No. 789,081. PATENTED MAY 2, 1905.

F. S. CRAVENS.

AIR BRAKE APPARATUS.

APPLICATION FILED MAR. 22, 1904.

2 SHEETS—SHEET 1.

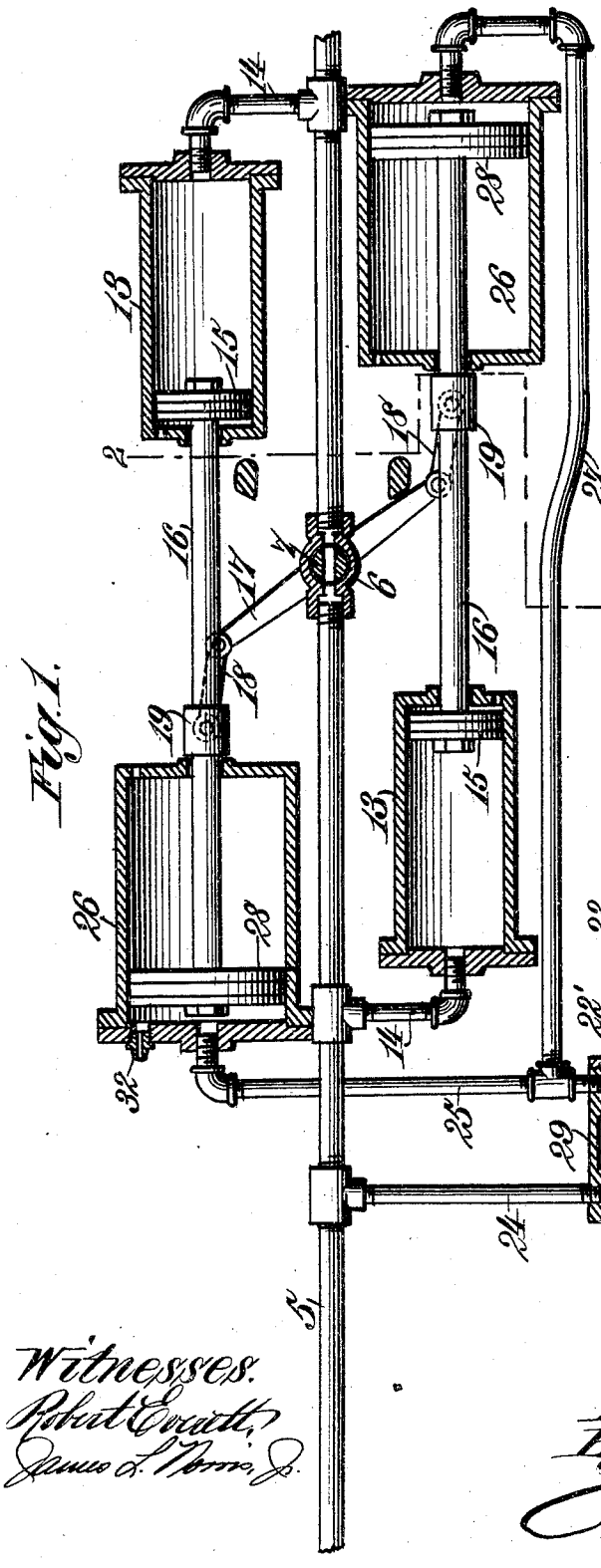


Fig. 1.

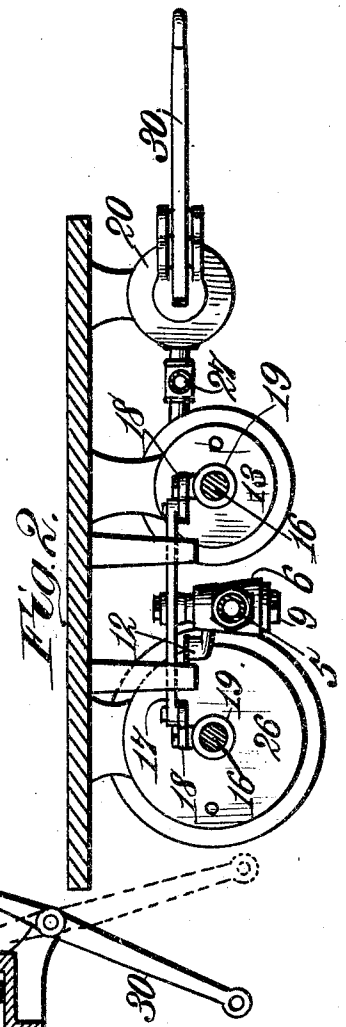


Fig. 2.

Witnesses.
Robt. Ewalt.
James L. Norris, Jr.

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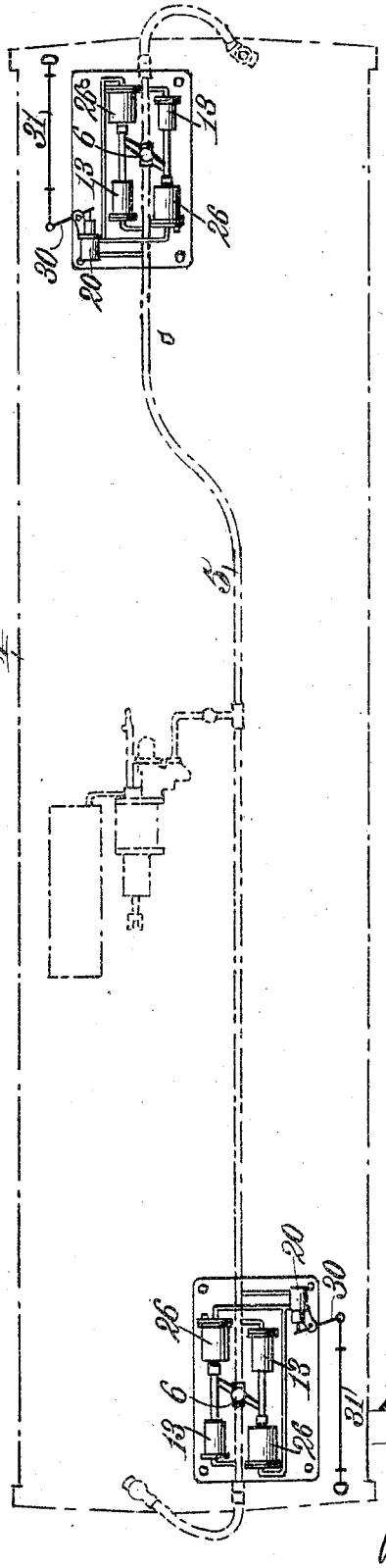


Fig. 3.

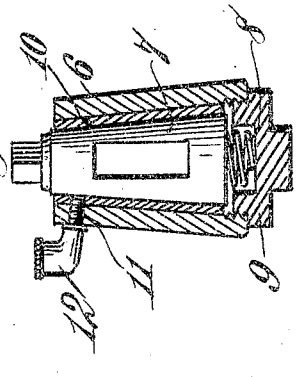


Fig. 4.

Witnesses.
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James L. Norris Jr.

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No. 789,081. Patented May 2, 1905.

UNITED STATES PATENT OFFICE.

FRANK S. CRAVENS, OF LEXINGTON, KENTUCKY.

AIR-BRAKE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 789,081, dated May 2, 1905.

Application filed March 22, 1904. Serial No. 199,373.

To all whom it may concern:

Be it known that I, FRANK S. CRAVENS, a citizen of the United States, residing at Lexington, in the county of Fayette and State of Kentucky, have invented new and useful Improvements in Air-Brake Apparatus, of which the following is a specification.

This invention relates to air-brake apparatus.

In air-brake apparatus as at present organized the train-pipe is intersected by what is known as "angle-cocks," each car being equipped with two of such cocks and at opposite ends thereof. These cocks are manually operable. It happens at times that a trainman in charge of the apparatus will fail after coupling the cars to open an angle-cock. This will be particularly disastrous if the cock not opened happens to be upon the first car of a long freight-train, for the air cannot pass from the air-tank upon the locomotive to the train-pipe, thereby rendering the braking system inoperative and causing accidents. Instances are known where what might be termed the "head angle-cock," or the one immediately behind the locomotive-tank, becomes accidentally closed, thereby preventing such air from passing from the locomotive-tank to the train-pipe and causing the same disastrous results.

By virtue of my invention I avoid the possibility of accidents arising from the causes mentioned. This I secure by the action of valves which are automatically operable by air-pressure, so that the instant the train-pipe sections on the several cars of a train are coupled together and to the locomotive the air will travel uninterruptedly from the locomotive to the rear of the train, opening in its travel toward the rear the several valves in succession in a positive manner. The valves will be also held open as long as the cars are coupled to the locomotive.

The invention possesses other objects and advantages, which will appear at length in the following description. In said description I will describe that particular embodiment of the invention which I have selected for illustration in the accompanying drawings, forming a part of this specification. I do not limit myself to the showing thus made, for the apparatus or system may be materially modified within the scope of the claims succeeding such description.

Referring to the drawings, Figure 1 is a sectional plan view of certain cylinders, piping, and associated parts related in accordance with the invention. Fig. 2 is a transverse sectional view of the parts represented in Fig. 1. Fig. 3 is a diagrammatic plan view showing the arrangement of the parts of the apparatus with respect to a car, the latter being represented by a dotted outline in said figure. Fig. 4 is a sectional elevation of a valve hereinafter described.

In Fig. 3 I have shown by dotted lines a car or like vehicle, the same being denoted by 4 and having suitably associated therewith the usual brake and air cylinders and triple-valve mechanism. The opposite ends of the pipe-section 5, constituting a part of what is known as the "train-pipe," are provided with the usual flexible pipe members, terminating in coupling-heads, which coupling-heads when a car is not coupled are adapted to be united in an air-tight manner with dummies or blind couplings on the car. In that embodiment of the invention represented in the drawings and in this connection (see particularly Fig. 3) the train-pipe section 5 is equipped with two valves independently of the triple-valve mechanism and adapted, as will hereinafter appear, to be automatically operated upon the flow of air from either direction into said pipe-section. I will describe in detail but one of the valves and its connections, as such parts are duplicates of each other, and consequently a full description of one will apply to the other, reference being had particularly to Figs. 1, 2, and 4.

The train-pipe section, which for convenience in description I will hereinafter refer to as the "train-pipe" 5, is intersected by a casing 6 for a valve 7. This casing may in practice be made in the form of a casting, and the adjacent ends of the parts of the train-pipe 5 can be tapped or otherwise fitted into the said casing. The valve 7 is represented as being of plug form and as tapering toward one end, it having a transverse port between its ends adapted to be moved into and out of

registration with the bore of the pipe 5 or with the bores of the two parts of said pipe which the casing of the valve connects. When the valve 7 is open, in which position it is shown in Fig. 1, it will permit the flow of air from the right in Fig. 1 through the valve-casing and toward the left in said Fig. 1 or in the opposite direction. I have described the valve 7 as being of a common form. A valve of any other character might be substituted therefor, as will be perfectly obvious. The tapered plug-valve, however, is satisfactory for my purpose. To hold the said valve firmly to its seat, it is shown engaged by a coiled push-spring 8, seated upon a plug or cap 9, threaded into the larger end of the casing 6. (See Fig. 4.) A bushing, as 10, is inclosed by the smaller end of the casing 6 and surrounds the smaller end of the valve, and the nipple 11, projecting through the casing, is tapped into said bushing to prevent turning of the same. The nipple projects from a lubricator-cup 12, which may be supplied with a suitable lubricant in order to properly lubricate the turning valve 7.

From the foregoing description it will be apparent that the train-pipe 5 is provided in the present case with two valves of a suitable nature, and these valves are positively and automatically opened, as will hereinafter appear, by the power of the air in said train-pipe. Naturally when the air is flowing from the right toward the left in Fig. 3 the valve at the right in said figure will be initially opened, while the other valve will be subsequently opened. Owing to the rapidity of the flow of the air, however, this opening of the valves occurs practically simultaneously. Therefore as soon as the pipe-section 5 of a car is coupled to the pipe-section of a car in front of the same and as soon as the air flows into said pipe-section or train-pipe 5 the valves 7 are instantly automatically and positively opened, so that it is unnecessary to rely upon a trainman to establish continuous communication from the locomotive to the rear car of a train, as has customarily been done through the aid of the angle-cocks.

I will set forth the means illustrated for effecting the opening of the valves and in this connection will refer to the mechanism illustrated in full in Figs. 1 and 2, as such mechanism is the same as that upon the opposite end of the car. Referring to said Fig. 1, it will be seen that it represents two cylinders, each denoted by 13, which, like certain other cylinders hereinafter described, may be mounted in any desirable way upon the car. While I have set forth the parts 13 as being "cylinders," this of course is not essential, for they may be of any other shape, the term in question being adopted simply as a matter of convenience. From the cylinder on the right in said Fig. 1 a pipe-section 14 extends and is connected with the train-pipe 5 at one side of the valve 7, while a substantially similar pipe-section, also denoted by 14, connects the other cylinder 13 with the train-pipe 5 at the opposite side of said valve. Each cylinder contains a piston, as 15, peripherally packed, as is customary. Each piston-rod is denoted by 16. A rocker is illustrated at 17, being limited in its oscillation by suitably-placed stops, and said rocker is rigidly connected approximately centrally between its ends to the stem of the turning valve 7. The opposite ends of the rocker are connected by links, as 18, with suitable collars, as 19, fastened to the piston-rods 16 at a point relatively remote from the respective pistons 15. The valve 7, as previously set forth, is represented as being wide open in Fig. 1, so as to permit the flow of air through the train-pipe. With the said valve 7 closed its port would be transverse to the position in which it is shown in Fig. 1, and at this time the piston 15 at the right would be toward the right end of its cylinder 13, while the other piston 15 would be toward the opposite end of its cylinder 13. It will be understood that the two cylinders 13 are in open or unobstructed communication with the train-pipe 5—that is to say, there is no valve or valves between such train-pipe and the respective cylinders. The consequence will be that when the train-pipe 5 is connected with the train-pipe or train-pipe section upon a car in front of the same—say to the right in Fig. 1—the air will flow into the pipe 5 in said figure from the right toward the left and as soon as it reaches the pipe-section 14 will enter said pipe-section and force the piston 15 toward the left, thereby, through the piston-rod 16 and rocker 17, opening wide the valve 7. Should the air flow from the left and the valve 7 be closed, such air will when it reaches the entering end of the pipe-section 14 on the left enter said pipe-section, and thereby the corresponding cylinder 13, propelling the piston 15 toward the right and opening, through the intermediate parts, the valve 7, permitting the air to freely pass through the valve-casing 6 and toward the end of a train or end of a car if the latter be the final one of a train.

Upon the cutting out of a car from a train I provide manually-operable means for bringing about the closure of the valves 7, which is important. For example, should it be necessary to cut out an intermediate car of a train, it is desirable that the rear valve (as it would be for the time being) of the car preceding the one that is to be cut out should be closed, so as to prevent the escape of air from the train-pipe. I will now describe the means shown in Fig. 1 for securing the closure of the valve 7.

A cylinder is shown at 20, the said cylinder containing the piston 21, from the opposite faces of which the stem 22 projects, one branch of the stem being longer than the other

branch. The long branch of the piston is provided with an auxiliary piston part 22', peripherally packed, and said long branch extends through and beyond an opening in the cylinder 20. The short branch of the piston is partially surrounded by a coiled push-spring 23, bearing at its opposite ends against the cylinder 20 and also against the piston 21 therein. This cylinder 20 is adapted to communicate, by means of the pipe-section 24, with the train-pipe 5 at a point between the two valves 7. The pipe-section 24 opens into one side of the cylinder 20, while the pipe 25 leads from the opposite side of said cylinder and is connected with a cylinder, as 26. A branch pipe 27 communicates with the pipe 25 and also with the cylinder 26, which is a duplicate of the cylinder 26 hereinbefore described, and therefore I use a corresponding character. Pistons, as 28, are mounted in the cylinders 26 and are connected with the piston-rods 16, hereinbefore described, to which, as will be remembered, the pistons are united. In other words, each rod 16 is common to two pistons, and it will be seen that the effective areas of the pistons 28 exceed those of the pistons 15, and the reason for this will hereinafter appear. The piston 21 separates the cylinder 20 into two chambers or compartments, the pipe-section 24 leading into one of these compartments, while the pipe-section 25, from which the branch 27 extends, leads from the other chamber, and the two chambers or compartments are adapted to be connected by a by-pass passage or channel 29. Upon a suitable bracket or bearing, which may be conveniently carried by or connected with the cylinder 20 or otherwise mounted, is a lever 30, one arm of which is adapted to engage the projecting end of the longer branch of the piston-rod 22, while the other arm of said lever is adapted for connection to a sliding rod or bar, as 31, suitably guided by the car (shown in Fig. 3) and having a handle at its outer end by which the rod may be drawn outward. The handle of the rod 31 is in proximity to the terminal flexible portion of the train-pipe 5, so that a trainman can simultaneously manipulate said flexible part and rod 31.

The following procedure may be adopted in cutting out a car from a train, and to aid in a correct understanding of the operation it will be assumed that the valve 7 (represented in Fig. 1) is the rear valve upon a car immediately in advance of one to be cut out from a train. To cut out such a car, the handle of the bar or rod 31 is initially grasped and said rod or bar pulled outward, thereby moving the long arm of the lever 30 in a corresponding direction and imparting an opposite motion to the short arm of said lever, whereby said short arm will thrust the piston-rod 22, and hence the piston 21, toward the left in Fig. 1, the parts when shifted occupying the positions represented by dotted lines in said figure. When the piston 21 is thus shifted, the by-pass passage 29 will put the two chambers of the cylinder 20 into communication, so that air flowing from the pipe-section 24 into said cylinder and into the left chamber thereof, Fig. 1, can flow by way of the by-pass passage into the pipe 25 and also into the branch 27. The air leaving said pipe 25 and branch 27 will enter the cylinders 26, and the pistons 28 being in the positions shown in Fig. 1 will be forced in what is represented in said figure as toward each other. The air-pressure of course will be against the pistons 15; but as the exposed areas of the pistons 28 exceed those of the pistons 15 said pistons 28 can be moved in opposition to the pistons 15. As the two pistons 28 move toward each other they serve, through the intermediate parts hereinbefore described, to close the valve 7. When said valve is closed, the two coupling-heads can be disconnected and can be subsequently connected to the dummies upon the respective cars. The valve 7 only momentarily remains closed; but should it not be opened in the manner presently to be described it will be positively opened as soon as the cars are coupled by the passage of the air through the train-pipe in the manner hereinbefore described. When the piston 21 reaches the position shown by dotted lines in Fig. 1, it will be balanced, at which time it is situated approximately centrally of its cylinder—that is to say, there will be equal pressures of air upon opposite sides of said piston 21. The latter will momentarily remain in this position. To return the piston to its initial position is the office of the spring 23. Naturally when the piston 21 was moved toward the left in Fig. 1 the spring 23 was compressed, so that subsequently, or when the pressure is removed from behind the pistons 28, said spring will become effective for returning the piston 21 to its initial position, at which time it will pass beyond the by-pass passage 29, and consequently prevent further flow of air from the train-pipe into the two cylinders 26 in the manner before described.

A vent, as 32, is formed in one of the cylinders 26 and leads from the chamber or space of such cylinder into which the air from the pipe 25 is discharged. Only one of the cylinders is provided with such a vent, although both of them may be equipped with the same, if desired. The purpose of the vent 32 is to relieve the pressure from the cylinder 26 sufficiently to permit the opening of the valve 7 under the action of the pistons 15—that is to say, the vent provides for the reduction of air acting to close the valve 7 below that tending to open said valve. When, therefore, a certain amount of air has been exhausted from the cylinder 26, (shown at the left in Fig. 1,) the two pistons 15 serve to effect the opening of the valve 7. It will be understood, of

course, that the valve 7 remains closed for only a short while; but the period of closure of the valve is ample in which to disconnect two coupling-heads from each other and to connect them to the dummies on the cars.

The closure of the valve 7 can of course be effected by the air flowing from either direction through the pipe 5, and the same statement applies to the opening of said valve. Naturally, also, the same statement applies to all the other valves in the system both during their opening and closing movements. Therefore it will be apparent that as soon as the sections of a train-pipe are coupled the several valves are instantly and automatically opened by the primary agency of the air flowing through such train-pipe, so as to form an uninterrupted communication from the head to the rear end of a train, while at the same time should it be desired to cut out any cars in such train said result can be effected without waste of air.

The system hereinbefore described, it will be evident, constitutes one adaptation of the invention. The objects and advantages can be of course carried out in other ways radically different from the one hereinbefore specifically set forth.

The system described is simple and inexpensive and can be installed in or combined with present systems without any change in the latter, except that it will be necessary to discard the present angle-cocks in such common systems.

In the foregoing description I have employed to set forth the advantages of the system certain terms. I desire to state that these terms are used in their broad senses. For example, while I use the term "cylinder" it is obvious that the part so called may be of other shape or construction.

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

1. An air-brake apparatus involving triple-valve mechanism, and a train-pipe having a valve independent of the triple-valve mechanism, a device for operating said valve, and means for supplying train-pipe air to the valve-operating device to actuate the latter in a direction to either open or close the valve.

2. In an air-brake apparatus, a train-pipe having a valve, cylinders connected with the train-pipe at opposite sides of the valve, and pistons in the cylinders, each serving to operate the valve.

3. In an air-brake apparatus, a train-pipe having a valve for controlling the flow of air through the same, cylinders connected with the train-pipe at opposite sides of the valve, and pistons in the cylinders operatively connected to the valve and serving to open said valve.

4. In an air-brake apparatus, a train-pipe having a valve for controlling the flow of air therethrough, cylinders having uninterrupted communication with the train-pipe at opposite sides of the valve, pistons in said cylinders, and a rocker connected with the valve and operatively connected with the pistons, said pistons serving, when moved in one direction, to open the valve.

5. In an air-brake apparatus, a train-pipe, a valve in said train-pipe for controlling the flow of air through said pipe, means actuated by the train-pipe air for opening said valve and independent air-operated means for closing the valve.

6. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, cylinders connected with the train-pipe, and pistons in the cylinders, adapted to be operated by the train-pipe air, one piston, when moved by the train-pipe air in an advancing direction, serving to open the valve, and the other piston, when moved in an advanced direction by the train-pipe air, serving to close the said valve.

7. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said pipe, means normally operated by the train-pipe air to open said valve, and independent and manually-controlled means also operated by the air for effecting the closure of said valve.

8. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, a cylinder connected with the train-pipe, a piston in said cylinder, a second cylinder, a piston in the second cylinder, the effective area of which is larger than that of the first piston, means for connecting the two pistons with the valve, and manually-controlled means for intermittently diverting train-pipe air into the second cylinder.

9. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, two cylinders, one of which is in constant communication with the train-pipe, and means for intermittently directing train-pipe air into the other cylinder, pistons in the respective cylinders, the piston of the cylinder into which the air is intermittently directed, having a greater effective area than that of the other piston, and a rod common to the two pistons, operatively connected with the valve for opening and closing the latter.

10. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, a cylinder in uninterrupted or open communication with the train-pipe, a piston in said cylinder, a second cylinder, a piston in the second cylinder, means connecting the two pistons and the valve for opening and closing said valve, and connections between the train-pipe and the second cylinder including a cylinder, a piston in said last-mentioned cylinder dividing the same interiorly into two chambers, and the last-mentioned cylinder having a by-pass passage con-

necting said chambers, and manually-operable means for moving the last-mentioned piston in a direction to put the train-pipe into communication with the second cylinder.

11. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, a piston in said cylinder, a second cylinder, a piston in the second cylinder, means connecting the two pistons and the valve for operating the latter in a direction to open and close the same, and connections between the train-pipe and the second cylinder, including a cylinder, a spring-actuated piston in the third cylinder, the latter having a by-pass passage adapted to put the two chambers of the third cylinder into communication upon the operation of the third piston, and means for operating the third piston in opposition to its spring.

12. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, a cylinder in open communication with the train-pipe, a piston in said cylinder, a second cylinder, a piston in the second cylinder, means for intermittently directing air into said second cylinder, the latter having a vent for such air, means for connecting the two pistons with the valve for opening and closing said valve, and means for intermittently directing train-pipe air into said second cylinder.

13. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, a cylinder in uninterrupted communication with said train-pipe, a piston in the cylinder operatively connected with the valve and serving normally to open the latter to permit such air to pass by said valve, and manually-operable means for effecting the closure of said valve.

14. In an air-brake apparatus, a train-pipe, a valve for controlling the flow of air through said train-pipe, a cylinder in open communication with said train-pipe, a piston in the cylinder, operatively connected with the valve, and serving normally to open the latter, and manually-operable means in position to be operated by air from the train-pipe to effect the closure of said valve.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK S. CRAVENS.

Witnesses:
HEATH SUTHERLAND,
GEO. W. REA.