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S. W. ROBINSON & E. A. HITCHCOCK.

AUTOMATIC AIR BRAKE MECHANISM.

(Application filed Nov. 4, 1897.)

(No Model.)

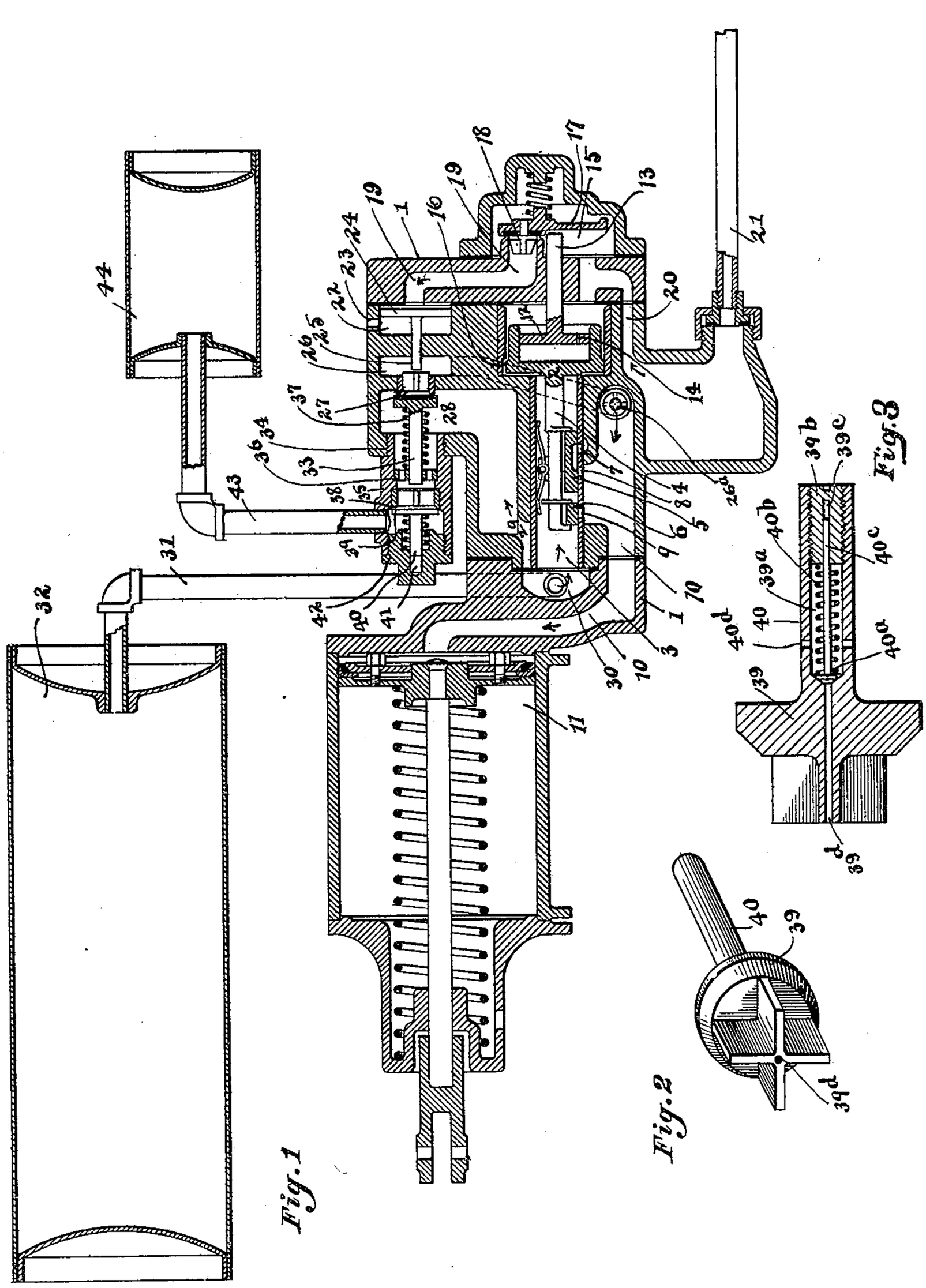

Fig. 1

Fig. 2

Fig. 3

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AUTOMATIC AIR-BRAKE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 622,020, dated March 28, 1899.

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To all whom it may concern:

Be it known that we, STILLMAN W. ROBINSON and EMBURY A. HITCHCOCK, citizens of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Automatic Air-Brake Mechanism, of which the following is a specification.

Our invention relates to the improvement of automatic air-brakes, and has particular relation to new attachments for a well-known form of triple valve.

The objects of our invention are to provide the triple valve with improved additional mechanism and attachments whereby, in addition to the usual maximum air-pressure in the brake-cylinder necessary for service stops, the desired pressure for what are known as "emergency" stops may be readily and positively attained; to accomplish the above object in a simple and comparatively inexpensive manner and by the aid of comparatively few new parts; to so construct and arrange our attachments as not to interfere with the usual or ordinary operation of the triple-valve mechanism during service stops, and to utilize, in connection with the additional or superadded brake-cylinder pressure which we employ in the manner hereinafter described for emergency stops, the usual train-pipe pressure which is ordinarily employed for service stops; to so construct and arrange the parts of our improved attachments as to admit of their being readily used in connection with an ordinary air-brake mechanism with comparatively slight additions to the triple valve, the details of construction and arrangement of parts of which will be more fully pointed out hereinafter.

These objects we accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of a known form of triple-valve brake-cylinder and auxiliary reservoir, showing our improvements connected therewith and for the sake of clearness showing the chambers and passages of the triple valve in the same plane. Fig. 2 is a detail view in perspective of a valve which we employ in the manner hereinafter described, and Fig. 3 is an enlarged central longitudinal section of the valve, shown in Fig. 2.

Similar numerals refer to similar parts throughout the several views.

The general form of triple valve herein shown is of a character too well known to necessitate a detailed description of its construction and operation, but the same consist of the following parts, arranged as hereinafter set forth.

1 represents the triple-valve casing or body, in which is mounted in the well-known manner a piston 2, the latter being arranged in the enlarged mouth of a horizontal passage 3 and having a valve-controlling arm 4, which extends into said passage and controls the movement of separated slide-valves 5 and 6, which are adapted to close and open ports 7, 8, and 9 in the bottom of said passage 3. The ports 8 and 9 communicate with a lower passage 10, which leads in the usual manner into the brake-cylinder 11, while the port 7 communicates with the atmosphere. In the outer recessed side of the piston-head 2 is inserted a piston 12, having a central outwardly-extending stem 13, which is adapted to bear and slide in the body of the triple valve. The piston-head 12 is provided with a small opening therethrough, which is indicated at 14. The outer end of the piston-stem 13 projects within an end chamber 15, as shown.

16 represents a charging-groove which is adapted to form in the usual manner communication between the inner end of the passage 3 and the space on the outer side of the piston 2. The outer end of the piston-stem 13 is normally in close proximity to the inner side of the arm 17 of a spring-actuated valve 18, which normally closes the mouth of a passage 19.

Through the medium of a passage 20 the train air-pipe 21 communicates with the chamber 15 and also with the mouth of the passage 3 in front of the piston 2. The outer end of the passage 19 communicates with a chamber 22, which is provided with an exhaust or outlet opening 23.

24 represents a piston which is adapted to fit and slide within the chamber 22 and which is provided on its rear side with a projecting

central stem 25, which extends within a passage 26 and is normally retained in close proximity to the end of a valve 27, which closes a port or valve opening between the passage 26 and a chamber 28. This chamber 28 communicates, as shown, through a passage 29 with a chamber 30 at the end of the passage 3. Through the medium of a suitable pipe connection 31 the chamber 30 is connected with the usual auxiliary air-reservoir 32. The valve 27 is provided with a stem extension 33. The passage 26 leads, as indicated in dotted lines, through a check-valve 26^a into the chamber 10.

The above-described construction of the triple valve is well known and has been described briefly for the purpose of illustrating our improvements in connection therewith, said improvements being described as follows: The chamber 28 is provided with a threaded opening 34, into which is ordinarily introduced a plug into which the arm 33 of the valve 27 has commonly extended. In place of inserting a plug in said opening 34 we connect therewith a tubular casing extension or neck 35, within the inner portion of which is fitted an open guide-ring 36, through which the valve-stem 33 is adapted to slide, said valve-stem being provided in the usual manner with a coiled spring 37, one end of which bears against the valve and the remaining end of which bears against the guide-ring 36. Within the extension 35 we provide a valve-seat 38, which is normally closed by a spring or gravity actuated valve 39, the stem 40 of which is adapted to fit and slide within a central recess 41 of a plug 42, which closes the outer end of the casing extension 35.

The preferable construction of the valve 39 and its stem 40 is more clearly shown in Figs. 2 and 3 of the drawings. Within the stem portion 40 of the valve we provide a chamber 39^a, the outer end of which is closed by a detachable plug 39^b, said plug being formed with a central guide-socket, (indicated at 39^c.) The forward end of the chamber 39 has leading therefrom a smaller passage or extension of said chamber, which, as shown, extends longitudinally through the head of the valve and which is indicated at 39^d. Within the chamber 39^a we provide a check-valve 40^a, which is adapted by pressure of a spring 40^b to close communication between the chamber 39 and the passage 39^d. The stem 40^c of the check-valve 40^a, about which is coiled the spring 40^b, is adapted to fit and slide within the guide-socket 39^c of the plug 39^b. As shown at 40^d, we provide the valve-stem 40 with oppositely-located ports, which communicate with the chamber 39^a. On the outer side of the valve 39 we connect with the casing extension 35 a pipe 43, which leads to a conveniently-located air-reservoir 44, the latter being of a comparatively small size and being adapted in the manner hereinafter described to contain additional air of train-pipe pressure.

In order to properly charge for use the various compartments, passages, and reservoirs hereinbefore described, the compressed air from the train-pipe leads through the passage 20 into the chamber 15 and into the mouth of the passage 3. From the latter point the air passes through the charging-groove 16, through said passage 3 into the chamber 30, thence through the passage 29, chamber 28, and into the extension 35. The air thus directed into said extension passes through the valve-passage 39^d of the valve 39 and, opening the valve 40^a, the air thus directed into the passage 39^a escapes through the openings 40^d, from which points the air passes through the pipe 43 into the reservoir 44. It is obvious that when the pressure in said reservoir 44 and pipe 43 becomes substantially equal to the pressure in the chamber 28 the comparatively weak spring of the valve 40^a will serve to close the latter. From the chamber 30 the air passes in the usual manner through the pipe 31 into the usual auxiliary reservoir 32. In the above manner the air-pressure in the various compartments and passages mentioned is substantially equalized.

Although our invention does not pertain to the manner of producing what is known as a "service application," we will in order to more clearly illustrate the use of our device describe in a general way the usual manner of applying the air for service stops. In producing this service application the pressure in the train-pipe is reduced in the usual manner a comparatively small amount, which results in lowering the pressure accordingly in the chamber 15 and in the passages leading thereto. The train-pipe pressure being thus reduced, it is obvious that the greater pressure of air in the auxiliary reservoir must result in forcing the piston 2 outward, which in the usual manner opens the port 9 and provides a communication between the passages 3 and 10, causing the air to flow to the brake-cylinder 11 and exert its pressure upon the usual spring-actuated piston of the latter. When the pressure in the auxiliary reservoir is in this manner sufficiently reduced until slightly less than that in the chamber 15, the piston 2 partially returns to the position shown in the drawings, closing the port 9 and leaving the parts in position for further service applications in increasing pressures in the brake-cylinder.

It is well known that in order to produce a quick stop of the train, or what is generally termed an "emergency" stop, it becomes necessary to apply quickly a greater air-pressure to the brake-cylinder than that ordinarily attained in the service application. In the latter application the movement of the piston 2 is not accomplished with sufficient speed or quickness to prevent the air which is between the pistons 2 and 12 escaping through the vent 14 of the latter, thus admitting of the movement of the piston 2, while the piston 12 is substantially stationary. In an emergency

stop, however, the operator reduces the pressure in the train-pipe to such a degree and with such rapidity as to result in the piston 2 being forced outwardly at such speed as to cause the air back of the piston 12 to carry the latter forward, no time for the escape of the air through the vent 14 being allowed. By this forward movement of the piston-stem 13 a contact of the latter with the arm 17 of the valve 18 is produced, which opens the passage 19 to communication with the chamber 15. The pressure of air in the passage 19 forces the piston 24 back in the chamber 22, resulting not only in opening the port 23, and thereby providing an escape for the air, but in opening the spring-actuated valve 27 through contact therewith of the stem 25. Through the opening of the valve 27 the air-pressure from the auxiliary reservoir and which is equal in the chamber 28 is directed into the passage 26 and thence through the valve 26^a and passage 10 to the brake-cylinder. This flow of air, which is provided by opening the valve 27, is thus produced in addition to the flow of air through the port 9, the two currents being joined in the passage 10. The above-described known emergency application, although producing a certain pressure in the brake-cylinder, is not regarded as sufficient for emergency stops, and in order to remedy this difficulty we have provided the following additional operation: When the valve 27 is opened, its stem 33 comes into contact with the spring-actuated valve 39, thereby providing through the extension 35 and pipe 43 a communication between the additional reservoir 44 and the passage 26, and a consequent increase in the amount of air which is directed into the brake-cylinder, resulting in a decided increase of air-pressure therein.

As indicated in the drawings, the additional reservoir 44 is small as compared with the auxiliary reservoir. The small size of this additional reservoir, together with the comparatively large outlet therefrom which is afforded by the opening of the valve 39 and by the passage of the extension, must result, as will readily be seen, in a rapid reduction of the air-pressure in the reservoir 44 in comparison with the reduction in the reservoir 32, inasmuch as the passage 29, through which the greater portion of the air from said auxiliary reservoir must pass to the emergency channel 26, is limited in size. In this manner the additional air supplied by the reservoir 44 is quickly transmitted to the brake-cylinder, where, in conjunction with the usual air-supply from the auxiliary reservoir, it raises the air-pressure within said brake-cylinder to the required amount for the emergency application of the brake. Owing to the stiffness or rigidity of the spring which is about the valve-stem 40 the air which returns from the brake-cylinder into the extension 35 immediately after the piston of the brake-cylinder has operated has not sufficient pressure to open the valve 39, thus preventing undesirable rapidity in the reduction of the pressure in the brake-cylinder which might otherwise be caused by a too rapid return of the air therefrom to the reservoir 44. In making this return from the brake-cylinder or other parts of the brake system air is gradually returned to the reservoir 44 by entering the passage 39^d, opening the valve 40^a, which is controlled by a comparatively light spring, and entering the passage 39^a, from which the air escapes through the ports 40^d and thence through the pipe 43 to said reservoir 44.

In case it should be found that a comparatively rapid return of the air to the reservoir 44 is not detrimental to the proper operation of the brake-cylinder piston it is obvious that the valve 39 and its stem 40 may be formed without the central chamber 39^a and passage 39^d and a comparatively light spring substituted for the otherwise stiff spring which actuates said valve 39.

It will be observed that the new parts necessary to produce our attachments are exceedingly few in number and simple of construction. In this connection attention is called to the fact that the valve 39 may be substantially a duplicate of the valve 26^a, which is ordinarily employed, and that the plug 42 is simply substituted for the plug usually employed in the threaded opening 34 or in an opening opposite the valve 26^a. (Not herein shown.)

From the construction and operation of our device it will be seen that simple, reliable, and effective means are provided for producing in the brake-cylinder the desired increase in air-pressure in making emergency stops, the same exceeding the maximum in service stops, and that these means may be readily adapted for use in conjunction with the ordinary air-brake mechanism.

Having now fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an automatic air-brake system, the combination with a triple-valve body provided with chambers and passages which are normally in communication with the train-pipe and an auxiliary reservoir, a passage 26 10 communicating with the brake-cylinder, a valve 27 normally cutting off communication between the passage 26 which leads to the brake-cylinder and a chamber 28 which normally communicates with the train-pipe, of a supplemental air-reservoir 44 and a valve 39 normally cutting off communication with the supplemental reservoir and opening only in the case of a sudden reduction of pressure in the train-pipe, said supplemental reservoir having no communication with the auxiliary reservoir excepting through a passage or passages of the triple-valve body and means whereby the opening operation of the valve 27 opens communication between said supplemental reservoir and the passages leading

to the brake-cylinder, substantially as specified.

2. In an automatic air-brake system, the combination with a triple-valve body provided with chambers and passages which are normally in communication with the train-pipe and an auxiliary reservoir, one of said passages having a port communicating with a passage leading to the brake-cylinder, said port adapted to be opened by the pressure of air from the auxiliary reservoir and a valve 27 normally cutting off communication between a passage 26 which leads to the brake-cylinder and a chamber 28 which normally communicates with the train-pipe, of a neck extension 35 of said triple-valve body, a spring-actuated valve 39 normally closed against the valve-seat in said extension, a supplemental air-reservoir 44 connected with said extension on the outer side of said valve 39 and means whereby the opening of the valve 27 is accomplished by the sudden reduction of the air-pressure in the train-pipe and whereby the opening of said valve 27 also results in the opening of the valve 39, substantially as and for the purpose specified.

3. In an automatic air-brake system, the combination with a triple-valve body provided with chambers and passages which are normally in connection with the train-pipe and an auxiliary reservoir, the passage 26 10 communicating with the brake-cylinder and a valve 27 normally cutting off communication between the passage 26 which leads to the brake-cylinder and a chamber 28 which normally communicates with the train-pipe, of a neck extension 35 in said triple-valve body, a spring-actuated valve 39 normally closed against the valve-seat in said extension, a chamber within said valve-body, a valve-controlled opening 39^{d} leading thereto, ports 40^{d} leading from said internal chamber, a supplemental air-reservoir connected with said extension and means whereby the opening of the valve 27 is accomplished by the sudden reduction of the air-pressure in the train-pipe and means whereby the opening of said valve 27 also results in the opening of the valve 39, substantially as and for the purpose specified.

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In presence of—
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