

(No Model.)

3 Sheets—Sheet 1.

T. J. HOGAN.

APPARATUS FOR OPERATING FLUID PRESSURE DEVICES.

No. 499,735.

Patented June 20, 1893.

FIG. 1.

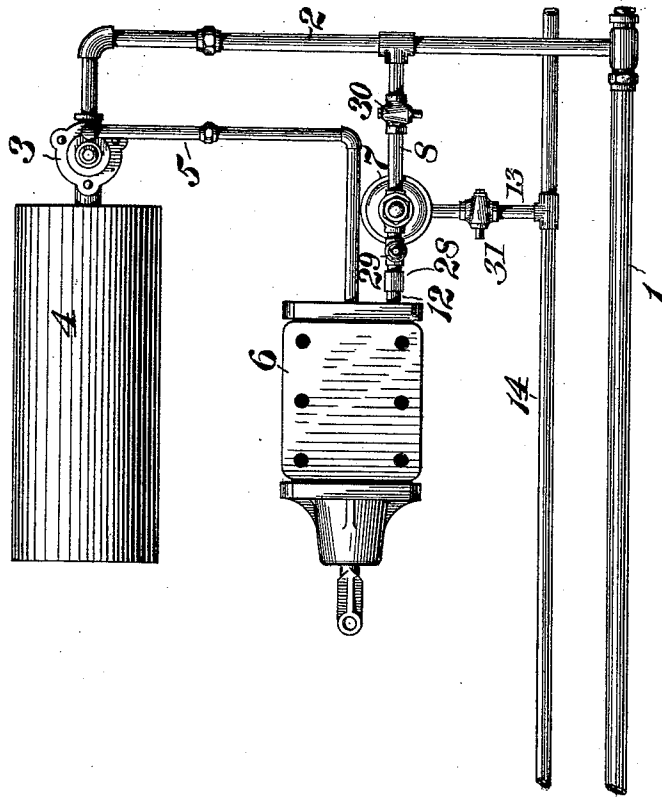
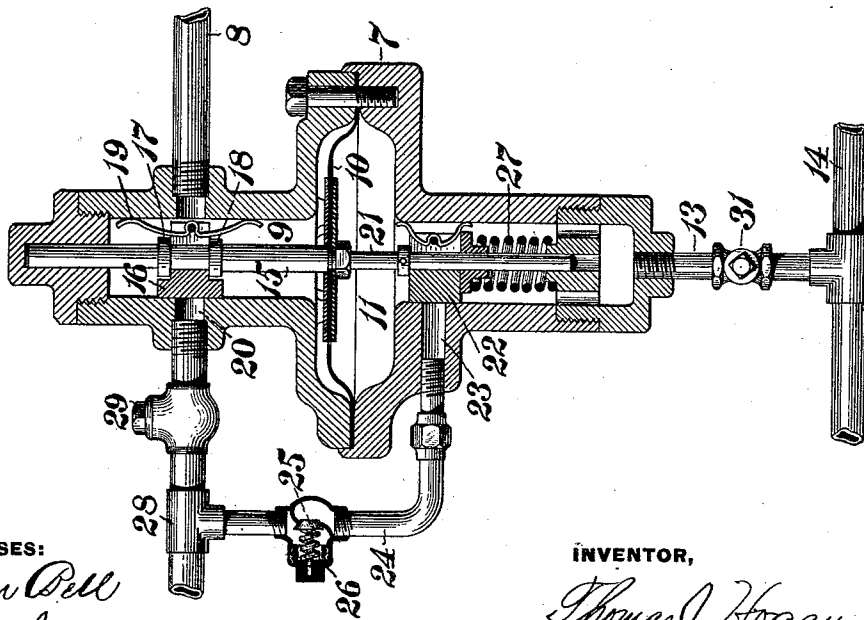


FIG. 2.



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(No Model.)

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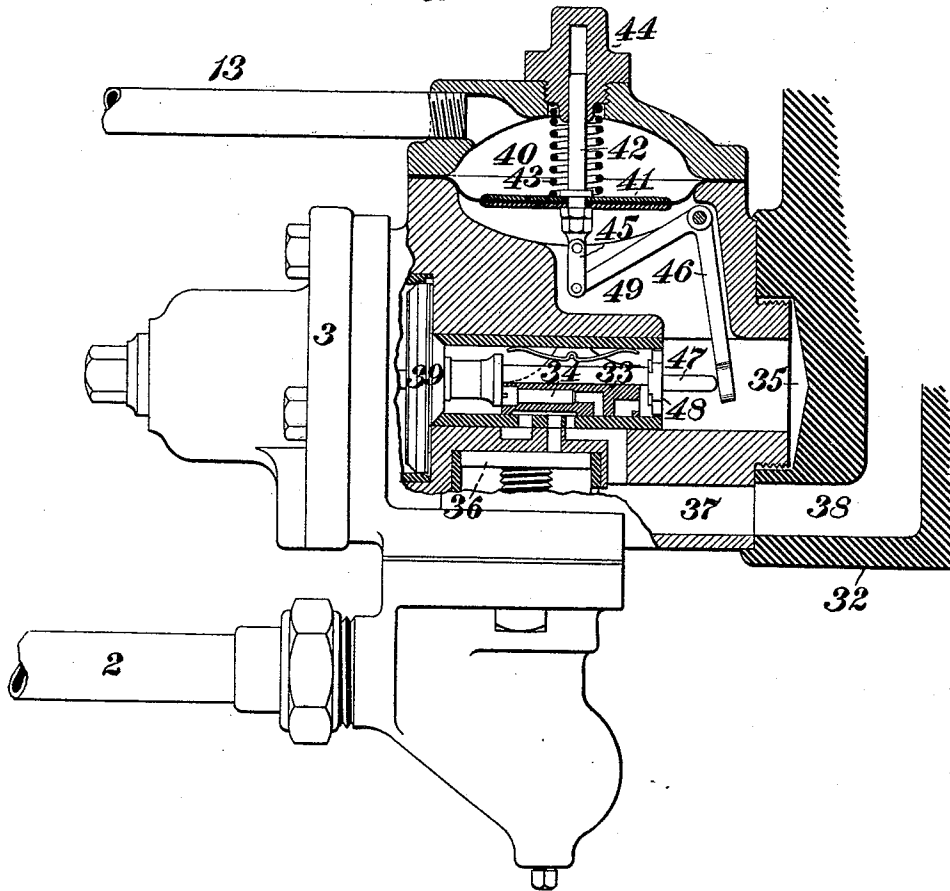
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FIG. 3.



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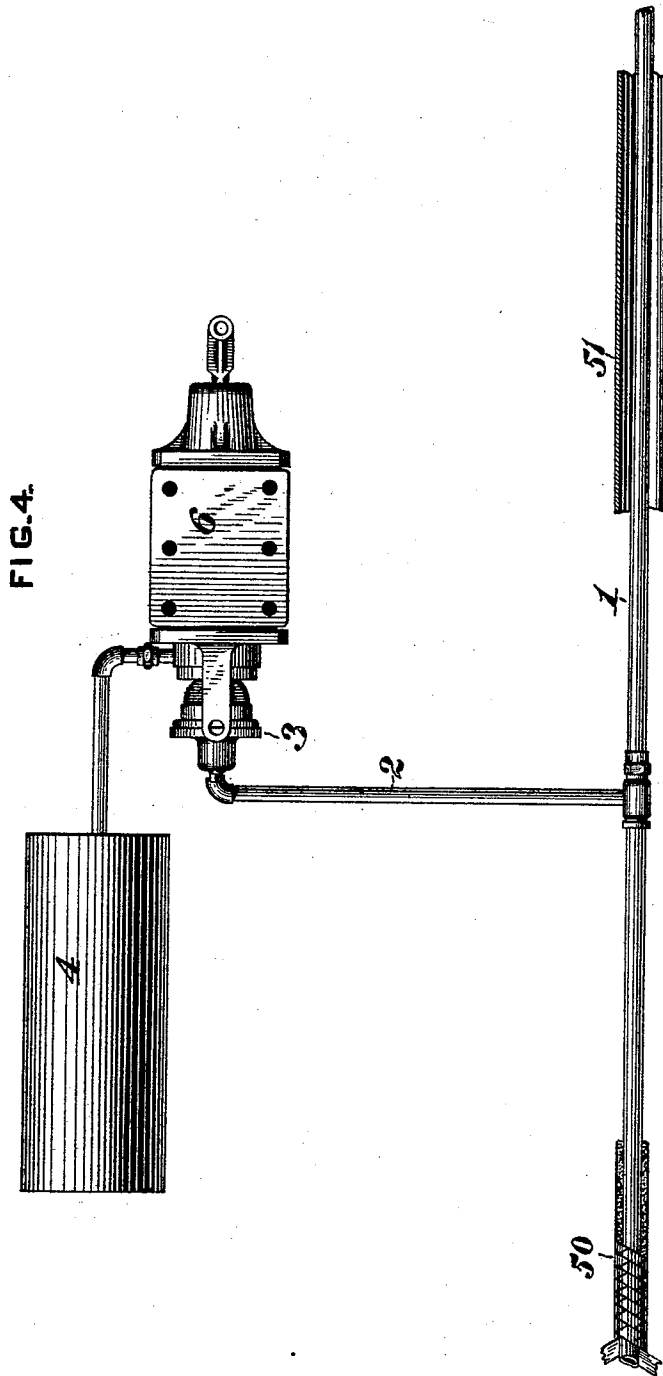
3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

THOMAS J. HOGAN, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF SAME PLACE.

APPARATUS FOR OPERATING FLUID-PRESSURE DEVICES.

SPECIFICATION forming part of Letters Patent No. 499,735, dated June 20, 1893.

Application filed November 30, 1892. Serial No. 453,561. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. HOGAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Apparatus for Operating Fluid-Pressure Devices, of which improvements the following is a specification.

10 The object of my invention is to provide a new and improved fluid pressure system for operating, and controlling the operation of, fluid pressure devices such as are employed in fluid pressure railway brake systems, signaling, and other similar systems; whereby the rapidity of the transmission of variations of fluid pressure is very greatly increased; and to this end it consists in a new and improved system for controlling and operating such fluid pressure devices by means of a highly elastic gaseous medium, or for controlling, or inducing, their operation by means of said gaseous medium and causing their operation by some other medium, whereby such control or operation may be effected with greater rapidity than has been possible heretofore in such fluid pressure systems.

It further consists in devices for improving the efficiency of the gaseous medium, and in new and improved constructions and combinations of devices which are specially applicable with my improved fluid pressure system.

In the application of fluid pressure brakes to long trains of cars, the rapidity with which the brakes can be applied successively to the cars in the train has been so very much increased by the Westinghouse quick acting system that the limit seems to have been reached, or nearly so, where the operation is effected by compressed air only. In order to transmit the necessary variations or reductions of pressure with greater velocity, I employ a more highly elastic gas, preferably hydrogen, of less density and greater elasticity than air. And I employ this medium specially for the purpose of transmitting such variations as are necessary to initiate the movement of, or bringing into operation, such devices as are necessary to effect the desired final operations. For example, in a brake system, the new medium may be employed merely

for the purpose of operating or causing the operation of the triple or other valves which control the supply of fluid to the brake cylinders, and the fluid supplied to the brake cylinders may be the same highly elastic gas, or air, or some other fluid. I also employ means for supplying heat to or retaining it in the gas through which the variations of pressure are transmitted, for the purpose of further increasing its efficiency of transmission.

In the practice of my invention I employ a line pipe charged with a highly elastic gas, preferably hydrogen, or a mixture of gases, one of which may be hydrogen or some other highly elastic gas of greater elasticity than air, and connect this line pipe with the operating device such as an engineer's brake valve by which the variations of pressure are controlled at one point; and at the other point or points where the desired effect is to be produced, I connect the line pipe with a device which is to be affected by variations of pressure in the line pipe. In an air brake system this line pipe may be the usual train pipe, or it may be an additional pipe charged with hydrogen and so connected up with the usual air brake system that the brakes may be operated by hydrogen or by compressed air. When the usual train pipe is employed without any additional pipe, the hydrogen may be supplied to the brake cylinder to move the brake piston and operate the brakes; and when a separate line pipe is employed the brake cylinder piston may be operated by compressed air which is brought into action by variations of pressure in either the additional pipe which contains the hydrogen or in the usual train pipe which contains compressed air.

In making service applications of the brakes, the brake cylinder may be charged by causing variations of pressure in the ordinary train pipe, and in making emergency applications the brakes may be applied by causing variations of pressure in the hydrogen pipe. The variations of pressure in the hydrogen pipe may cause the operation of a triple valve to release fluid under pressure from an auxiliary reservoir, or from an auxiliary reservoir and a train pipe to the brake cylinder, or they may cause the release of

fluid under pressure from a train pipe directly, independent of the triple valve, to a brake cylinder, or to the atmosphere, or to a chamber from which it can be returned to the train pipe. In order to further increase the rapidity of transmission of the variations of pressure I employ means for retaining in the fluid under pressure the heat produced in it by compression, or supply heat to it from another source. The heat due to compression may be retained by covering with a non-conductor the parts containing the fluid under pressure such as the pipes and reservoirs; and further heat may be added by inclosing the pipes within the usual steam heating pipes so far as practicable, and covering the parts not so inclosed with a non-conductor.

In the accompanying drawings, Figure 1 is a plan view of a portion of a fluid pressure brake system adapted for operation in accordance with my invention; Fig. 2, a central section on a larger scale than Fig. 1 of a quick acting valve device to be used in connection with my improvement; Fig. 3, a sectional view of a quick acting triple valve arranged to be operated by variations of pressure in the usual air pipe or in another pipe containing hydrogen; Fig. 4 is a plan view of a portion of an ordinary quick acting automatic fluid pressure brake system which may be employed in the practice of my invention, and which I have shown in connection with means for retaining heat in or supplying it to the fluid under pressure.

In Figs. 1 and 2, I have shown a construction in which I employ both compressed air and hydrogen for operating and controlling the braking mechanism of railway cars. The train pipe 1, branch pipe 2, triple valve 3, auxiliary reservoir 4, branch pipe 5, and brake cylinder 6, may be similar in construction and arrangement to the same parts as at present employed in the Westinghouse automatic brake system, although my invention is not limited, in its application, to a system having that specific construction. In connection with such a system, in which the train pipe 1 and auxiliary reservoir 4 are normally charged with compressed air, I employ a quick acting valve device 7, shown in section in Fig. 2, which is connected by means of the branch pipe 8 with the branch pipe 2 which communicates with the train pipe 1. The pipe 8 opens into the chamber 9 of the supplemental valve device 7 above the movable abutment or diaphragm 10, so that the chamber 9 is normally filled with compressed air, at the same pressure as the air in the train pipe; and the chamber 11 on the other side of the diaphragm 10 is in communication by means of a branch pipe 13 with a train pipe 14 which is charged with hydrogen or other highly elastic gas at a pressure sufficiently great to hold the diaphragm up against the pressure of the air on its other side. The diaphragm has connected to it a stem 15 which extends upward into the chamber 9 and is connected to a valve 16 which fits

between two shoulders 17 and 18 on the stem and is held to its seat by the pressure of the air and a spring 19. The valve 16 controls a port 20 which communicates, by means of the pipe 12, with the brake cylinder 6. A stem 21 projects from the other side of the diaphragm 10 into the chamber 11 and is connected to the valve 22, controlling a port 23 which communicates with the pipe 12 and brake cylinder 6 by means of a branch pipe 24, which is connected with pipe 12 by a T joint 28. A check valve 25 is located in the pipe 24, between the port 23 and the pipe 12, and is held to its seat by a spring 26, of such tension as to cause the valve to be seated before an equalization of pressure takes place on its opposite sides.

A simple triple valve 3 may be employed, and service applications of the brakes may be produced by variations of pressure in the train pipe 1 which cause the operation of the triple valve 3 to release air under pressure from the auxiliary reservoir 4 to the brake cylinder 6, as usual in the Westinghouse automatic system; or, if the triple valve 3 be a quick acting valve, emergency applications may be made by variations of pressure in the train pipe, 1, without causing the operation of the supplemental quick acting valve device 7. But irrespective of the form of the triple valve 3, the quick acting valve device 7 may be operated to produce quick applications by causing the proper variations of pressure in the train pipe 14 which is charged with hydrogen.

The variations of pressure in the train pipe 14 may be controlled by a separate valve on the locomotive or by the movement of the handle of the ordinary engineer's brake valve, but I do not claim any special device for that purpose in this application. It is only necessary to state that the required variations of pressure in the train pipe 14 may be made either simultaneously with the variations of pressure in the train pipe 1, or they may be made separately and independently. When a proper reduction of pressure is made in the train pipe 14, the reduction of pressure below the diaphragm 10, in the chamber 11, permits the pressure of the compressed air in the chamber 9 above the diaphragm 10 to move the diaphragm down and open the valves 22 and 16. The valve 22 is so adjusted as to open a little before the valve 16, and when valve 22 is open the hydrogen in the chamber 11 escapes through the port 23, pipe 24, check valve 25 and pipe 12 into the brake cylinder, and causes a further reduction in the chamber 11 which insures a full opening of the valve 16 and permits the escape of air from the train pipe 1 through branch pipes 2 and 8, chamber 9 and pipe 12 into the brake cylinder 6. The reduction of pressure which is thus produced in the train pipe 1 and branch pipe 2 causes the operation of the triple valve 3 and the release of air from the auxiliary reservoir 4 to the brake cylinder 6, through the pipe 5; and the sudden reduc-

tion of pressure in chamber 11 and train pipe 14 caused by opening valve 22, quickens the action of the supplemental valve device on the next car and causes a quick application of the
 5 brakes on that car, and in the same manner on the cars following. Before the pressure in the chamber 11 and train pipe 14 becomes equalized with the pressure in the brake cylinder 6 and pipe 12, the back pressure from
 10 the brake cylinder and the pressure of the spring 26, acting together, seat the check valve 25 and prevent a complete exhaustion of the gas from the hydrogen pipe and the reduction of pressure in the chamber 11 below the final pressure in the chamber 9. A
 15 simple check valve 29 which seats toward the port 20 prevents a return of fluid from the brake cylinder, after the pressure in pipe 8 has been reduced, and prevents the recharging of the chamber 9 to a pressure above that
 20 in the chamber 11, so that, after the reduction of pressure in the chamber 9, and the closing of the check valve 25, the diaphragm 10 returns to its normal position and closes the
 25 valves 16 and 22. The pipe 14 may then be recharged with hydrogen immediately, or just before recharging the train pipe 1 for releasing the brakes. The spring 27 assists the return of the diaphragm and valves to their
 30 normal position, and the tension of the spring 27 determines the amount of reduction necessary in the pipe 14 to permit the downward movement of the diaphragm 10 and the opening of the valves 22 and 16.

35 In the branch pipe 8 is placed a plug cock 30 for cutting out the valve device 7, from the branch pipe 2, and a similar plug cock 31 is placed in branch pipe 13 for closing communication between the pipe 14 and the valve device, 7, when necessary.

40 The velocity with which the variations of pressure in the pipe 14, are transmitted, when charged with hydrogen, or other highly elastic gas, is so very much greater than the velocity of transmission in air, that the brakes
 45 will be applied almost simultaneously on a long train of cars.

In Fig. 3, I have shown a Westinghouse quick acting triple valve 3, arranged for operation in the usual manner by means of compressed air, and in connection therewith a device for operating by means of a more highly elastic fluid in another train pipe, which fluid is preferably hydrogen. The triple valve 3
 55 is connected to the brake cylinder head 32, and by means of a branch pipe 2, with the train pipe, in the usual manner. The slide valve 33, graduating valve 34, piston 39, and quick acting piston 36 are the same as in the
 60 Westinghouse quick acting triple valve. The passages 37 and 38 lead to the brake cylinder and the passage 35 is open to the auxiliary reservoir. A branch pipe 13, which is connected as in Figs. 1 and 2 with a train pipe 14, opens
 65 into a chamber 40 on one side of a diaphragm 41 which is exposed on its opposite side to the pressure of air in the auxiliary reservoir. A

stem 42 projects from one side of the diaphragm into a hole in a nut 44 which serves as a guide, and on the other side of the diaphragm the end of the stem is connected by
 70 a link 45 with a bell crank 46, one arm of which bears against a stem which projects from the shoulder 48 on the stem of the triple valve.
 75

When the brakes are off and the parts are in their normal positions the chamber 40 is charged with hydrogen under pressure, and the diaphragm 41 is held by the pressure of the hydrogen, with the assistance of the spring
 80 43, in the position shown in Fig. 3, against the auxiliary reservoir pressure in the chamber 49. The bell crank lever 46 is then in such a position that one of its arms bears lightly on the stem 47 or is moved far enough to be just
 85 out of contact with the stem 47. With this construction, the triple valve may be operated in the usual manner to apply the brakes by variations of pressure in the train pipe and branch pipe 2, and the slide valve of the
 90 triple valve may be returned to its normal position to release the brakes without interference from the bell crank 46. But when it is desired to cause an application of the brakes by variations of pressure in the hydrogen
 95 pipe, a sufficient reduction of pressure in the chamber 40 will permit the auxiliary reservoir pressure to move the diaphragm 41 and by means of the bell crank 46 move the slide valve 33 into position to apply the brakes.
 100 In this manner both service and emergency applications may be produced by variations of pressure in the hydrogen pipe alone.

When it is desired to release the brakes, the recharging of the hydrogen pipe returns
 105 the diaphragm and bell crank to their normal positions, and if only a service application has been made the slide valve of the triple valve will be returned to its normal position without recharging the air pipe.
 110

In Fig. 4 I have shown a portion of an automatic fluid pressure brake system which may be operated either by hydrogen or other highly elastic gas, or by compressed air; and I have shown in connection therewith means
 115 for retaining in the fluid the heat due to compression, or for preventing too great a cooling of the fluid in very cold weather; and also means for supplying heat to the fluid in order to raise its temperature, or compensate
 120 for loss of heat.

The train pipe 1, branch pipe 2, triple valve 3, auxiliary reservoir 4, and brake cylinder 6 may be the same as that employed in the ordinary brake system now in use, or other constructions or arrangements may be employed
 125 and these parts may be connected and operative with other improvements or constructions.

Any or all the parts may be provided with
 130 means for retaining and supplying heat in the manner shown, but in Fig. 4 I have only shown the train pipe so provided.

On the left of Fig. 4 I have shown the train.

pipe covered with a non-conducting material
50 to prevent the cooling of the fluid; and on
the right in the same figure I have shown the
train pipe inclosed within another pipe such
5 as the ordinary steam heating pipe whereby
the temperature of the fluid in the brake
pipe may be increased for the purpose of in-
creasing the rapidity with which variations
of pressure may be transmitted.

10 In the practice of my invention hydrogen
is preferable to other gases on account of its
great elasticity and cheapness, but other
highly elastic gases may be employed, espe-
15 cially any mixture or compound consisting
largely of hydrogen and which is therefore
more elastic than air; for example, natural
gas. As there are no reservoirs to be charged
from the pipe 14, it may be made smaller in
20 diameter than the usual train pipe which
must be of such a size as to permit a flow of
fluid sufficiently great in quantity to charge
the auxiliary reservoirs in a short time. And
since the fluid in pipe 14 may be used solely
25 for causing variations of pressure on one side
of a diaphragm, its pressure need not be so
great as that of the fluid in an ordinary
brake system. On account of this compara-
tively small volume and pressure of the fluid
30 in pipe 14 and the short length of time the
valve 22 is open, the quantity of the highly
elastic gas released at each operation of the
quick action devices will be very small; and
as emergency applications of the brake are
35 seldom necessary there will be no difficulty in
keeping a proper supply of the gas on hand.

What I claim as my invention, and desire to
secure by Letters Patent, is—

1. In a fluid pressure brake system the com-
40 bination, with an auxiliary reservoir charged
with a brake-actuating fluid, and a brake cyl-
inder, of a valve device controlling the release
of fluid from the auxiliary reservoir to the
brake cylinder, and a train pipe charged with
45 a more highly elastic fluid, such as hydrogen,
or other fluid of greater elasticity than air,
whereby the valve device may be operated by
variations of pressure in the highly elastic
fluid to cause a quick application of the
brakes, substantially as set forth.

50 2. In a fluid pressure brake system, the com-
bination, with a brake cylinder and an aux-
iliary reservoir charged with a brake actuat-
ing fluid, of a train pipe charged with a more
highly elastic gas, such as hydrogen, or other
55 gas of greater elasticity than air, a movable
abutment exposed on one side to the pressure
of the brake actuating fluid and on the other
side to the pressure of the highly elastic gas
in the train pipe, and a valve device operated

by the movement of the abutment caused by 60
variations of pressure in the highly elastic
gas, substantially as set forth.

3. In a fluid pressure brake system, the com-
bination, with a brake cylinder, auxiliary res-
65 ervoir, and triple valve, of a train pipe through
which the brake actuating fluid is supplied,
and a train pipe charged with hydrogen, or
other highly elastic gas, of greater elasticity
than air, and a device by which variations of
70 pressure in the highly elastic gas cause the
operation of the triple valve to admit the
brake actuating fluid to the brake cylinder,
substantially as set forth.

4. In a fluid pressure brake system, the com-
bination, with a brake cylinder and two train
75 pipes, of a valve device connected to both
pipes and operative by variations in the press-
ure of one of the pipes to release fluid under
pressure simultaneously from both pipes to
the brake cylinder, substantially as set forth. 80

5. In a fluid pressure brake system, the com-
bination with a brake cylinder and two train
pipes, of a valve device connected to and oper-
ative by variations of pressure in one of the
85 train pipes, and passages controlled by the
valve device for releasing the fluid simulta-
neously from both of the pipes, substantially
as set forth.

6. In a fluid pressure brake system, the com-
bination, with a brake cylinder, auxiliary res-
90 ervoir, train pipe, and triple valve, of a train
pipe charged with hydrogen, or other highly
elastic gas of greater elasticity than air, and
a valve device operative by variations of the
pressure of the highly elastic gas, and con-
95 trolling the release of fluid from the auxiliary
reservoir and from the train pipe to the brake
cylinder, substantially as set forth.

7. In a fluid pressure brake system, the com-
bination with a train pipe, auxiliary reser-
100 voir, brake cylinder, and triple valve, of a
movable abutment exposed on one side to the
pressure in the train pipe and on the other
side to the pressure of a highly elastic gas
such as hydrogen or other gas of greater elas-
105 ticity than air, a valve movable by the abut-
ment and controlling a passage for releasing
fluid from the train pipe, and another valve
also movable by the abutment and controlling
a passage for releasing the highly elastic fluid
110 from the other side of the abutment, substancially as set forth.

In testimony whereof I have hereunto set
my hand.

THOMAS J. HOGAN.

Witnesses:

J. SNOWDEN BELL,
W. B. CORWIN.