(No Model.) 2 Sheets—Sheet 1.

J. B. STEWART.

AUTOMATIC AIR BRAKE.

No. 420,121. Patented Jan. 28, 1890.

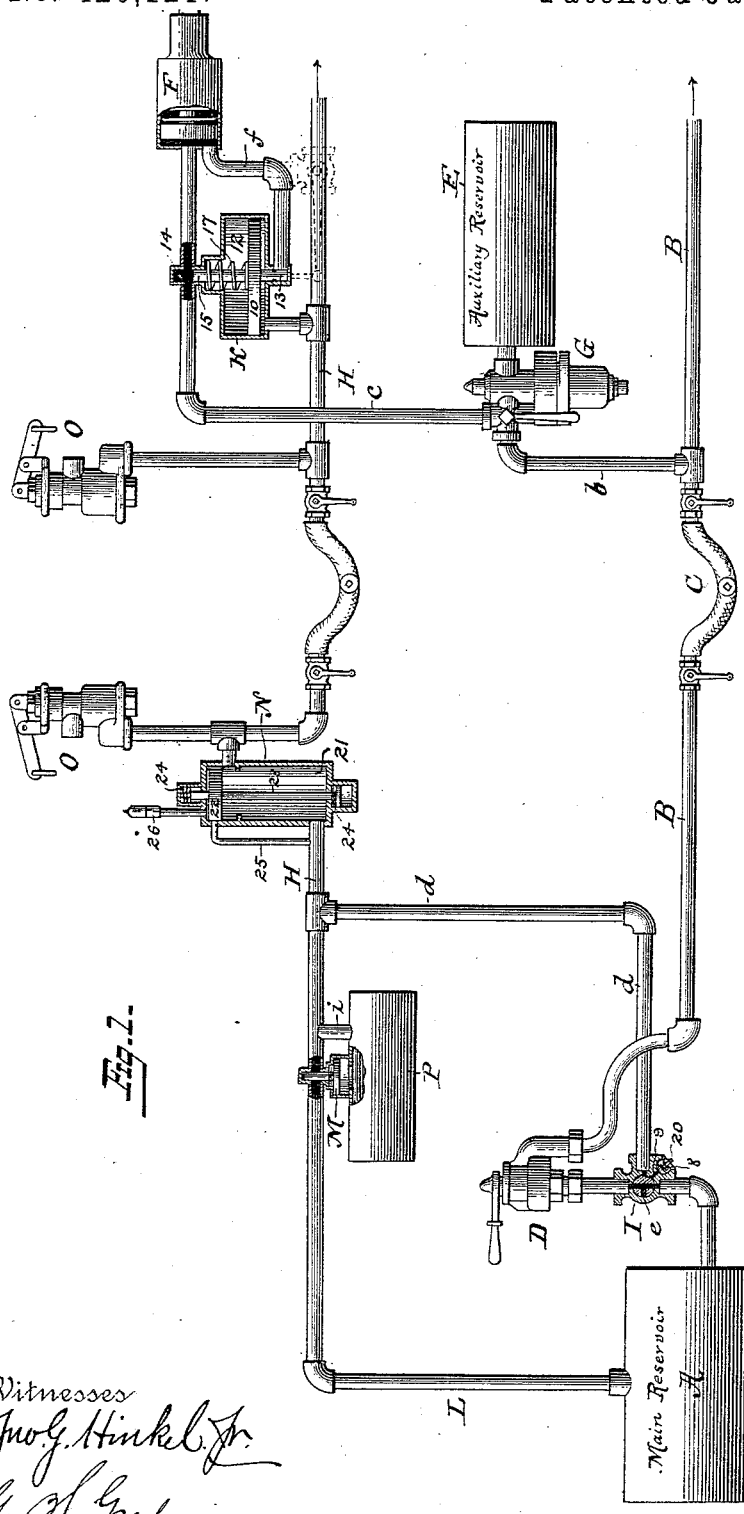

Fig. 1.

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Fig 2.

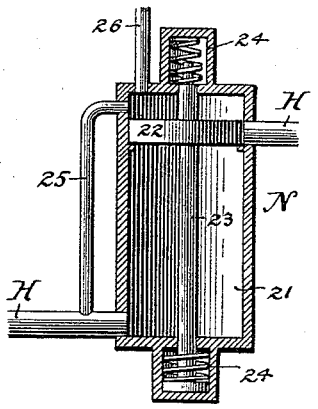


Fig. 3.

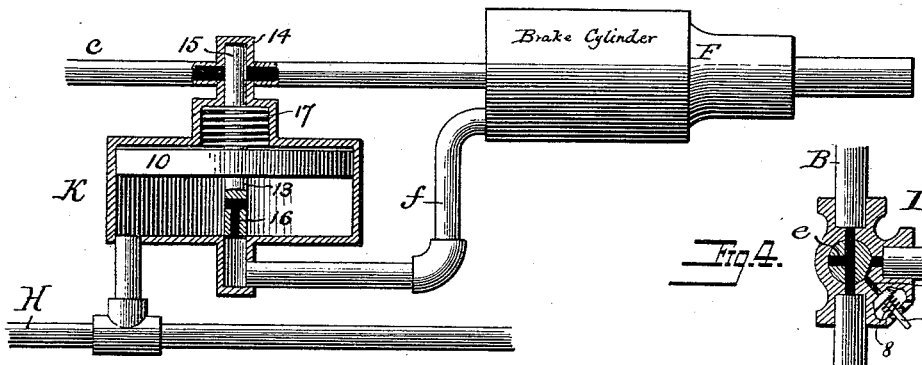
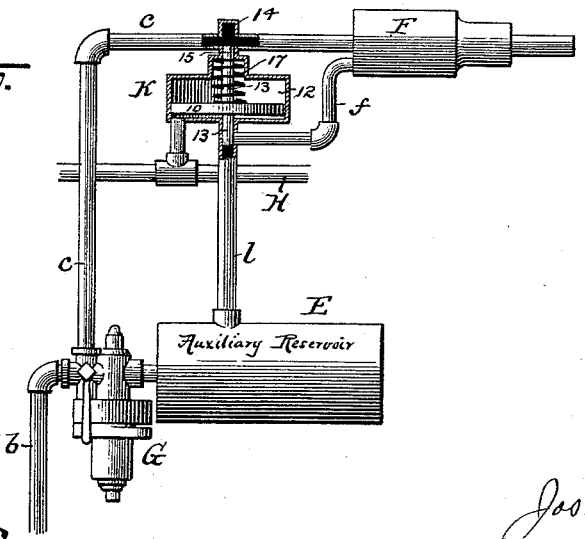


Fig. 4.

Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSEPH B. STEWART, OF BALTIMORE, MARYLAND.

AUTOMATIC AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 420,121, dated January 28, 1890.

Application filed November 6, 1888. Serial No. 290,110. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH B. STEWART, a citizen of the United States, residing at Baltimore, Maryland, have invented certain new and useful Improvements in Automatic Air-Brakes, of which the following is a full, clear, and exact description.

The present invention relates generally to fluid-brake apparatus for railway-trains, whether passenger or freight, and more particularly to such apparatus when used in connection with a signaling apparatus through which the engineer may be signaled by the conductor, or vice versa; and it consists, essentially, in means whereby the fluid-conduit for the signaling apparatus is adapted for use for conveying the operating-fluid direct to the brake-cylinder when from any cause the fluid conveyed by the main automatic conduit fails to operate the brake.

It also consists in means whereby the main reservoir may supply the fluid to both the brake and signaling apparatus at varying pressures, and in the combination of parts and details hereinafter fully set forth.

The accompanying drawings illustrate an apparatus containing the invention, in which—

Figure 1 is a diagrammatical sectional elevation of the same. Fig. 2 is a sectional elevation of the automatic signal-valve with its valve in its changed position. Fig. 3 is a similar view of the automatic valve for controlling the admission of fluid to the brake-cylinder. Fig. 4 is a detail view of the engineer's valve device, and Fig. 5 is a sectional elevation showing a modified structure.

Referring to said drawings, it is to be understood that only so much of the ordinary "automatic" air-brake apparatus is shown as is necessary to a proper description of the invention as it is employed in connection therewith, and for this purpose that portion of the apparatus usually located on the engine (with the exception of the pump) and that usually located on a single car need only be shown.

The construction and operation of the automatic brake apparatus are now so well known that a detailed description thereof is deemed unnecessary. It will suffice to say that A represents the main air-reservoir, in which the compressed fluid is stored by the action of a pump. (Not shown.) From this reservoir the main train-brake conduit B leads the length of the train, the said conduit being connected between the engine and the cars by a flexible coupling C, and is provided on the engine with an engineer's valve D, by means of which the operation of the brakes is controlled.

Upon each car is mounted an auxiliary reservoir E and a brake-cylinder F, the admission of fluid from the main conduit to the auxiliary reservoir through a branch *b*, from the said reservoir to the brake-cylinder through a branch *c*, and the exhaust from the latter cylinder and branch all being controlled by an automatic triple valve G, as is usual.

My invention contemplates the employment of certain appliances in connection with a train or signal-conduit H, extending the length of the train and provided with couplings between the engine and the cars similar to those used with the main conduit B. This auxiliary conduit is in connection with the main air-reservoir A and with each of the brake-cylinders on the train, so that the pressure from the said reservoir may be conducted directly to the brake-cylinders to operate the brakes independent of the main conduit and auxiliary reservoirs should any exigency arise. For this purpose the auxiliary conduit H may be connected directly to the main reservoir and provided with a suitable valve within the control of the engineer, by means of which the full pressure of the said reservoir may be turned into said conduit and thence to the brake-cylinder F; but the conduit H may connect by a branch *d* with a port in a valve I, connected with the engineer's valve D, thus saving an independent connection directly with the reservoir. When thus arranged and it is desired to operate the brake by fluid direct from the main reservoir, the valve I, or, as hereinafter described, the engineer's valve D, when the said valve I is combined therewith, will be turned so that its port *e* will open the branch *d*, and the fluid will pass directly to the brake-cylinders F, operating the pistons therein and putting the

brakes on. In this case, when an independent valve device I is employed, the engineer's valve D may remain unchanged. The particular construction, however, of the valve device is not important. In order that the fluid thus conveyed to the brake-cylinder direct from the main reservoir shall not be exhausted to the open air through the branch pipe *c*, the triple valve G being always normally open to permit this passage of the fluid from the brake-cylinder to the air, there is provided an automatic closing-valve K, that is adapted to close the branch pipe *c* when the fluid passes to the brake-cylinder through the auxiliary conduit H.

Many different forms of device capable of automatically closing said branch *c* will occur to those skilled in the art, and hence the invention is not limited to the particular form of device taken for illustration. The closing-valve K shown consists of a piston 10, adapted to reciprocate within certain limits in the chamber 12, which chamber upon one side of the piston is in communication with the conduit H, and upon the same side has a port 16, adapted to be placed in connection with the brake-cylinder F, as shown, by means of a branch pipe *f*. The piston 10 is provided with a stem 13, extending in opposite directions therefrom, one portion projecting into a suitable casing 14 on the branch pipe *c*, and forming a valve 15 for opening and closing the passage to and from the brake-cylinder through said branch *c*. The other portion of the piston-stem controls the port 16, so that in one position of the piston said port is closed, as in Fig. 1, and in another the port is opened, as in Fig. 3. The opening of the port 16 may be had by suitable passages in the stem 13, as shown, in which case the passages will be opened or closed by the movement of the piston, or the stem may be short enough to leave the port 16 entirely free in the open position of the piston. The normal position of the piston and its stem is shown in Fig. 1, and to aid in sustaining it in such position a spring 17 may be used to bear upon the same, or the piston itself may be weighted for the same purpose. The tension of the spring or the weight of the piston should be such that the piston will be held in its normal position, closing the port 16 and leaving the branch *c* open, so long as the pressure in the auxiliary conduit H remains somewhat below the normal pressure in the main reservoir; but so soon as the pressure of said reservoir is turned into said conduit it will move the piston against the pressure of the spring or its weight, thus opening the communication with the brake-cylinder and closing the branch *c*, and as soon as the pressure ceases the piston will return to its normal position, opening the branch *c* and permitting the fluid to exhaust from the brake-cylinder to the open air past the triple valve G, thus releasing the brakes, as in the usual operation of the automatic apparatus.

In order that the main-reservoir pressure through the conduit H, exerted upon the piston 10, may be properly relieved upon cutting off the said pressure, so that the piston may return to its normal position, as just described, there is provided an escape-valve 20, preferably in connection with the valve device controlled by the engineer, that will automatically open and allow the fluid held in the conduit H between the valve device and the piston 10 to exhaust to the open air.

As illustrated, the casing of the valve I has a passage 9, against the outer end of which is seated the valve 20, held to duty by a spring 8, that is of sufficient tension to permit the valve to open and allow the fluid to exhaust from the conduit H down from the main-reservoir pressure to a pressure sufficiently low to permit the device K to resume its normal position. When the valve I is turned to cut off the main-reservoir pressure, the passage *e* thereof will be permitted to register with the passage 9 of its casing for a short space of time, as shown in Fig. 4, thus opening communication between the conduit H and said passage and insuring the exhaustion of the fluid held therein down, as before described, after which the valve I may be turned to the position shown in Fig. 1 to wholly cut off communication between the reservoir and conduit.

The valve I, for the sake of perspicuity, has been illustrated as being independent of the engineer's valve D. As stated, however, in practice it is proposed to unite the two in any ordinary manner, so that the engineer need only operate a single valve, so that should he find that upon the usual operation of his valve the automatic fails to work he may simply turn the same valve a little farther and turn the direct pressure into the brake-cylinders, as will be obvious without further illustration.

While it is obvious that the auxiliary conduit H may be used entirely independent of any signaling apparatus, as the latter is now in general use, it is preferable that such conduit and the means by which it may act as a direct conduit of fluid between the main reservoir and the brake-cylinder shall be also adapted to permit its use for the signaling apparatus. To this end the auxiliary conduit H is extended so as to connect directly with the main reservoir, as at L.

It is not essential nor is it preferable that the signal apparatus shall work at such a high normal pressure as that of the brake apparatus. Thus, for instance, the normal working-pressure for the brake apparatus may be eighty pounds, while that for the signal apparatus need be only about fifteen pounds, and to obtain this reduced pressure there is provided in the conduit H a pressure-reducer M, adjusted to permit a pressure, say, of fifteen pounds in said conduit.

The signal apparatus consists, essentially, of an automatic signal-valve N, interposed in the conduit at some suitable point beyond

the reducer M. This signal-valve is so constructed as to prevent any signal being given so long as the pressure in conduit H is kept at the normal—as, for instance, at fifteen pounds; but so soon as such pressure is reduced its operation will be to open a passage for the fluid to the audible-signal device to operate it. It is also so constructed that when this occurs it will close one of the openings of the auxiliary conduit H with the valve, so that the fluid, instead of escaping past the audible signal without operating it, will be retained to expend its force in operating the signal.

The signal-valve N consists of a chamber 21, in which is seated a piston 22, adapted to have a limited movement therein. The valve-chamber 21 is open to the conduit H, so that in the normal position of the piston (shown in Fig. 1) the fluid is free to pass therethrough. The piston 22 has a stem 23 to suitably guide and sustain it, and on which one or more springs 24 exert its or their pressure, tending to move the piston to close one of the openings of the conduit with the valve-chamber against the pressure in said conduit and chamber. Of course the same effect may be produced by weighting the piston. The force of the spring or weight should be less than the desired normal pressure—say fifteen pounds—so that so long as said pressure is maintained in the conduit H the piston will be held to its normal position.

The piston 22 of the valve N also controls the passage of fluid through a smaller pipe 25, which communicates with the conduit H and the audible-signal device 26, so that in its normal position it will prevent the passage of fluid to said device, but on the pressure being reduced, permitting the piston to be operated by the force of the spring or springs 24, will open said communication and allow the fluid to pass to the audible-signal device to sound it. At the same time the piston also closes one end of the conduit H, thus holding the pressure in chamber 21. So soon as the pressure of the fluid in chamber 21 of the valve again reaches the normal—say fifteen pounds—the piston will be moved back to its normal position, opening the communication with the conduit H and closing the passage for the fluid to the signal device 26 until the pressure is again reduced below said normal point.

Any suitable means may be employed for conveniently lowering the pressure in the conduit H to effect the sounding of the signal, that shown consisting of a valve O, held to its seat by the pressure and moved therefrom by a lever in easy reach of the engineer or conductor, or both; or, as shown, there may be two or more valves O, one on the engine and one on each car of the train, or, if a freight-train, one on the caboose. When, however, it is desired to adapt the apparatus so that signals can be exchanged between the engineer and conductor of a train, and vice versa, it is preferable to place a duplicate of the signal-valve and signal in one of the cars of the train—as, for instance, in the caboose of a freight-train—and, whether or not such valve or signal be duplicated, if the auxiliary conduit be extended the entire length of the train, if the train break in two, of course the signal-valve and its signal will be operated in the same manner as they would if the valve was opened.

It should be stated with relation to the automatic closing-valve K and the exhausting-valve 20 that their respective springs will be so adjusted that the valve K will be returned to its normal position immediately the pressure in the auxiliary conduit H reaches that set for the operation of the signal-valve N—say fifteen pounds—and the valve 20 will be seated immediately it has permitted the fluid to exhaust down to a like pressure, from which it will be seen that while the conduit H is ready for use for signaling purposes the pressure therein will not be great enough to operate the closing-valve K or the exhausting-valve 20. So, too, when the full working-pressure for the brake apparatus is let into the conduit H, such pressure, of course, will have no other effect on the signal-controlling valve N than to hold its piston 22 more firmly to its seat, closing the passage of fluid to the audible-signal device.

So far as the operation of the reducer M, in regulating the pressure for the signal apparatus, is concerned, there need only be a passage from the conduit H to its opposite side; but, in order to keep the chamber 21 of the valve N supplied with a proper quantity of fluid at the reduced pressure and to readily resupply said chamber after said operation of the exhausting-valve O, the apparatus is preferably provided with a storage-reservoir P in connection with the reducer M, it being connected with the conduit H through a branch *i*, the reservoir and branch *i* in this construction forming also a passage for the fluid to the large area of the reducer, the casing of which opens into the reservoir, as is clearly shown. When the signal-valve N and signal are also used on any of the cars of the train, it will be found desirable to also employ a duplicate of the reservoir P in connection therewith, so that sufficient of the fluid is stored to readily fill the chamber of the valve after each signal. It is not essential that the fluid operating the valve K should pass into the brake-cylinder to also operate its piston; but the construction may be such that the fluid-pressure in the auxiliary conduit H may be raised sufficient to operate the valve K, and by suitable connection permit the pressure from the auxiliary air-reservoir E to pass into the brake-cylinder, as in the ordinary operation of the automatic apparatus. Such a modified construction is shown in Fig. 5, wherein the stem of the piston 10 controls a passage in a branch pipe 1, leading from the auxiliary reservoir E to the brake-cylinder F.

In that class of brake apparatus not employing a branch c between an auxiliary reservoir and the brake-cylinder it is obvious that the closing-valve K need only operate to control communication between the auxiliary conduit and the brake-cylinder. Such a modified construction is indicated by dotted lines, Fig. 1, wherein the stem of the piston 10 operates a three-way valve in the conduit H to permit the fluid to pass from the said conduit to the brake-cylinder.

What I claim is—

1. In a brake and signaling apparatus, the combination, with the main and auxiliary conduits and brake-cylinder, of an automatic closing-valve device communicating with the brake-cylinder and the auxiliary conduit, a signal-valve, also in communication with said auxiliary conduit, and an exhausting-valve in the auxiliary conduit for varying the pressure therein, whereby the signal-valve is operated and the signal sounded, substantially as described.

2. In a brake and signaling apparatus, the combination, with the main and auxiliary conduits and brake-cylinder, of an automatic closing-valve device communicating with the brake-cylinder and auxiliary conduit, a signal-valve, also in communication with said auxiliary conduit, an exhausting-valve in the auxiliary conduit, and a valve device on the engine for changing the pressure in the auxiliary conduit, substantially as described.

3. In a brake and signaling apparatus, the combination, with the main and auxiliary conduits, the main reservoir, and a brake-cylinder, of a signal-valve in communication with the auxiliary conduit and a pressure-reducer in the latter conduit between the main reservoir and the signal-valve, substantially as described.

4. In a brake and signaling apparatus, the combination, with the main and auxiliary conduits, the main reservoir, and brake-cylinder, of a signal-valve in communication with the auxiliary conduit, a pressure-reducer in the latter conduit between the main reservoir and signal-valve, and a storage-reservoir, also in communication with the auxiliary conduit, substantially as described.

5. In a brake and signaling apparatus, the combination, with the main and auxiliary conduits, the main reservoir, and brake-cylinder, of an automatic closing-valve device communicating with the brake-cylinder and auxiliary conduit, a signal-valve, also in communication with said conduit, a pressure-reducer in the auxiliary conduit between the main reservoir and the signal-valve, a branch between the auxiliary conduit and the main conduit, and an engineer's valve device for changing the pressure in the auxiliary conduit, substantially as described.

6. In a brake and signaling apparatus, the combination of the main reservoir, brake-cylinder, and signal device with a conduit communicating with said main reservoir, brake-cylinder, and signal device, and valves interposed in the conduit for controlling the admission of fluid to the brake-cylinder and to the signal device, substantially as described.

7. In a brake and signaling apparatus, the combination, with the main reservoir, brake-cylinder, and signal device, of a conduit communicating with said main reservoir, brake-cylinder, and signal device, valves controlling the admission of fluid to the brake-cylinder and signal device, and a pressure-reducer interposed in said conduit for regulating the pressure sounding the signal, substantially as described.

8. In a brake and signaling apparatus, the combination, with the main reservoir, brake-cylinder, and signal device, of a conduit communicating with said main reservoir, brake-cylinder, and signal device, valves controlling the admission of fluid to the brake-cylinder and signal device, a reducer interposed in said conduit for regulating the pressure for sounding the signal, and an engineer's valve for controlling the passage of the main-reservoir pressure into said conduit, substantially as described.

9. The combination, with the main reservoir and conduit leading therefrom, of a chamber 21, in communication with said conduit, an audible-signal device communicating with said chamber, and a valve controlling the passage of fluid to the audible-signal device, and also controlling one end of the conduit, substantially as described.

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

JOSEPH B. STEWART.

Witnesses:

H. W. HETZEL,

GEO. M. PAUL.