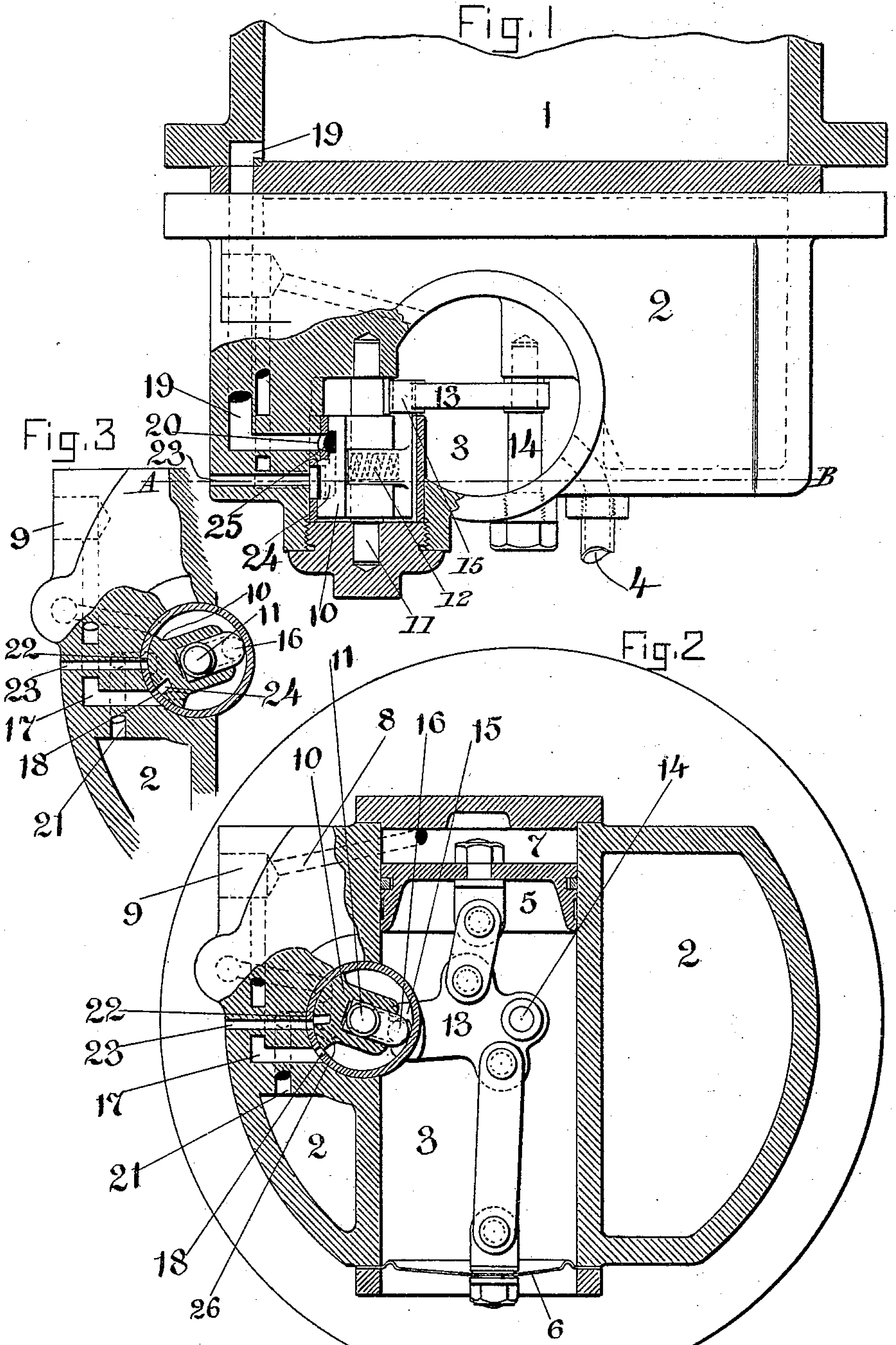
(No Model.) 2 Sheets—Sheet 1.

A. P. MASSEY.

AUTOMATIC AIR BRAKE.

No. 447,783. Patented Mar. 10, 1891.



WITNESSES

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F. L. Massey

INVENTOR

Albert P. Massey

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

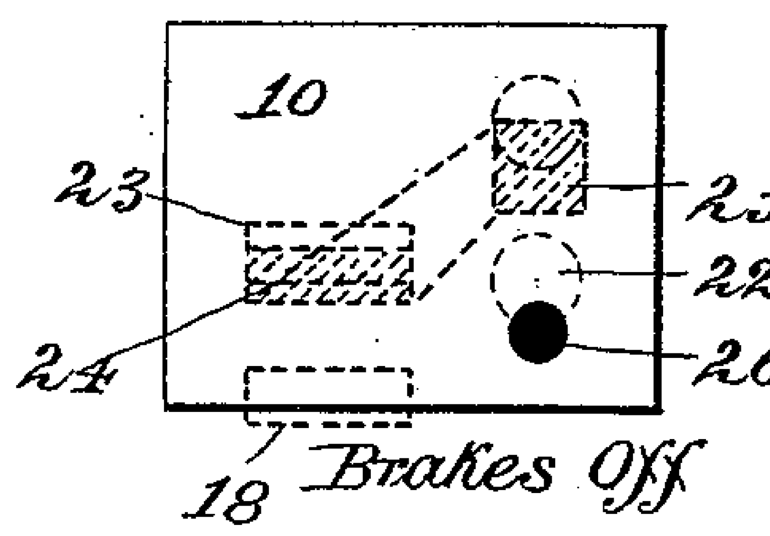


Fig. 5.

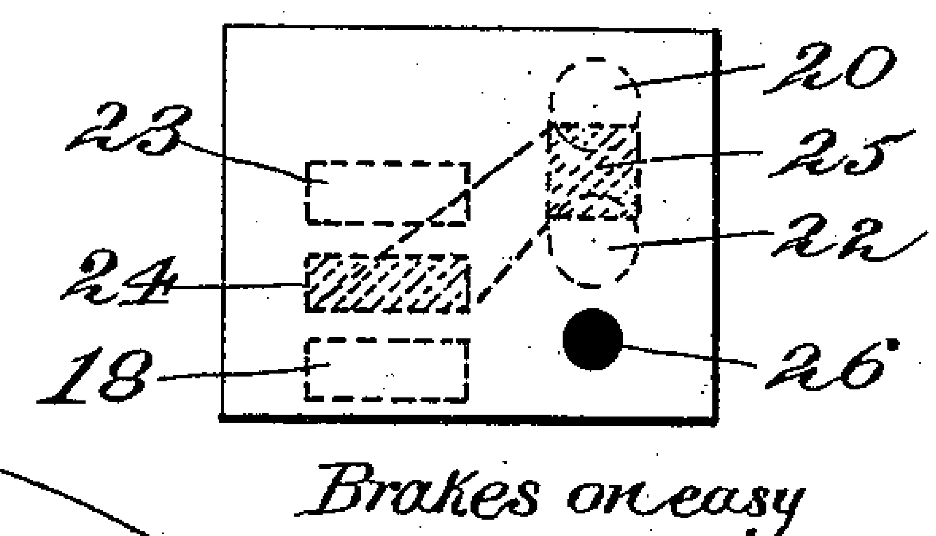


Fig. 7

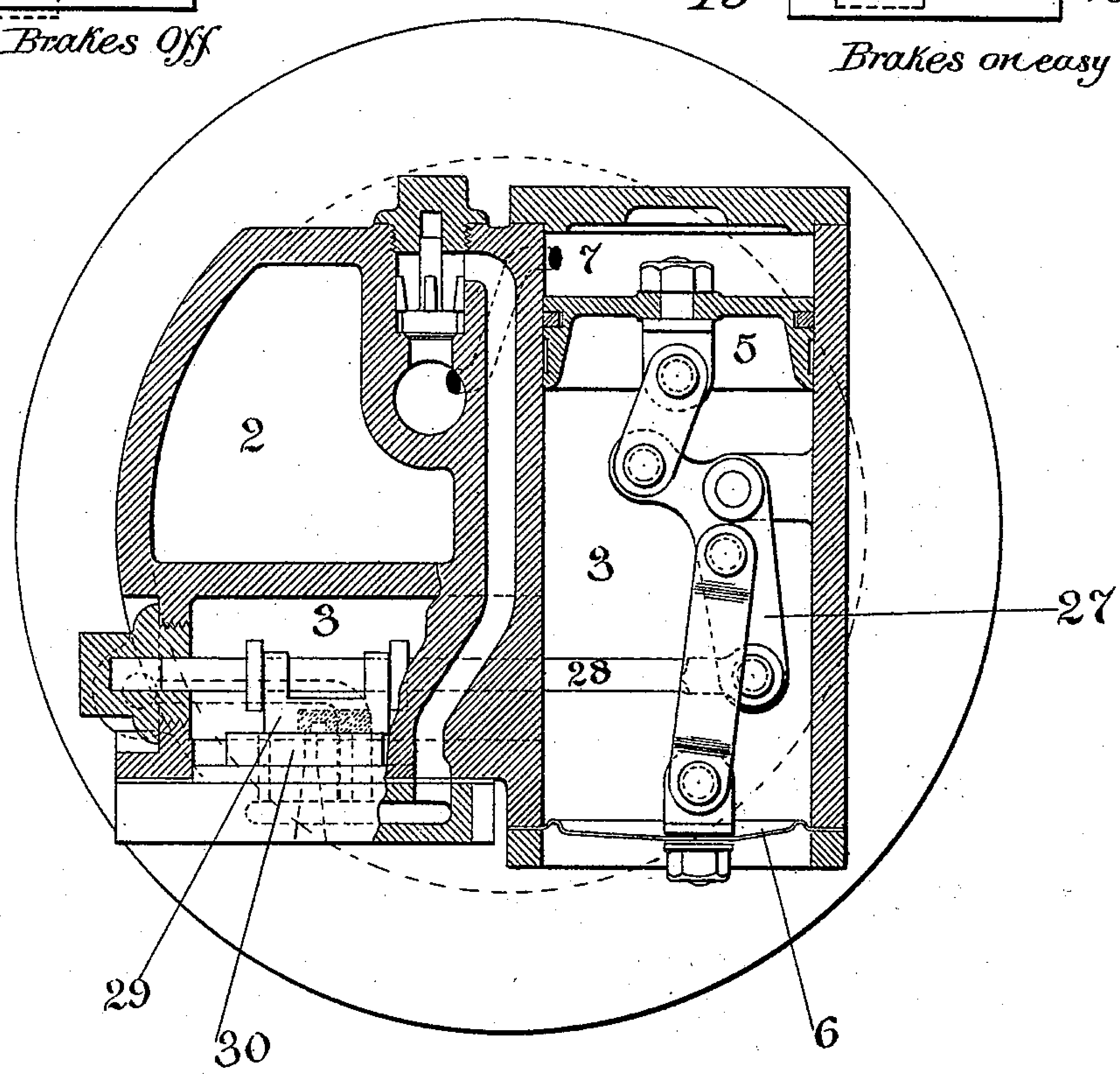
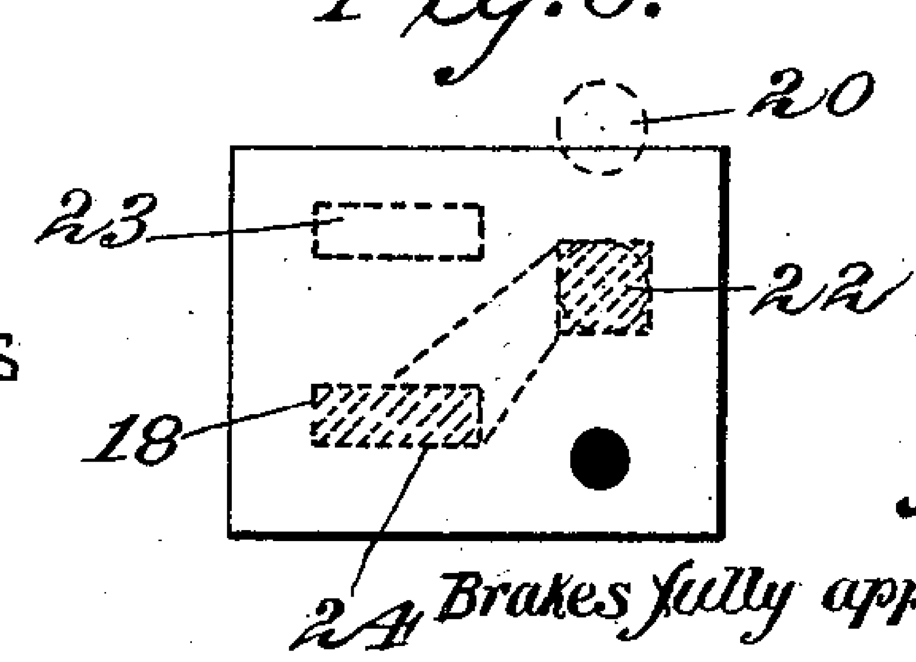


Fig. 6.



WITNESSES

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F. L. Massey.

INVENTOR

Albert P. Massey

UNITED STATES PATENT OFFICE.

ALBERT P. MASSEY, OF WATERTOWN, NEW YORK, ASSIGNOR TO THE EAMES VACUUM BRAKE COMPANY.

AUTOMATIC AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 447,783, dated March 10, 1891.

Application filed January 23, 1890. Serial No. 337,868. (No model.)

To all whom it may concern:

Be it known that I, ALBERT P. MASSEY, a citizen of the United States, residing in the city of Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Automatic Air-Brakes, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention comprises certain improvements upon the automatic-brake apparatus patented by me November 2, 1886, No. 351,786. It is for the purpose of giving greater uniformity of action to all the brakes on a train of cars.

Figure 1 is a plan view, partly in section. Fig. 2 is a sectional view on line A B when brakes are released. Fig. 3 is a sectional view of the valve when brakes are applied. Figs. 4, 5, and 6 are transparent views of the valve in relation to the ports in its various positions. Fig. 7 is a view, partly in section, showing a modification of the apparatus wherein a slide-valve is substituted for the oscillating valve.

In the drawings, 1 represents the brake-cylinder of a car.

2 is an intermediate chamber between the brake-cylinder and the auxiliary reservoir.

3 is a chamber connected directly with the auxiliary reservoir through pipe 4, Fig. 1. Chamber 3 is a cylinder, in which is fitted a piston 5 near one end and a flexible diaphragm 6 at the other end. The portion of this cylinder between the piston and the cap (marked 7) is connected by the passage 8 with the orifice 9, which is connected to the train-pipe.

10 is an oscillating valve which is actuated by valve-spindle 11 and is kept to its seat by the spring 12 in the valve-spindle.

13 is a lever having a fulcrum at 14 and connected by links to piston 5 and diaphragm 6 at such an angle that the effective leverage of one will increase when the other decreases, for when the lever rises the effective leverage of the piston 5 to turn the lever about the fixed fulcrum 14 grows shorter and the effective leverage of the diaphragm 6 grows longer; but when the lever is depressed the leverage of the piston grows longer and the leverage of the diaphragm grows shorter.

15 is a jaw in lever 13, which incloses the pin 16 on valve-spindle 11 and through it actuates valve 10. The passage 17 connects the train-pipe 9 with the port 18 in the valve-seat. The passage 19 connects the brake-cylinder with port 20 in the valve-seat. The passage 21 connects intermediate chamber 2 with the port 22 in the valve-seat. The port 23 is open to the atmosphere.

In the valve, Figs. 4, 5, and 6, 24 and 25 are ports open only on the face of the valve. They are connected by a cored passage. 26 is a port passing directly through the valve.

In the modification shown in Fig. 7 a slide-valve 29 is substituted for the oscillating valve 10. This valve and its valve-seat 30 have the same ports as shown in Figs. 4, 5, and 6, and these ports are connected with the same chambers, as above described. The lever 13 is changed in form to that of 27, but its action is the same.

By means of these improvements the following objects are attained: Assuming that the apparatus is attached to a train-pipe, a brake-cylinder, and an auxiliary reservoir, as used on cars, and that the train-pipe is supplied with compressed air at a suitable pressure, then by simply varying the pressure in the train-pipe the brakes may be applied easy with a definite pressure and carry that pressure without increasing or decreasing the same. The brakes may be applied slowly, but finally attain full force. The brakes may be applied quickly for emergency stops. They may be quickly released.

The operation is as follows: Fig. 2 shows the valve 10 in its normal position. Fig. 4 is a plan of the valve and seat when in this position. Compressed air passes from the train-pipe at 9, through passage 17 and port 18, to chamber 3, which is connected with the auxiliary reservoir. From chamber 3 it will also pass through ports 26 and 22 and passage 21 to the intermediate chamber 2. It will also pass from 9 through passage 8 to chamber 7 above the piston. The pressures will therefore be the same in the intermediate chamber 2, the auxiliary reservoir 3, and the train-pipe chamber 7. The chamber 2 has about one-fourth the capacity of the brake-cylinder. The piston 5, having the same air-pressure on both sides, is in equilibrium, and the air-pressure on diaphragm 6 draws the lever 13 downward and holds the valve 10 in its normal position. If now the pressure in the train-pipe is reduced, say, five pounds, the pressure in chamber 7 will be less than in chamber 3, and there will therefore be an upward pressure on the piston 5 equal to the difference in the pressure on its respective sides. As the piston 5 is connected to lever 13 with an effective leverage many times greater than the effective leverage of diaphragm 6, a very slight upward pressure is sufficient to move lever 13, and with it spindle 11 and valve 10; but as soon as motion commences the effective leverage of piston 5 decreases and that of diaphragm 6 increases, so that a short upward motion is sufficient to bring piston 5 and diaphragm 6 in equilibrium, and thus hold lever 13 and valve 10 in a new position a certain distance from the normal position. If the train-pipe pressure is reduced a greater amount, the greater difference in pressure on opposite sides of piston 5 will draw up lever 13 a greater distance before the effective leverages of piston 5 and diaphragm 6 will be in equilbrium, and therefore the valve 10 will be moved a greater distance. The proportions of the piston and diaphragm and the angle between their leverages on 13 are so adjusted that a slight reduction of pressure in the train-pipe will move the valve 10 to the position shown in Fig. 5. Referring to Fig. 4, port 18 opens train-pipe to auxiliary reservoir, port 20 opens to brake-cylinders, port 23 opens to the atmosphere, and consequently the brake-cylinder is open to the atmosphere through 20, 25, 24, and 23. Port 22 opens to intermediate chamber 2. When the valve has moved, as in Fig. 5, the train-pipe port 18 is closed and the port 23 is closed and cuts off communication between the brake-cylinder and the atmosphere. The port 26 is closed, cutting off the auxiliary reservoir from the intermediate chamber, and the port 25 opens port 22 to port 20, thus allowing air to flow from the intermediate chamber to the brake-cylinder. As the intermediate chamber is about one-fourth the capacity of the brake-cylinder, the air in it will expand to about one-fifth of the pressure originally in the intermediate chamber, or, say, twelve pounds per square inch. The valve will remain in this position as long as the train-pipe pressure remains a little below that of the auxiliary reservoir. Hence the brakes can be carried at the above-determined pressure for an indefinite time. If the train-pipe pressure be increased to that of the auxiliary reservoir, the piston 5 will offer no resistance to the pressure on diaphragm 6, and the lever 13 will be forced downward, bringing the valve 10 to its normal position and releasing the brake. For an emergency stop the pressure in train-pipe is reduced, say, twenty pounds. This variation on opposite sides of piston 5 gives such a preponderance of force to piston 5 over diaphragm 6 that it raises lever 13 high enough to bring valve 10 to the position shown in Fig. 6 before the change in the angle of 13 brings the piston and diaphragm again to equilibrium. As the valve moves from the position in Fig. 4 to that in Fig. 6 it opens ports 20 and 22 to each other, as before described, and the excess pressure in intermediate chamber 2 is reduced to twelve or fifteen pounds. When the valve reaches position shown in Fig. 6, the brake-cylinder port 20 is open to the reservoir-pressure, which quickly brings the brake-cylinder to full pressure. At the same time ports 22 and 18 are connected by the cored passage from 24 to 25. This allows a portion of the air in the train-pipe to pass into chamber 2, which has just been partially emptied, and thus reduces the train-pipe pressure quickly for actuating the valves on the cars farther to the rear of the train. Restoring the train-pipe pressure to that of the auxiliary reservoir again brings the valve to its normal position and releases the brakes.

If the train-pipe pressure is reduced ten or twelve pounds, the valve will be moved to a position intermediate between Figs. 5 and 6, when port 20 will be opened slightly, while port 18 remains closed. In this case the brakes would be applied slowly but with full force in three or four seconds. If the train-pipe pressure is reduced ten or twelve pounds and then restored to about five pounds below the normal pressure, the valve will move to the intermediate position described above and then return to position in Fig. 5. This will have put the brakes onto a pressure intermediate between twelve pounds and the full pressure and will retain it at that intermediate pressure as long as desired.

It is obvious that by changing the points of attaching the links from the piston and diaphragm to the lever 13 any varying resistance may be obtained that may be desired. I have proportioned them in this apparatus to move the valve through its extreme travel with a variation of twenty pounds pressure in the train-pipe.

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

1. In a fluid-pressure brake mechanism, the combination of a train-pipe, auxiliary reservoir, intermediate chamber, and brake-cylinder with a valve device consisting of a valve-case containing a diaphragm and piston connected at different angles to a lever in such a manner that the effective leverage of one will increase when the other decreases, combined with a valve situated in a chamber connected with the auxiliary reservoir, whose preliminary traverse admits air from an intermediate chamber to the brake-cylinder, and which by a further traverse closes the intermediate chamber from the brake-cylinder and admits air from the auxiliary reservoir to the brake-cylinder, substantially as set forth.

2. In a fluid-pressure brake mechanism consisting of a train-pipe, auxiliary reservoir, intermediate chamber, and brake-cylinder, a governing-valve situated in a chamber connected with the auxiliary reservoir, with ports which will in a preliminary traverse admit air from an intermediate chamber to the brake-cylinder and by a further traverse will close the intermediate chamber from the brake-cylinder and open it to the train-pipe, so that air may flow directly from the train-pipe to the intermediate chamber, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 20th day of January, A. D. 1890.

ALBERT P. MASSEY.

Witnesses:
H. G. MANNING,
MICHAEL J. MORKIN.