No. 701,327. Patented June 3, 1902.

E. L. GOSSE.

CONTINUOUS AUTOMATIC AIR BRAKE SYSTEM.

(Application filed Nov. 1, 1901.)

(No Model.) 2 Sheets—Sheet 1.

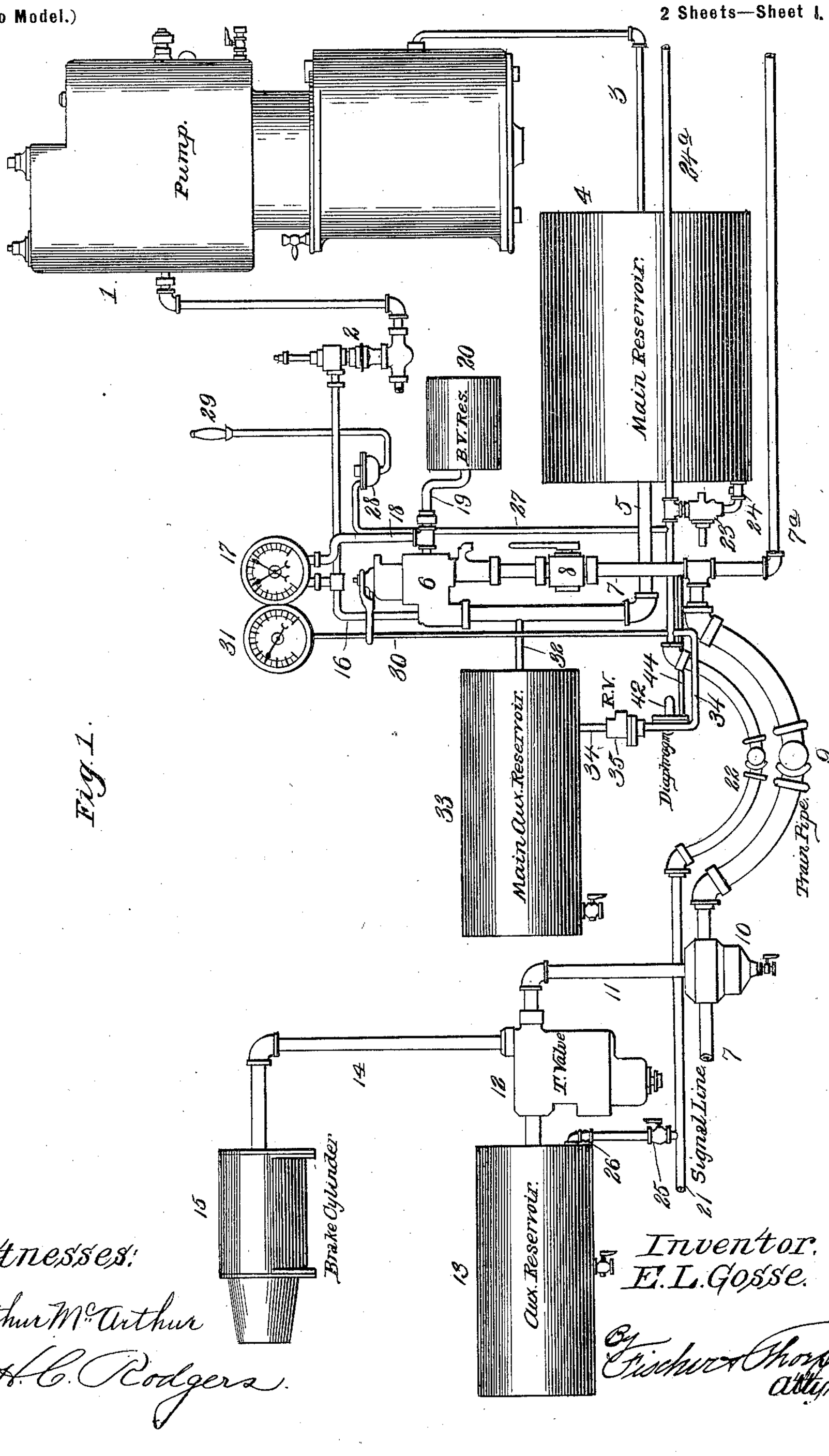

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

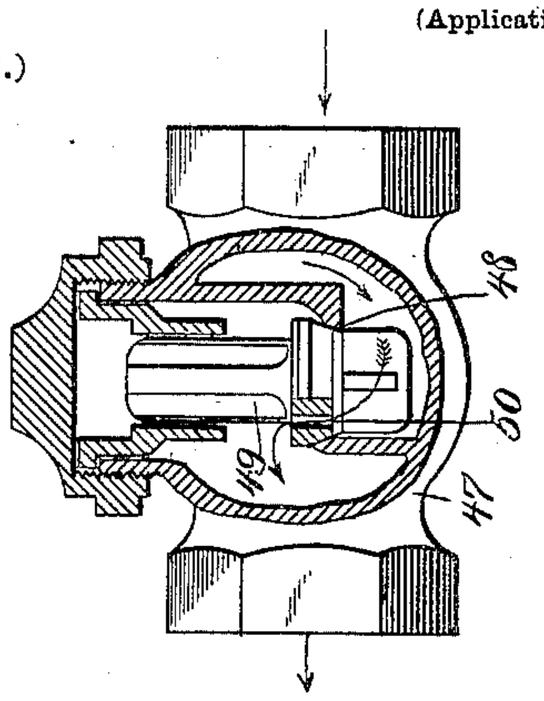
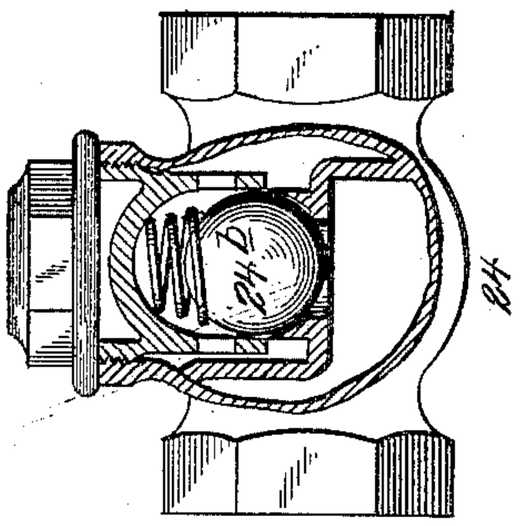


Fig. 5.



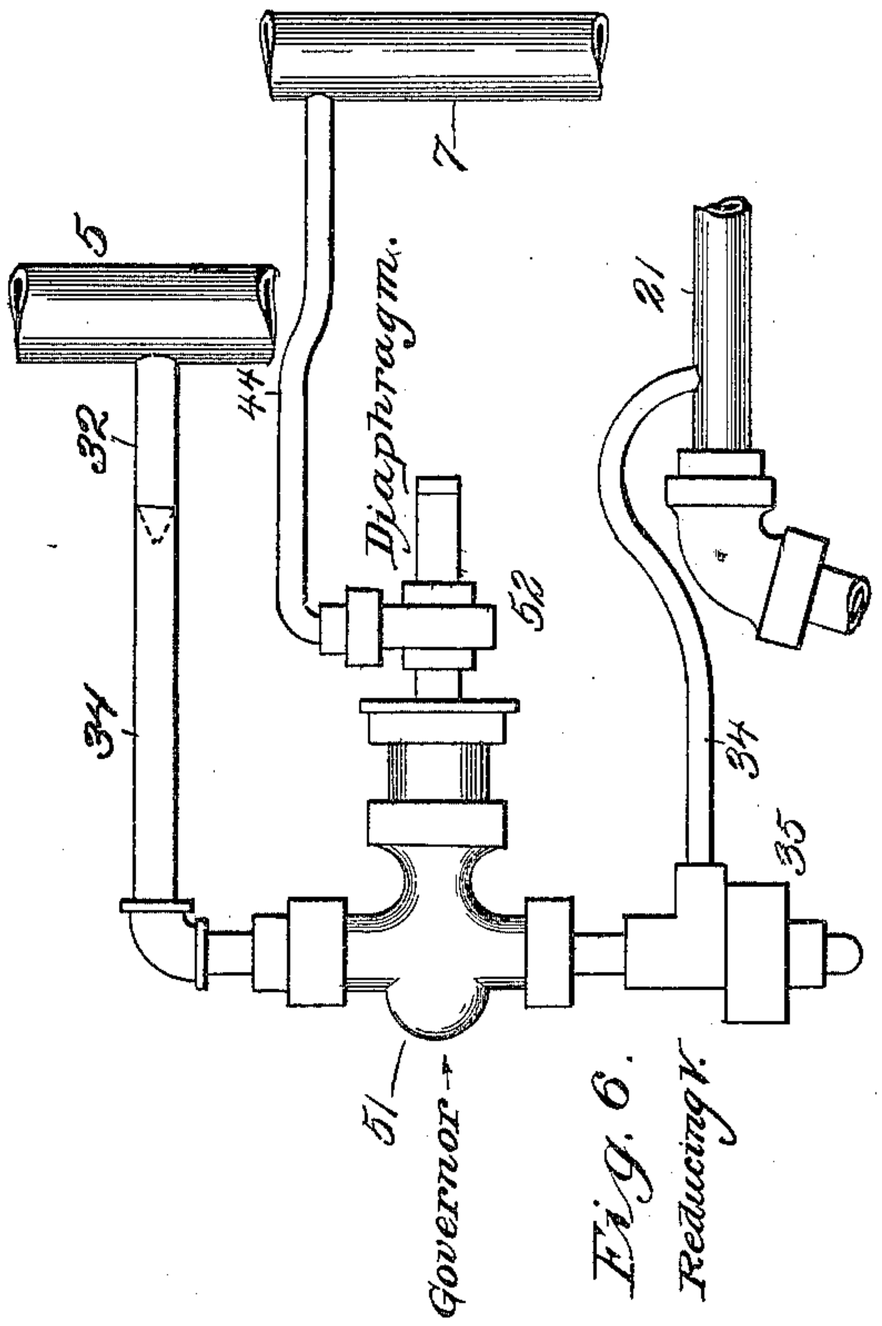


Fig. 6.

Fig. 3.

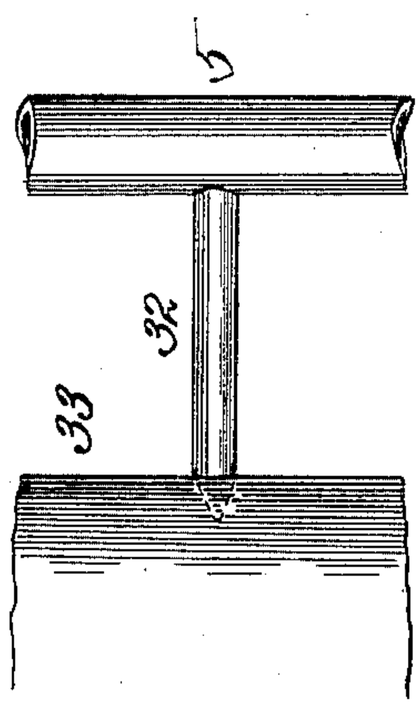
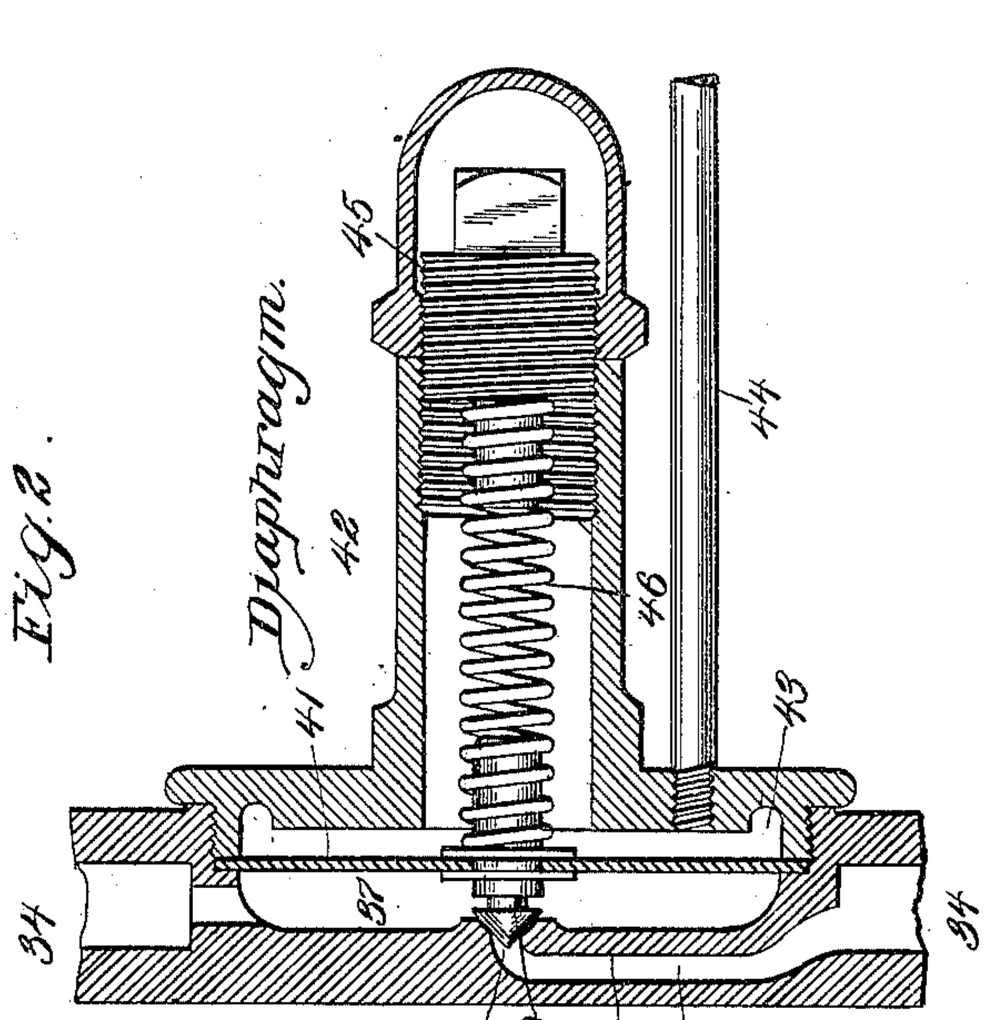


Fig. 2.



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UNITED STATES PATENT OFFICE.

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CONTINUOUS AUTOMATIC AIR-BRAKE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 701,327, dated June 3, 1902.

Application filed November 1, 1901. Serial No. 80,758. (No model.)

To all whom it may concern:

Be it known that I, EDWARD L. GOSSE, a citizen of the United States, residing at Chanute, in the county of Neosho and State of Kansas, have invented certain new and useful Improvements in Continuous Automatic Air-Brake Systems, of which the following is a specification.

My invention relates to air-brakes; and my object is to produce an apparatus whereby the engineer is enabled to establish and maintain automatically a continuous pressure in the brake-cylinders.

A further object is to produce means for the automatic prevention of a pressure in excess of that required to properly set and hold the brakes, so as to eliminate any possibility of causing the wheels to slide.

A still further object is to insure an equal pressure in all of the brake-cylinders irrespective of the distance which the pistons thereof travel.

A still further object is to assist the pump in compensating the main reservoir for its loss of pressure occasioned by an ordinary application of the brakes, it being understood that for ordinary stops where there is no grade the pressure applied is direct from the auxiliary reservoirs, which are compensated for their loss by the main reservoir after the brakes are released.

A still further object is to produce a connection whereby a supplemental reservoir receives air from the main reservoir without robbing the latter of its required pressure.

A still further object is to produce means whereby the auxiliary reservoirs shall be charged with a supply of air before the signal-line is supplied in order to eliminate possibility of accidentally setting the brakes.

Other objects of the invention, which consists in certain novel and peculiar features of construction and combinations of parts, hereinafter appear and are pointed out in the appended claims, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view of an air-brake system embodying my invention. Fig. 2 is an enlarged sectional view of a diaphragm forming an element of the invention. Fig. 3 is an enlarged section showing the connection whereby the main reservoir is enabled to supply the supplemental or main auxiliary reservoir without being robbed. Fig. 4 is a sectional view of a modified form of said connection. Fig. 5 is a sectional view of the check-valve for excluding air from the signal-line until the train-pipe has been first supplied. Fig. 6 is a diagrammatic view of a modified type of one of the connections between the main reservoir and the signal-line and of the means whereby a certain reduction of pressure in the train-pipe shall provide through the signal-line an automatic and continuous supply of air to the brake-cylinders to compensate for leakage therefrom.

Referring now to the drawings, where like reference characters identify corresponding parts, 1 designates the usual locomotive-pump, 2 the governor, and 3 the air-pipe thereof, the latter communicating with the main reservoir 4, so as to charge it with the required pressure—as, for example, ninety pounds.

5 designates the reservoir-line, leading from reservoir 4 to brake-valve 6, and 7 the train-pipe, leading from valve 6 to the different cars of the train and provided with the usual stop-cock 8 and a forward extension 7^a to serve as a connection between double-headers—namely, trains provided with two locomotives. Between the cars the train-pipe is of course provided with the usual flexible couplings 9, and each car is equipped with the usual drain-cup 10, connected in turn by pipe 11 with the triple valve 12, and the latter is connected with the auxiliary reservoir 13 and by pipe 14 with the brake-cylinder 15. The brake-valve 6 is connected by pipe 16 with the pump-governor and with air-gage 17, the latter being also connected by pipe 18 to the pipe 19, leading from the brake-valve to the brake-valve reservoir 20.

21 designates the signal-line, the same being provided with couplings 22 between the cars and with a reducing-valve 23, connected to the main reservoir to prevent an excessive volume of air from passing from said reservoir into said signal-line, and in order to guard against a supply of any air to the signal-line from the reservoir until a certain pressure has been

stored in the train-pipe a check-valve 24 is interposed between the reservoir and said reducing-valve, the preferred construction of which check-valve is hereinafter referred to. A pipe connecting the signal-line with each auxiliary reservoir is provided with a stop-cock 25 and a check-valve 26, the latter being preferably interposed between the former and said reservoir. The stop-cock is provided, so that in case of injury to the apparatus of any car such car may be entirely cut out of circuit without impairing the efficiency of the mechanism of the remaining cars. The signal-line is also provided with a forward extension, as at 24ª, for use with double-headers, as hereinbefore referred to, with a whistle-line 27, equipped with the usual diaphragm 28 and whistle 29, and with a pipe 30, connected to the pressure-gage 31 to inform the engineer at all times of the pressure of the signal-line, of how much the pressure is increased therein due to its supply from the main reservoir or main auxiliary reservoir, hereinafter referred to, and of the fact that said reducing-valve of the said connection between the signal-line and main reservoir is defective. For instance, should gage 31 register the same pressure as the main reservoir the engineer will know at once that valve 23 is inoperative, as it should close after the normal signal-line pressure is attained and prevent the entrance of additional air thereto from the main reservoir.

32 designates a pipe connection between the main-reservoir line and the supplemental or what I prefer to term the "main auxiliary" reservoir 33, this connection being preferably in the form of a choke-tube which discharges into the main auxiliary reservoir at a speed proportionate to the supply by the pump to the main reservoir, this discharge continuing until the requisite pressure in the main and main auxiliary reservoirs has been attained. When this occurs, the governor automatically stops the pump and cuts off a further supply of air until such pressure has been reduced, when it automatically resumes its operation in the usual manner.

34 designates a pipe connecting the main auxiliary reservoir and the signal-line, and mounted on said pipe is a reducing-valve 35. Between said reducing-valve, by preference, and the signal-line pipe 34 is equipped with a diaphragm, having a partition 36, so as to form a chamber 37 and a passage 38, connected by a valve-opening 39. This opening is normally closed by a valve 40, secured to the diaphragm proper, 41, secured in position by casing 42, so as to provide the usual chamber 43, with which communicates pipe 44, connected at its opposite end to the train-pipe in order that a reduction of pressure in the latter from seventy pounds (about normal) to about fifty pounds will be instantly followed by the unseating of valve 40, and the passage of air from chamber 37 through passage 38 to the signal-line and thence to the brake-cylinders to instantly replace air lost from the latter by leakage. It will thus be seen that this arrangement effects automatically an incessant pressure on the brakes, and thereby makes it possible to hold the latter set for an indefinite length of time and peculiarly appropriate and invaluable to mountain traffic. The tension on the diaphragm may be varied when desired through the instrumentality of the screw-plug 45 and the spring 46, interposed between and bearing at its opposite ends against the screw-plug and diaphragm and tending to hold the valve seated with a yielding pressure.

The operation of the pump in the usual manner discharges air into the main reservoir, thence through reservoir-line 5 to main auxiliary reservoir and brake-valve. From the latter air passes to the brake-valve reservoir and train-pipe and from the latter to the triple valves and auxiliary reservoirs. After a suitable pressure has been attained in the main reservoir and its connections above enumerated the resistance of the check-valve 24 is overcome, and the latter opens and permits air to flow from the main reservoir into the signal-line; but such air has no access to the auxiliary reservoirs through the pipe connection between said reservoirs and the signal-line, because the back pressure from the former upon the check-valves 26 exceeds that from the signal-line by an amount equal to that which was required to be stored in the main reservoir and its connections before valve 24 could be opened. The object in obtaining a preliminary pressure in the auxiliary reservoirs before air is admitted to the signal-line is to insure that check-valves 26 are closed when the pressure in the auxiliary reservoirs equals or exceeds signal-line pressure, and thus avoid the production of a pressure in the signal-line greater than that to which the auxiliary reservoirs are reduced by each application of the brakes. Should such excessive volume of air be stored in the signal-line, it is obvious that each application of the brakes would be followed by a rush of air from the signal-line into the auxiliary reservoirs and a long blast of the whistle, this blast at an inopportune time being undesirable, because it has peculiar significance to trainmen. The pump continues in operation until the requisite pressure is attained in the main and main auxiliary reservoirs, when its operation is arrested by governor 2, it being understood that the diaphragm 41 prevents air entering the signal-line through pipe 34 as long as the train-pipe pressure is normal and that the reducing-valve 35 upon pipe 34 acts to prevent an excessive volume of air from passing from main auxiliary reservoir to the signal-line, and thereby guards against the application of the brakes with sufficient force to slide the wheels.

To set the brakes for ordinary stops, as on level grades, the engineer operates the brake-valves in the usual manner, so as to exhaust

from the train-pipe to atmosphere. This slight reduction of pressure is of course followed by pressure on the brakes applied from the auxiliary reservoirs, which loss and the incidental leakage is compensated for obviously after the brakes are released by air passing from the main reservoir, the slight fall in the latter incidentally setting the pump in operation to restore the pressure to the proper point, and in this connection it will be apparent that the pressure rises in the main reservoir more quickly because air flows back from reservoir 33 until the pressure of both is equal. The pump of course continues to operate until the normal pressure in both has been again attained. The only advantage in providing for the backflow of air described lies in the fact that a second or third light application of the brakes may sometimes be necessary before the pump has restored the pressure of the main reservoir. In such light application the train-pipe pressure does not fall sufficiently low to effect the operation of the diaphragm 41 and permit air to pass from the main auxiliary reservoir to the signal-line. During this period, therefore, the main-reservoir pressure in the main auxiliary reservoir is not needed, though of course its pressure should always exceed that to which the train-pipe pressure falls—say fifty pounds—after a severe or heavy application of the brakes in order that the loss of air by leakage may be compensated for by a supply from the main auxiliary reservoir, this air passing to the signal-line and increasing the pressure therein, so as to open valves 26 and pass into the auxiliary reservoirs and thence to the brake-cylinders. This pressure is obviously continuous for the reason that the instant the pressure in the main auxiliary reservoir begins to fall the pump begins to operate, the air thus supplied compensating for the loss by leakage. It will thus be seen that the brakes will be maintained at the requisite pressure for an indefinite length of time and that as long as the apparatus remains uninjured the pressure of the brake-cylinders will not be reduced by leakage.

In Fig. 6 I show in lieu of the diaphragm (see Fig. 2) interposed between the signal-line and reducing-valve 35 a governor 51 of the same type as the pump-governor and a diaphragm 52. In this case the latter is connected by pipe 44 to the train-pipe 7, and the governor is interposed on pipe 34 between the reducing-valve 35 and the reservoir-line 5 or the main auxiliary reservoir 33, if it is desired to use the latter, and in this connection it should be stated that the main auxiliary reservoir is not absolutely essential in connection with the preferred construction, as shown on Sheet 1, as without it the connection between the reservoir-line 5 and pipe 34 may be of such limited capacity that its discharge does not exceed the pump-supply. This being true, it is obvious that as long as the pump is in operation and can pump as much air as leaks from the brake-cylinders just that long will such leakage be automatically compensated for, as hereinbefore described.

Referring again particularly to Fig. 6, it will be apparent that the reduction in the train-line pressure operates the diaphragm, and thereby the governor, so as to enable air to pass through pipe 34 to the signal-line, the reducing-valve 35 preventing an increase of pressure therein which would be more than sufficient to compensate for loss by leakage. This construction, however, is not as desirable as that illustrated on Sheet 1, because it is more expensive. As long as either type of my improved apparatus is in operation nothing but a defect or break in some part of the mechanism itself will permit the pressure in the signal-line to fall, and thereby cause a blast of the whistle, which single blast signifies nothing in connection with the train-operating rules except that "train has parted" and that consequently the brakes have been automatically applied.

Fig. 4 shows a check-valve coupling 47 as a substitute connection between the reservoir-line 5 and main auxiliary reservoir 33, said coupling having a seat 48 for a valve 49, and the latter also has a perforation 50, corresponding to and for the same purpose as the choke-tube 32, the air passing from said line to the said reservoir in the direction indicated by the arrows, same figure. This valve, which is of a well-known type, opens quickly to back pressure from said reservoir in order to more quickly equalize the pressure of said reservoir and of the main reservoir than would follow the backflow of air through the perforation. For this reason it is to be preferred to the choke-tube 32.

Fig. 5 shows my preferred type of check-valve 24, the same embodying a spring-depressed ball 24^b to resist the passage of air from the main reservoir to the signal-line until the "certain" pressure has stored in the train-pipe and auxiliary reservoirs.

With my apparatus, where loss by leakage is compensated for by air passing through the signal-line, it is obvious that brake-cylinders of different capacity and piston travel will have uniform pressure and that in consequence the bumps and jars incident to the application of the brakes at present in use will be eliminated. The cut-out valves or stop-cocks 25 of the pipe connections between the signal-lines and auxiliary reservoirs enable the former to be cut away from any defective brake rigging or riggings without interfering with the operation of the brakes of any of the cars. It is also obvious that the apparatus can be applied to freight-trains by simply adding a second air-pipe to each car and that the signal-line of passenger-trains performs its original function in connection with that of supplying continuous pressure to the auxiliary reservoirs.

Among other advantages the invention en-

ables the inspector to locate any leak when testing the air-brakes at terminals, so that the defect can be remedied and reported and the line cut away from such defective parts, as by the closure of the proper stop-cocks 25. It permits cars for transporting perishable freight to be used in passenger-trains. It gives communication from the caboose to the engine, as in passenger-trains, and it obviously enables the train to be stopped on an incline and the brakes left set, as leakage cannot release them as long as the air-pump is in operative condition.

From the above description it will be apparent that I have produced a continuous automatic air-brake system which embodies the features of advantage enumerated as desirable in the statement of invention and that the invention is susceptible of modification in various particulars without departing from its spirit and scope or sacrificing any of its advantages.

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

1. In an apparatus of the character described, a valve-controlled connection between the signal-line and the auxiliary reservoir, a connection between the main reservoir and signal-line, a reducing-valve in such connection, a diaphragm on said connection between the reducing-valve and the signal-line, and a connection between said diaphragm and the train-pipe, whereby a reduction of pressure in the latter shall result in the operation of the diaphragm and the passage of air through said connection to the signal-line, substantially as described.

2. In an apparatus of the character described, a valve-controlled connection between the signal-line and the auxiliary reservoir, a connection between the main reservoir and signal-line, embodying a choke-tube, and means whereby a suitable decrease of pressure in the train-pipe shall result in the discharge of air through said choke-tube and into the signal-line; said choke-tube discharge being about equal in volume to that pumped into the main reservoir as said discharge takes place.

3. In an apparatus of the character described, a valve-controlled connection between the signal-line and the auxiliary reservoir, a main auxiliary reservoir, a connection between the main reservoir and said main auxiliary reservoir, a connection between the main auxiliary reservoir and the signal-line, and means whereby a suitable decrease of pressure in the train-pipe shall permit air to pass from the main auxiliary reservoir to the signal-line, substantially as described.

4. In an apparatus of the character described, a valve-controlled connection between the signal-line and the auxiliary reservoir, a main auxiliary reservoir, a connection between the main reservoir and the main auxiliary reservoir, whereby the latter is supplied without robbing the former of the required pressure, a connection between the main auxiliary reservoir and the signal-line, means whereby a reduction in the train-pipe pressure shall result in the passage of air from the main auxiliary reservoir to the signal-line, and means to limit the volume of air passing from the main auxiliary reservoir to the signal-line, substantially as described.

5. In an apparatus of the character described, a valve-controlled connection between the signal-line and the auxiliary reservoir, a main auxiliary reservoir, a connection between the main and main auxiliary reservoirs whereby the latter receives air from the former in volume proportionate to the pump-supply, a connection between the main auxiliary reservoir and the signal-line, a reducing-valve in such connection, and means also on said connection whereby a suitable reduction of pressure in the train-pipe shall permit air to pass from the main auxiliary reservoir to the signal-line, substantially as described.

6. In an apparatus of the character described, a valve-controlled connection between the signal-line, and the auxiliary reservoir; a valve on the signal-line, to offer resistance to the passage of air therein from the main reservoir until an initial pressure in said reservoir, train-pipe, and the auxiliary reservoir has been attained; a reservoir-line leading from the main reservoir to the brake-valve; a connection between the signal-line and the reservoir-line, the point of connection with the reservoir-line being between the main reservoir and the brake-valve; and means whereby a suitable decrease of pressure in the train-pipe shall permit air to pass through said last-named connection and into the signal-line.

In testimony whereof I affix my signature in the presence of two witnesses.

EDWARD L. GOSSE.

Witnesses:
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G. Y. THORPE.