(No Model.) 2 Sheets—Sheet 1.

G. B. WILLIAMS.

AIR BRAKE.

No. 441,526. Patented Nov. 25, 1890.

Fig. 1.

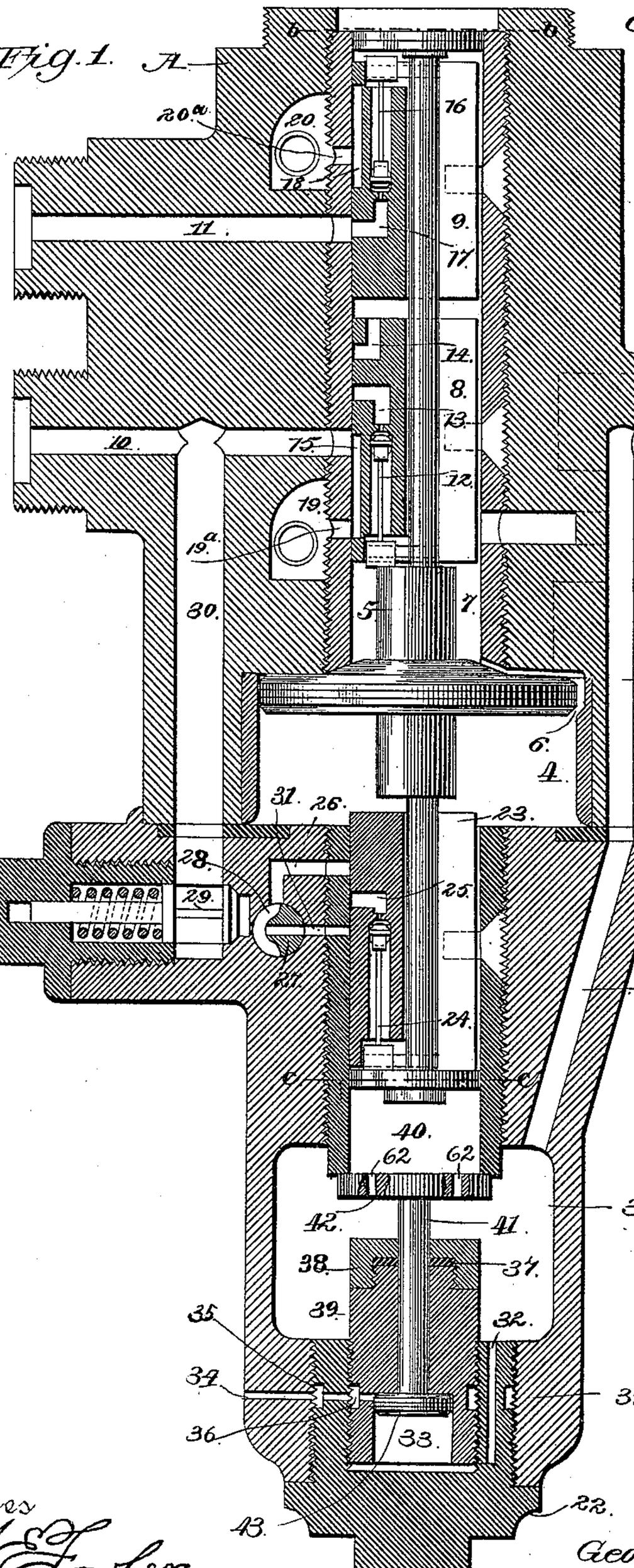


Fig. 1b.

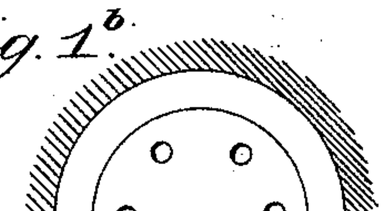


Fig. 1c.

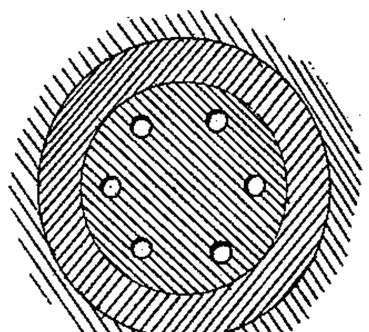
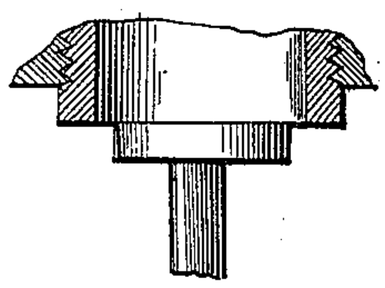


Fig. 1a.



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(No Model.) 2 Sheets—Sheet 2.

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No. 441,526. Patented Nov. 25, 1890.

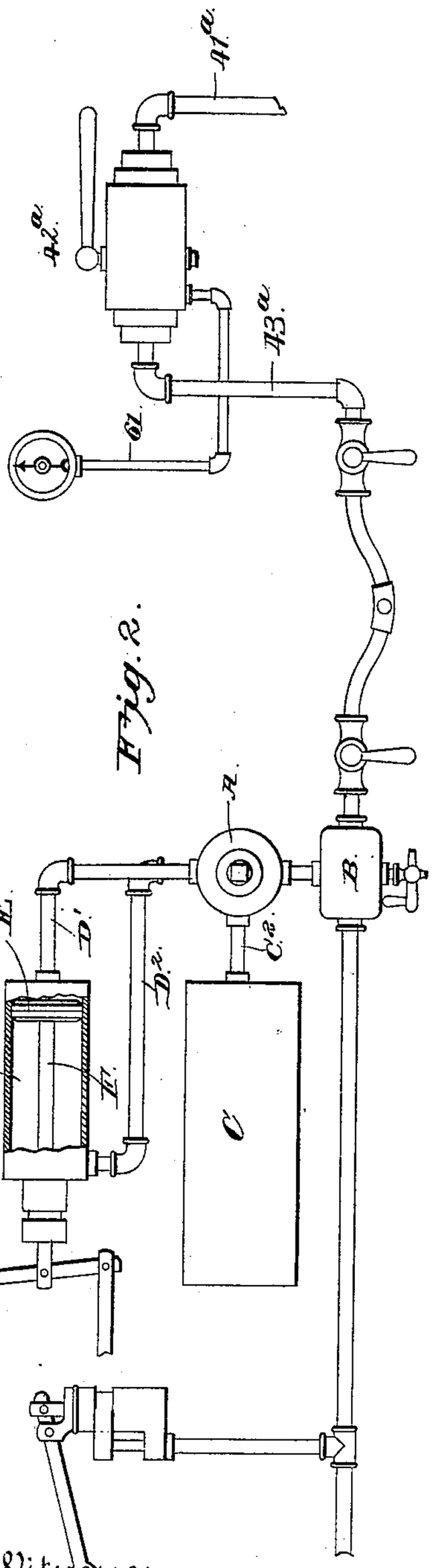

Fig. 2.

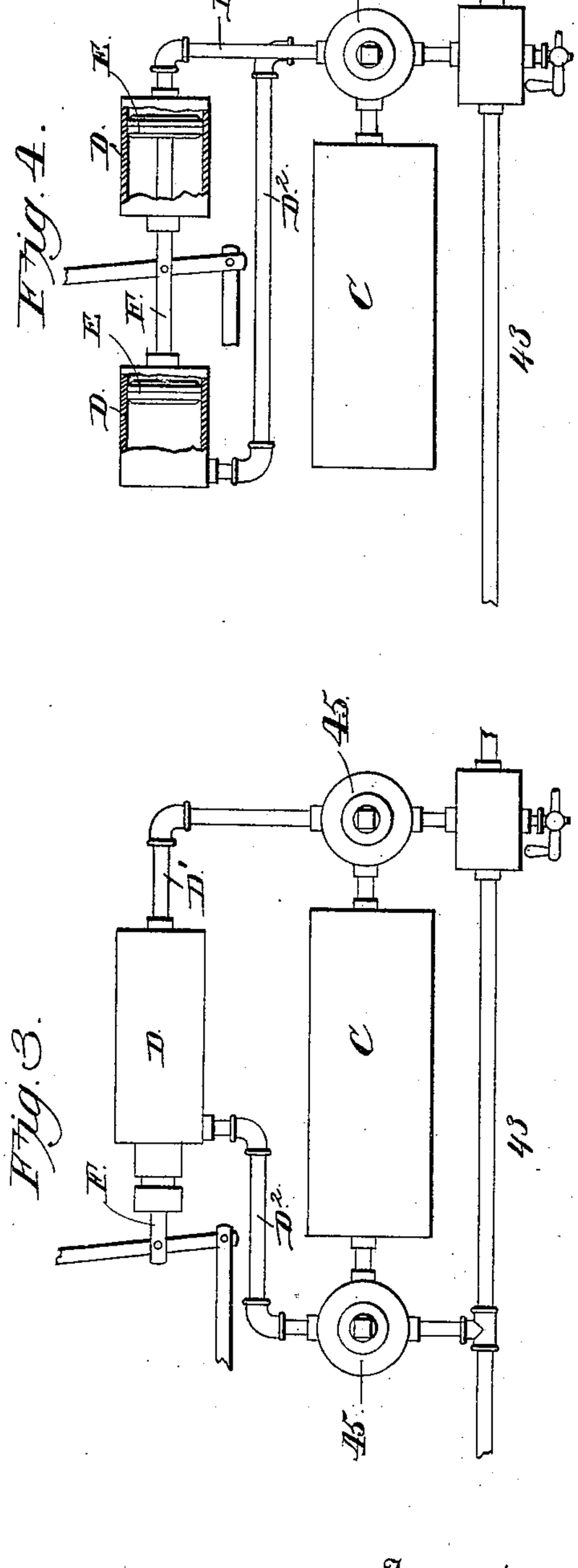

Fig. 4.

Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE BAYLEY WILLIAMS, OF LA CROSSE, WISCONSIN.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 441,526, dated November 25, 1890.

Application filed November 22, 1887. Serial No. 255,901. (No model.)

To all whom it may concern:

Be it known that I, GEORGE BAYLEY WILLIAMS, a citizen of the United States, residing at La Crosse, in the county of La Crosse and State of Wisconsin, have invented new and useful Improvements in Air-Brakes, of which the following is a specification.

My invention relates to an improvement in double-action automatic air-brakes, being an improvement upon the Westinghouse system of air-brakes; and it consists in the peculiar construction and combination of devices that will be more fully set forth hereinafter, and particularly pointed out in the claims.

The object of my invention is, first, to provide means whereby the graduation of the action of the triple valve may be controlled by atmospheric or other fluid pressure, and thus enable me to dispense with the imperfect and uncertain graduating-spring now commonly employed; and a further object of my invention is to provide means whereby the brakes are released by atmospheric pressure, as well as applied thereby, this enabling me to dispense with the springs now employed for releasing the brakes, thereby rendering the brake apparatus more certain in its operation, and also effecting an economy of compressed air.

In the accompanying drawings, Figure 1 is a vertical central sectional view of a triple valve embodying my improvements. Fig. 1^a is a detail sectional view illustrating a modification. Fig. 1^b is a detail sectional view taken on the line *b b* in Fig. 1. Fig. 1^c is a detail sectional view taken on the line *c c* in Fig. 1. Fig. 2 is partly a plan view and partly a horizontal sectional view of my improved brake apparatus complete. Fig. 3 is a similar view of a modified form of the same. Fig. 4 is a similar view of another modified form of the same.

A represents the triple-valve case, which has in one side a channel 1, communicating with the main reservoir B, a channel 2, extending from the lower end of channel 1 to the drip-cup 3 in the lower end of the case. A chamber 4 communicates with the drip-cup 3 and in which the piston operates. A channel 6 in the side of the piston-chamber 4 communicates with the upper valve-chamber 7, which is in direct communication at all times with the auxiliary reservoir C, either by screwing the upper end of the triple valve into the lower side of the said auxiliary reservoir, Fig. 1, or by connecting the same to the auxiliary reservoir by means of a pipe, Fig. 2. Near the upper end of the triple-valve case is a transverse channel 11, which extends from one side of the same to the valve-chamber 7. Above the said channel 11 is an exhaust-channel 20, which communicates with the valve-chamber 7 through an opening 20^a.

10 represents a channel, which is similar to the channel 11, is located at a suitable distance below the same, and extends from one side of the triple-valve case to the valve-chamber 7. Below the said channel 10 is an exhaust-channel 19, which communicates with the valve-chamber 7 through an opening 19^a.

30 represents a vertical channel, which extends downward from the channel 10 for a suitable distance and communicates with a valve-seat, in which is arranged a spring-pressed check-valve 29. Between the piston-chamber 4 and the drip-cup 3 is a lower valve-chamber 40.

27 represents a three-way cock, which is arranged in the case A and is adapted to communicate with a channel 26 and with a channel 31, which channels communicate with the valve-chamber 40 near the upper end thereof. The said channel 31 is at a suitable distance below the said channel 26.

D represents the brake-cylinder, having the piston E and the rod F, the latter being connected to the brake apparatus in the usual manner. One end of the brake-cylinder D is provided with a pipe D′, which communicates with the channel 11 of the triple-valve case, and to the other end of the brake-cylinder is attached a pipe D^2, which communicates with the channel 10 of the triple-valve case.

5 represents the piston, which operates in the chamber 4 of the triple-valve case and is provided with a stem which extends upwardly into the valve-chamber 7 and downwardly into the valve-chamber 40. In the chamber 7 are arranged slide-valves 8 and 9, which are similar to the slide-valves employed in the ordinary Westinghouse triple valve. The function of the valve 8 is to control the admission of air into the brake-cylinder through the channel 10 and pipe D^2 for applying the

brakes by moving the piston E in one direction, and the function of the valve 9 being to control the admission of air into the opposite end of the brake-cylinder through the channel 11 and the pipe D′ to release the brakes by moving the piston E in the opposite direction. The slide-valve 8 has the graduating-valve 12, ports 13 and 14, and an exhaust groove or recess 15. The slide-valve 9 is similar to the slide-valve 8, but is arranged in an inverted position, so as to act reversely to the said valve 8, and is provided with a graduating-valve 16, a discharge-port 17, and an exhaust-recess 18, as shown.

23 represents the slide-valve, which is arranged in the valve-chamber 40 and is connected to the lower portion of the piston-stem in the usual manner. The said slide-valve 23 has a graduating-valve 24 and discharge-port 25, from which the air passes into channel 31 through the three-way cock 27 and check-valve 29 into channels 30 and 10, and from thence to the brake-cylinder, to enable the application of the brakes at various parts of the train where three-way cock 27 is open to commence simultaneously, or nearly so. This valve 23 and its connection form the subject-matter of Letters Patent No. 384,009, dated June 5, 1888, to which reference is hereby made. When the slide-valve 23 descends to its lowest limit, the air passes over its upper side and through the channel 26 to the brake-cylinder. By means of the channel 31 and the groove 28 in the three-way cock 27 channels 26 and 31 may be both left open, both closed, or channel 26 only left open. Thus when it is desired to have the application of the brakes commence simultaneously at the front and rear and middle of a train, then the three-way cock 27 is set on the several cars at the front and rear and also at the middle of the train, so that the ports 26 and 31 on such cars are both connected with the chamber or passage in which the valve 29 is seated, as shown in the drawings hereto annexed. The three-way cocks on the remaining cars are set to close the ports 26 and 31 in case the cars are equally loaded. If some of the cars are heavily loaded and some are empty, then on the heavily-loaded cars the three-way cocks 27 are set so as to leave the ports 26 open and close the ports 31, while on the empty cars the cock 27 will be set to close both the ports 26 and 31. When the engineer now operates his valve and allows air to escape from the train-pipe into the open air, there will also be an exhaust from the main air-pipe into the brake-cylinder on cars on which the cock 27 is open, so that the brakes on such cars will be applied sooner and with greater force than on cars on which the cock 27 is closed.

39 represents a graduating-piston case, which is secured in a cap-nut 22, that is screwed in the lower end of the drip-cut 3. The said piston-case 39 is provided in its lower end with a piston-chamber 33, and the said cap-nut is provided with a channel 32, which establishes communication between the drip-cup 3 and the chamber 33. The piston 43, which is arranged in the chamber 33, is provided with a stem 41, having at its upper end a head 42, which operates under the lower end of the slide-valve chamber 40. It is obvious that this head, the purpose of which is merely to receive the impact of the piston-stem on the downward movement of the latter, must either be provided with perforations or else be of smaller diameter than the chamber 40, in order to admit of the passage of air into and through the latter, or that other means of constant communication between chambers 3 and 4 be provided. In Fig. 1 of the drawings hereto annexed the said head has been shown to be provided with perforations 62, and in Fig. 1ª, the modified construction, whereby the diameter of the said head 42 has been reduced, is illustrated. In order to prevent leakage of air around the stem 41, I place a packing of leather or other suitable material 37 on the upper end of the case 39, and screw a packing-gland 38 onto the upper end of the said piston-case. In order to prevent pressure from being exerted on the upper end of the piston in chamber 33 in case of leakage around the edge of the said piston, I provide the cap-nut 22 with an annular groove 35, the piston-case 39 with an annular groove 36, arranged in the same horizontal plane, and then drill a channel 34 through the lower side of the drip-cup to the groove 35 and through the sleeve portion of the cap-nut to the groove 36, the said channel and grooves serving to permit the escape of any air above the graduating-piston. The said graduating-piston is very much smaller than the piston-head 5.

The operation of this portion of my invention is as follows: The compressed air from the main reservoir passes through the channels 1 and 2 into the drip-cup 3 and through the valve-chamber 40 into the piston-chamber 4, so as to raise the piston 5 to the position indicated in Fig. 1, and it then passes through the channel 6 into the slide-valve chamber 7, and into the auxiliary reservoir either through the top of the valve-case, as in Fig. 1, or through a pipe C^2, as in Fig. 2, so as to maintain a pressure in the latter equal to the pressure in the main reservoir, or any desired pressure through a reducing-valve. From the drip-cup 3 a portion of the air passes downward through the channel 32 into the chamber 33 and bears against the lower side of the graduating-piston, so as to raise the same. The pressure of the air under the graduating-piston being constant, the latter is maintained in an elevated position normally at all times, with a degree of force which is proportionate to the difference between the areas of the graduating-piston and the piston-head 5.

Heretofore it has been the practice to employ a spring to maintain the graduating-piston in an elevated position, but the use of

such springs is attended by disadvantages, owing to the fact that springs are not always reliable in action, sometimes stick and refuse to work, and no two can ordinarily be made of the same size and strength. The result is that when such springs are employed the action of said springs is not reliable and uniform. This objection I overcome by arranging means whereby the graduating-piston is operated directly by air-pressure.

The operation of my invention is as follows: From the main reservoir the air has constant communication with the engineer's brake-valve 42ª (see Fig. 2) by means of the supply-pipe 41ª. It being desired to apply the brakes the engineer places the lever of valve 42ª into the correct position as long as may be necessary, which he can decide by looking at the air-gage, which communicates with a main air-pipe by means of pipe 61. The engineer then returns the lever to its initial position. Exhausting air from the main air-pipe causes the piston 5 to descend after opening graduating-valve 12 of slide-valve 8 and closing graduating-valve 16 of the slide-valve 9. As the piston 5 descends, the leakage groove or recess 18 of the slide-valve 9 connects the channel 11 with the exhaust-outlet 20, said groove 18 being of sufficient length to connect the channel 11 with the opening 20ª of said outlet 20, allowing air to escape through the pipe D from the brake-cylinder, and consequently relieving the piston E of the pressure which has hitherto been maintaining the same in position to release the brakes. At about the same time, or, preferably, with a slightly further descent of the piston, the outlet-port 13 of the slide-valve 8 connects with the channel 10 and allows the air to pass to the brake-cylinder through the pipe D^2, so as to force the piston E forward, and thereby apply the brakes. When the pressure in the auxiliary air-reservoir has been reduced by expansion into the brake-cylinder until it is the same as the pressure in the main air-pipe, the graduating-piston 43 causes the piston 5 to rise, when the graduating-valve 12 in the slide-valve 8 is at once closed and the flow of air to the brake-cylinder ceases, the brakes having been applied with a force proportionate to the reduction of pressure in the main air-pipe. When it is desired to release the brakes and to recharge the auxiliary reservoir, the engineer admits air from the main reservoir into the main air-pipe 43ª, which enters the triple valve through the channels 1 and 2 into the drip-cup 3, thence passes into the chamber 4, causing piston 5 to rise, which results in closing the graduating-valve 12 in the slide-valve 8, and in opening the graduating-valve 16 in slide-valve 9. As the piston 5 ascends, the groove or recess 15 of the slide-valve 8 connects the channel 10 with the exhaust-outlet 19 through opening 19ª, thereby allowing the air to escape from the front end of the brake-cylinder through the pipe D^2. When the piston 5 ascends to the upper limit of its movement, the outlet-port 17 of slide-valve 9 connects with the channel 11, allowing air to pass through the pipe D′ into the rear end of the brake-cylinder to release the brakes. At the time that the piston 5 is at its upper limit the air passes through the channel 6 into chamber 7 to recharge the auxiliary reservoir.

I do not desire to limit myself to the precise construction and combination of devices hereinbefore described, as it is evident that modifications may be made therein without departing from the spirit of my invention. I reserve the right to any mechanical equivalent which accomplishes substantially the same result in substantially the same way by having a valve-motion for opening and closing two separate ports leading to opposite sides of brake-cylinder piston or into reverse-acting brake-cylinders in such sequence as the engineer wills by moving lever of valve, preferably so arranged that the travel of valves for applying the brakes is as great as is consistent with quick application and general efficiency, and so that the discharge of air into the brake-cylinders for releasing the brakes is limited to the extreme upper limit of travel of valve for that purpose.

Having thus described my invention, I claim—

1. In a fluid-brake, the combination of the main piston 5 with the supplementary or graduating piston 43, which latter is subject on its outer side to the air-pressure contained in the train-pipe, which has constant communication with the valve-chamber 33, and which supplementary piston is subject on its opposite or inner side only to the pressure of the atmosphere with which there is constant communication through channel 34, by which means the excess of pressure on the outer side of the piston 43 forces it inward, thus allowing said graduating-piston to be differentially actuated by varying degrees of pressure, substantially as described.

2. In a fluid-brake mechanism, a graduating-piston 43, actuated by the train-pipe pressure on one side only and exposed on its other side to the action of the atmosphere only, said train-pipe pressure being varying or differential and permitting the use of the lowest pressures in the auxiliary reservoir for braking purposes, substantially as set forth.

3. In a fluid-pressure-brake mechanism, the combination, with the triple-valve case A, of the cap-nut 22, the piston-case 39, and the graduating-piston 43, subject on one side to the train-pipe pressure flowing into chamber 33 and on the opposite side to the pressure of the atmosphere flowing through channel 34, substantially as set forth.

4. In a triple valve for air-brakes, the combination of the case A, the piston-case 39, having the chamber 33, the channel connecting the latter with the train-pipe, the regulating-piston 43, arranged in chamber 33, the valve-chamber 40, the piston 5, having the

stem depending in said valve-chamber, and the perforated head at the upper end of the stem of the regulating-piston and lying in the path of the main piston-stem, substantially as set forth.

5. In a triple valve for air-brakes, the valves 8 9, movable independently of each other for admitting air to opposite ends of the brake-cylinder, and the piston having the stem and connections to operate the said valves, substantially as described.

6. In a triple valve for automatic air-brakes, the combination of the case A, having chamber 4, the piston 5 working in said chamber, the slide-valve 8, with its graduating-valve 12 actuated by piston 5 and adapted for admitting compressed air from the auxiliary reservoir through ports 13 and 14 into the brake-cylinder to apply the brakes when piston 5 descends, and to exhaust said air from brake-cylinder through exhaust-groove 15 and exhaust-outlet 19, and the slide-valve 9, with its graduating-valve 16 also actuated by piston 5, adapted for admitting compressed air from the auxiliary reservoir through port 17 to the opposite end of brake-cylinder to release the brakes during the ascent of piston 5, and to exhaust said compressed air from brake-cylinder through exhaust-groove 18 and exhaust-outlet 20 to allow the brakes to be applied, substantially as described.

7. The combination, in air-brake apparatus, of the valve-case having the channels or passages 10 and 11 and exhaust-chambers 19 and 20, with the valve 8, having the channel 14 and the recess or channel 15, adapted to establish communication between channels 10 and 19, the valve 9, having the channel 17 and channel or recess 18, adapted to establish communication between chambers 11 and 20, the piston 5, and connections between the same, and the said valves to operate the latter, substantially as described.

8. The combination, in air-brake apparatus, of the valve-case having the channels 10 and 11 and exhaust-chambers 19 and 20, with the valve 8, having the channel 14, the channel or recess 15, the channel 13, and the valve 12 therein, the valve 9, having the channel or recess 18, the channel 17, and the valve 16 therein, the piston 5, and connections between the same and valves to operate the latter, substantially as described.

9. In a triple valve for fluid-brake mechanism, the combination of the case A, the piston 5 therein, the valves 8 9, operated by said piston, and the graduating-piston 43, subject on one side to the fluid-pressure in the train-pipe and on the other side to the pressure of the atmosphere only, said graduating-piston having a stem provided with a perforated head located in the path of the stem of the piston 5, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

GEORGE BAYLEY WILLIAMS.

Witnesses:

A. L. SHEREY,

THEO. SIMERMAN.