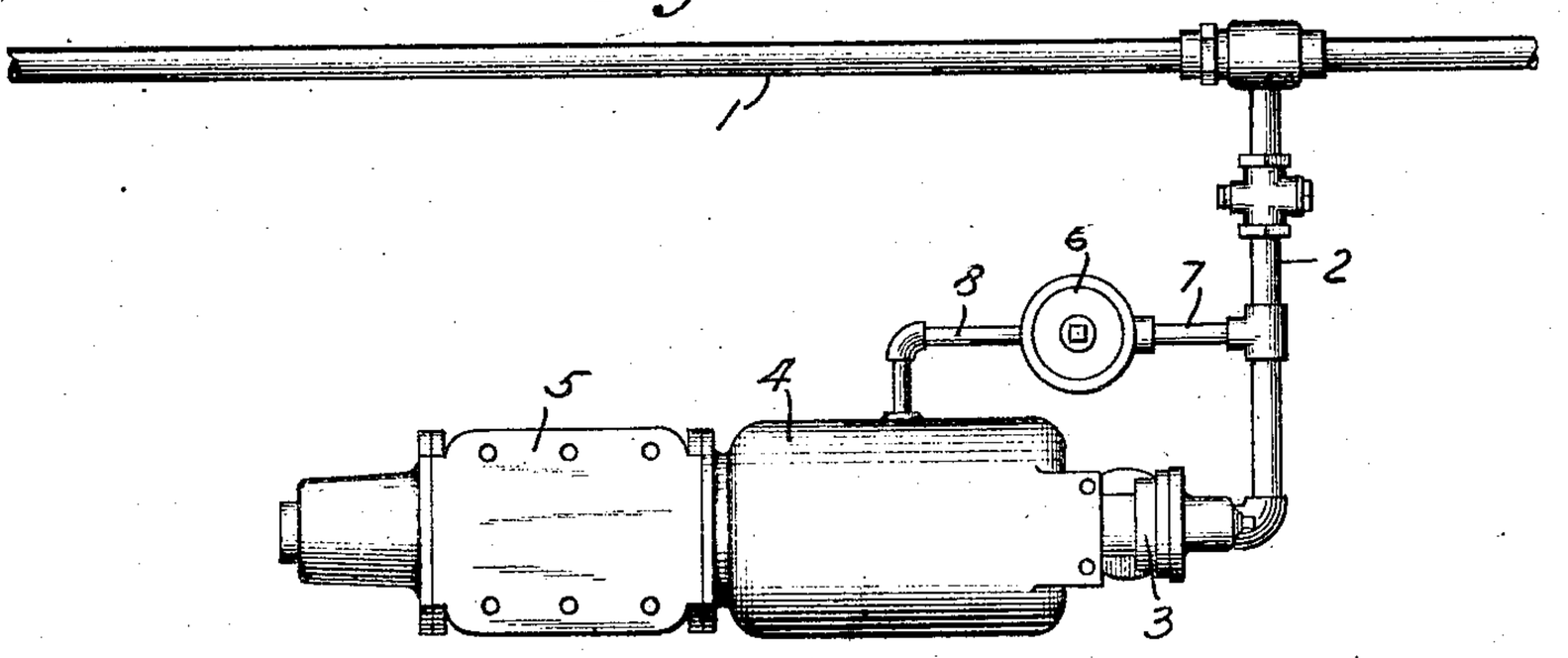

Fig. 2.

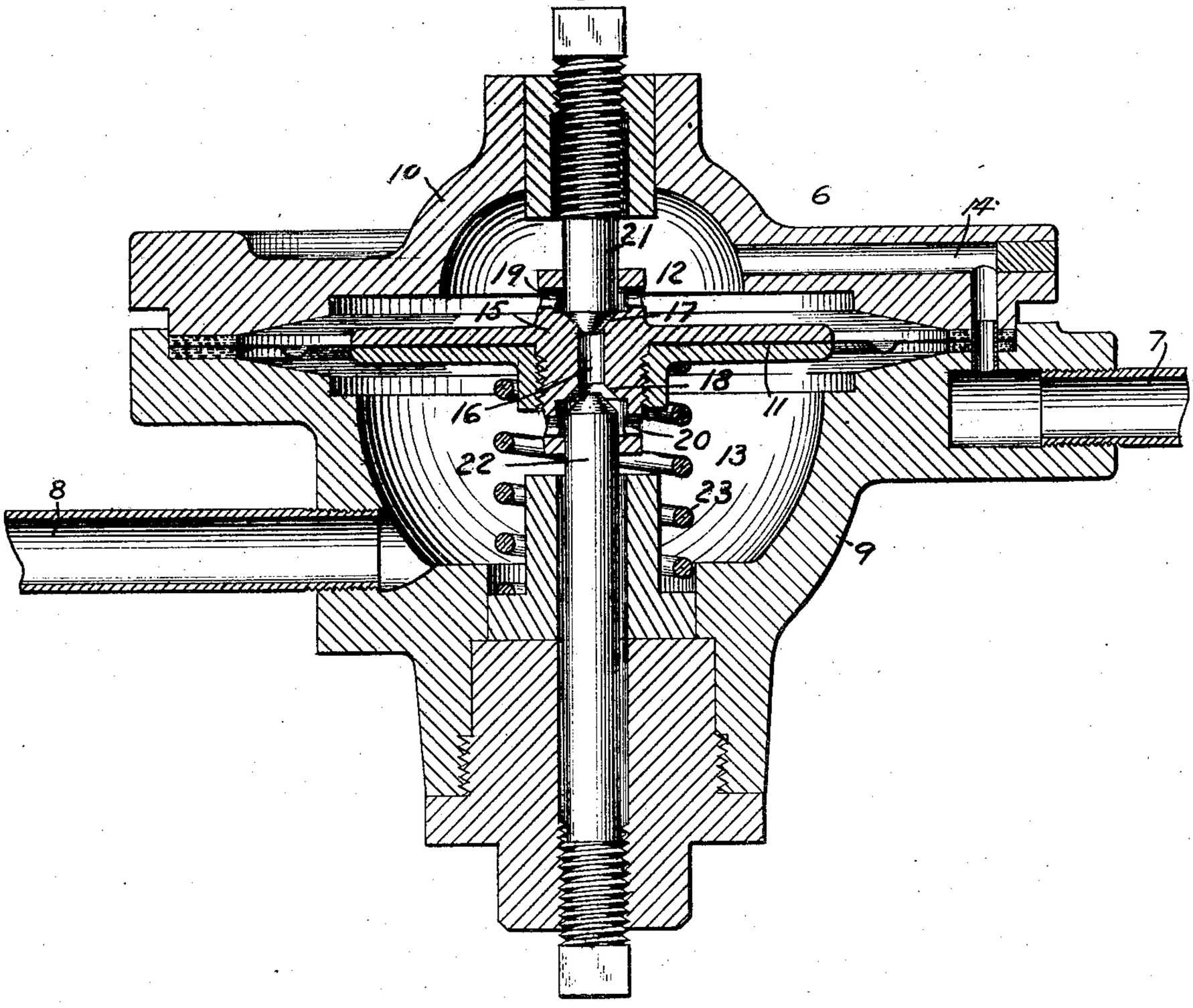

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Fig. 3.

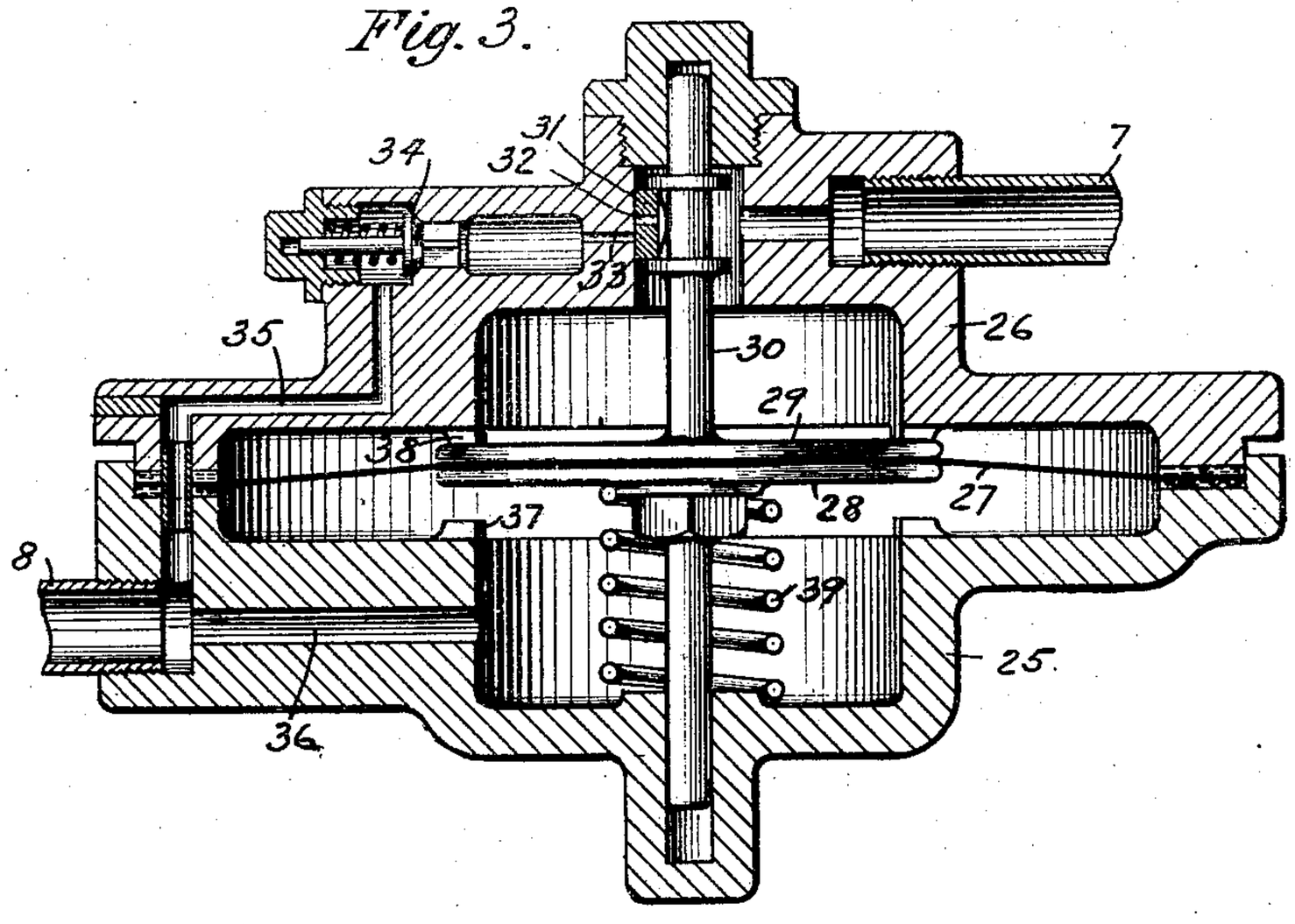
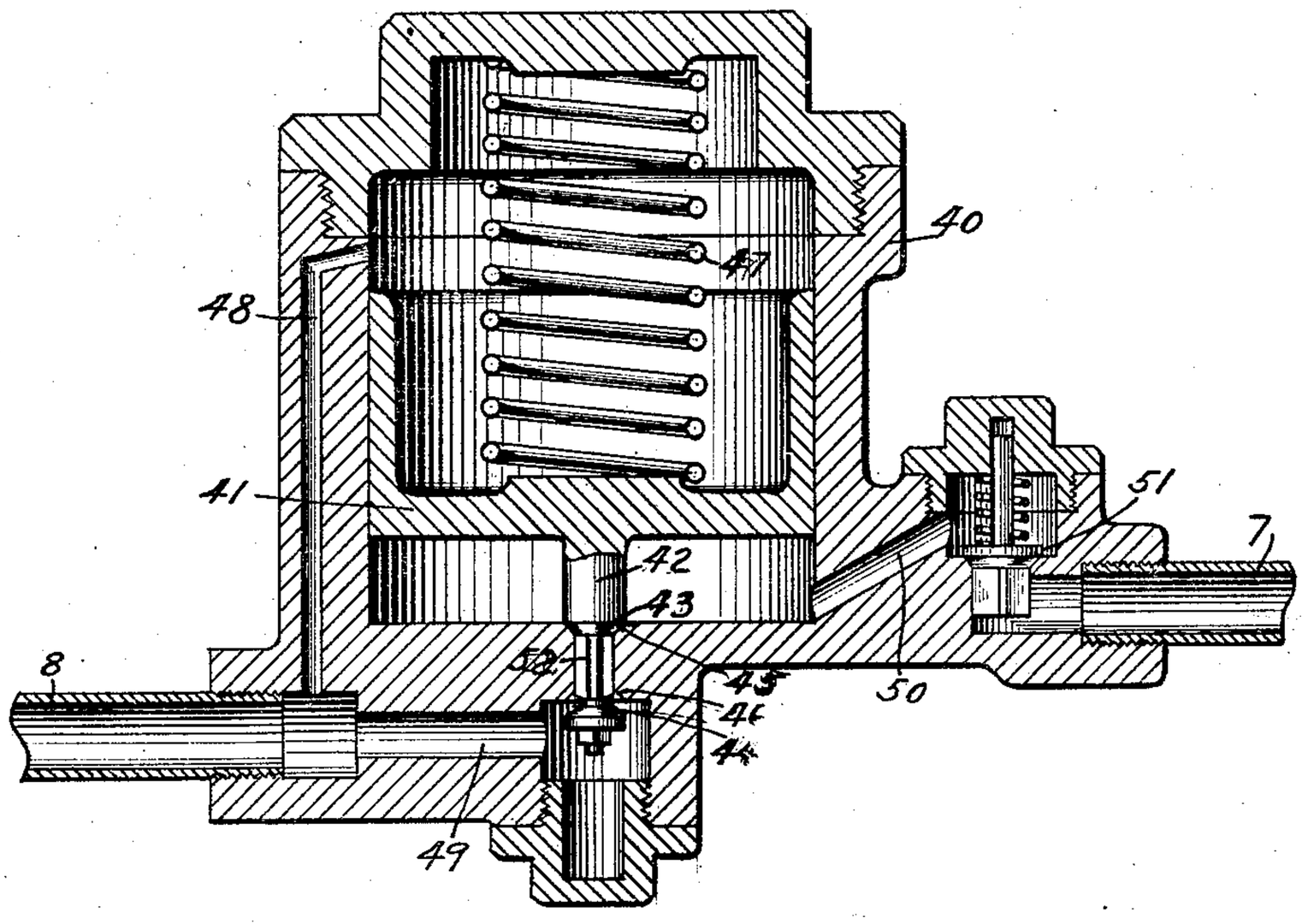


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANCIS L. CLARK, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RECHARGING-VALVE FOR AIR-BRAKES.

No. 847,317. Specification of Letters Patent. Patented March 19, 1907.

Application filed October 18, 1902. Serial No. 127,816.

To all whom it may concern:

Be it known that I, FRANCIS L. CLARK, a citizen of the United States, residing in Pittsburg, county of Allegheny, State of Pennsylvania, have invented a certain new and useful Improvement in Recharging-Valves for Air-Brakes, of which improvement the following is a specification.

My invention relates to automatic air-brakes, and has for its object to provide a new and improved recharging-valve device adapted to be inserted between the train-pipe and auxiliary reservoir and by means of which the auxiliary reservoir may be recharged to any desired degree during the time that the brakes are applied and without releasing the same.

It has heretofore been proposed to provide a separate recharging-passage containing a check-valve between the train-pipe and auxiliary reservoir; but it is found that while such valves may be opened to recharge the auxiliary reservoirs upon a slow and gradual increase of train-pipe pressure they are also opened still wider upon a sudden and greater increase of train-pipe pressure which is made for the purpose of releasing the brakes, thus opening a large passage around the triple-valve piston and detracting from the sensitiveness of the triple valves, whereby a much greater wave of pressure is required from the main reservoir through the train-pipe to release the triple valves than would otherwise be necessary. It also sometimes happens that with such a construction that after a certain amount of recharging the pressures in auxiliary reservoirs, train-pipe, and main reservoir become so nearly equalized that it is impossible to obtain a wave of pressure in the train-pipe sufficiently great to release the brakes when desired. This is a very dangerous condition of the brake apparatus, causing great inconvenience and delay in running trains and also increasing the liability of accidents.

My invention is designed to overcome these difficulties and comprises a new and improved recharging-valve device adapted to be actuated by a slight or gradual increase of train-pipe pressure to open communication from the train-pipe to the auxiliary reservoir and actuated by a sudden and greater increase of train-pipe pressure to close such communication.

It also comprises a novel form of recharging-valve having a movable abutment exposed on opposite sides to train-pipe pressure and auxiliary-reservoir pressure, respectively, and adapted by a slight movement in one direction to open said valve and by a further movement in the same direction to close said valve; and it further consists in certain new combinations and novel features of construction, all as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a plan view of an automatic air-brake apparatus, showing my improvement applied thereto. Fig. 2 is a transverse central section showing one form of my improved recharging-valve device. Fig. 3 is a section showing a modified form of valve, and Fig. 4 is a section showing another modification.

Referring to Sheet 1 of the drawings, Fig. 1 shows the train-pipe 1, branch pipe 2, triple-valve device 3, auxiliary reservoir 4, and brake-cylinder 5, all of which constitutes the ordinary car equipment of the automatic air-brake system.

My improved recharging-valve device 6 is inserted between the train or branch pipe and the auxiliary reservoir and is connected thereto by means of pipes 7 and 8, respectively.

According to the preferred form of recharging-valve, as shown in Fig. 2, the casing is composed of two parts—the body portion 9 and cap portion 10—the diaphragm 11 being clamped between these parts and forming the two chambers 12 and 13, the former being in communication with the train-pipe through passage 14 in the cover or cap portion and pipe 7 and the latter chamber communicating with the auxiliary reservoir through pipe 8. Secured in the center of the diaphragm is the plug 15, having the opening or central passage 16, with the oppositely-faced valve-seats 17 and 18 and lateral openings 19 and 20. The screw-threaded valve-stems 21 and 22 are adjustably mounted in the opposite portions of the casing and extend into the openings at the respective ends of the plug 15, the ends of said stems being beveled to form valves for engaging the

seats 17 and 18 in said plug 15. The stems are so adjusted that the distance between their ends is a little greater than that between the valve-seats 17 and 18 in the plug 15, and a light spring 23 is placed so as to bear against one side of the diaphragm and normally tends to seat the plug at 17 against the valve-stem 21, as shown in Fig. 2.

The operation of this form of my improvement is as follows: When the brakes are released and the train-pipe is charged up to its normal pressure, the auxiliary reservoir is also charged up to the same pressure through the usual feed-groove of the triple-valve device, as is well understood by those familiar with the art, and the pressures on opposite sides of the diaphragm 11 being substantially equal the spring 23 holds the seat 17 lightly against the valve 21, as shown in Fig. 2. When a reduction of train-pipe pressure is made for the purpose of applying the brakes, the valve at 17 still remains closed, since the pressure is then less in chamber 12 than in chamber 13 on the reservoir side of the diaphragm. If now it is desired to recharge the auxiliary reservoirs without releasing the brakes, the train-pipe pressure is very slowly and gradually increased, the effect being to cause a slight movement of the diaphragm against the spring, sufficient to open the valve at seat 17, but not enough to close seat 18 on valve 20. The spring 23 is very light and the valve device so adjusted that a slight accumulation of pressure on the train-pipe side of the diaphragm will cause the same to slightly compress said spring and move to mid-position before such increase of pressure is sufficient to move the triple valve to release position. Both valve-seats 17 and 18 are then open and the communicating passage is of proper size to allow for the gradual flow of air under pressure from the train-pipe through openings 19, 16, and 20 to the auxiliary reservoir at substantially the same rate that the train-pipe pressure is being increased, so that at no time during such recharging will the train-pipe pressure on the triple-valve piston accumulate sufficiently above that of the auxiliary reservoir to cause the triple valve to move to release position. Should it be desired to release the brakes at any time during this recharging operation or after a certain amount of recharging has been effected, all that is necessary is to produce a sudden rise in train-pipe pressure by moving the engineer's brake-valve to position for releasing. This wave of pressure immediately closes communication from the train-pipe to the auxiliary reservoir through the recharging-valve device by compressing the spring 23 and seating the diaphragm-plug valve-seat 18 upon the valve-stem 22, so that the pressure on the triple-valve piston immediately rises sufficiently to move the same to release position and release the air from the brake-cylinder in the usual way. The auxiliary reservoirs may then be recharged through the feed-groove of the triple valve, and as the pressures in train-pipe and auxiliary reservoir equalize the diaphragm recharging-valve is returned by the spring to the position shown in Fig. 2. This operation of recharging may be repeated as often as desired while the brakes remain applied to compensate for losses due to leakage; but at the same time the brakes may be instantly released at any desired moment, since the recharging-valve is closed by a sudden increase of train-pipe pressure, and thus the sensitiveness of the triple valve is not affected.

It will be observed that my improved recharging-valve device is adapted to close to prevent passage of air from the auxiliary reservoir to the train-pipe, to open upon a slow and gradual rise of train-pipe pressure to permit gradual recharging of the auxiliary reservoir, and to close communication from the train-pipe to the auxiliary reservoir upon a sudden increase of train-pipe pressure.

Various forms of valves may be devised for securing this result, and in Figs. 3 and 4 I have illustrated two such modifications. In Fig. 3 the valve-casing is formed in two parts 25 and 26, having diaphragm 27 clamped therein, the diaphragm carrying stiffening-plates 28 and 29, secured to opposite sides of its central portion, and stem 30 for operating slide-valve 31, having port 32, which is adapted to move over port 33 in the casing. A check-valve 34 is located in the passage 35, connecting port 33 with the pipe 8, leading to the auxiliary reservoir. The chamber above the diaphragm is in open communication with the slide-valve chamber and with the pipe 7, leading from the train-pipe, while the chamber below the diaphragm, containing the spring 39, communicates with the auxiliary reservoir through passage 36.

When the pressures in the train-pipe and auxiliary reservoir are substantially equal, the spring 39 holds the valve in its upper closed position and the plate 29 against the stops 38 on the casing, as shown in Fig. 3. Upon a reduction in train-pipe pressure the valve remains in the usual position; but, if it be desired to recharge the reservoirs without releasing the brakes the train-pipe pressure is increased very gradually, as before described, causing the diaphragm to move down to mid-position, thus opening ports 32 and 33 and feeding the auxiliary reservoir through the check-valve 34 and passage 35. A sudden increase of train-pipe pressure for releasing the brakes causes a further movement of the diaphragm to its lower position, with plate 28 resting upon the stops 37 of the casing, thus closing communication through the valve 31. The check-valve prevents the auxiliary-reservoir pressure from

raising the slide-valve from its seat when the train-pipe pressure is reduced.

According to the modification shown in Fig. 4 a piston 41 is located in a cylindrical casing 40 and is provided with a stem 42, carrying oppositely-faced valves 43 and 44, adapted to alternately engage the respective valve-seats 45 and 46. The chamber beneath the piston communicates with the train-pipe through passage 50, containing check-valve 51, and the chamber above the piston containing the spring 47 is in open communication with the auxiliary reservoir through passage 48 and pipe 8. A passage 49 also leads from the valve to the auxiliary reservoir.

The spring 47 normally maintains the piston in its lower position with valve 42 closed on its seat 45. When train-pipe pressure is gradually increased for the purpose of recharging auxiliary reservoirs without releasing the brakes, the check-valve 51 is slightly opened and the piston 41 moved up to its intermediate position, in which both valves 42 and 43 will be off their respective seats and the auxiliary reservoir will be reeharged through passage 52 between the valve-seats 45 and 46, passage 49, and pipe 8. A sudden rise in train-pipe pressure for releasing the brakes causes the piston 41 to move to its uppermost position against the spring 47 and closes valve 44 upon its seat 46, thus closing communication from the train-pipe to the auxiliary reservoir. Check-valve 51 prevents any leakage from the auxiliary reservoir around piston 41 to the train-pipe.

Various other modifications may be devised embodying the essential features of my improvement.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A recharging-valve device for air-brakes, comprising a movable abutment exposed on one side to train-pipe pressure and on its opposite side to a variable fluid-pressure, means actuated by a slight movement of the abutment caused by a slow and gradual increase of train-pipe pressure to open communication from the train-pipe to the auxiliary reservoir, and means actuated by a further movement of the abutment in the same direction to close said communication.

2. A recharging-valve device for air-brakes comprising a movable abutment exposed on one side to train-pipe pressure and on its opposite side to auxiliary-reservoir pressure, and means actuated by a slight movement of the abutment to open communication from train-pipe to auxiliary reservoir, and by a further movement in the same direction to close such communication.

3. A recharging-valve device for air-brakes, comprising a valve for controlling communication from the train-pipe to the auxiliary reservoir, and a movable abutment subject to the opposing pressures from the train-pipe and auxiliary reservoir for operating said valve.

4. A recharging-valve device for air-brakes, comprising a valve for controlling communication from the train-pipe to the auxiliary reservoir, a movable abutment exposed on opposite sides to train-pipe and auxiliary-reservoir pressures respectively, means actuated by a slight movement of said abutment to open said valve and means actuated by a further movement of the abutment in the same direction for closing said valve.

5. A recharging-valve device for air-brakes, comprising a valve for controlling communication from the train-pipe to the auxiliary reservoir, a movable abutment exposed on opposite sides to train-pipe and auxiliary-reservoir pressures respectively, a light spring acting on the reservoir side of the abutment, means actuated by a slight movement of the abutment for opening said valve, and means actuated by a further movement of the abutment in the same direction to close said valve.

6. In a recharging-valve for air-brakes, the combination with a casing having a movable abutment therein provided with an opening or passage and exposed on one side to auxiliary-reservoir pressure, of means for opening said passage upon a slight movement of the abutment and means for closing said passage upon a further movement of the abutment in the same direction.

7. In a recharging-valve, the combination of a casing having a movable abutment therein provided with an opening or passage and oppositely-arranged valve-seats, valve-stems mounted in the chambers on opposite sides of said abutment and adapted to be engaged by said valve-seats respectively.

In testimony whereof I have hereunto set my hand.

FRANCIS L. CLARK.

Witnesses:
R. F. EMERY,
JAS. B. MACDONALD.