(No Model.) 2 Sheets—Sheet 1.

T. J. HOGAN.

AUTOMATIC FLUID PRESSURE BRAKE APPARATUS.

No. 604,861. Patented May 31, 1898.

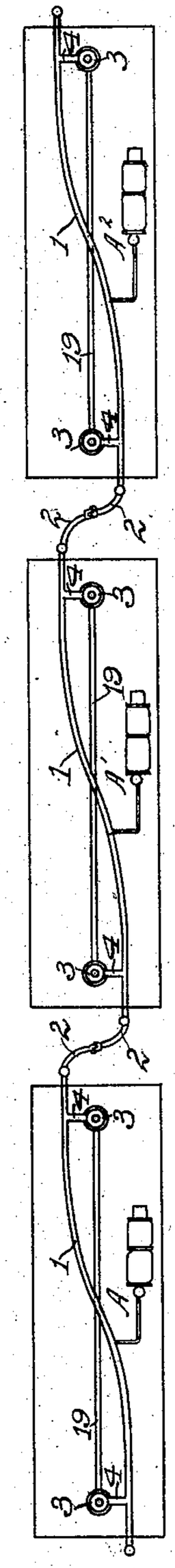

Fig. 1

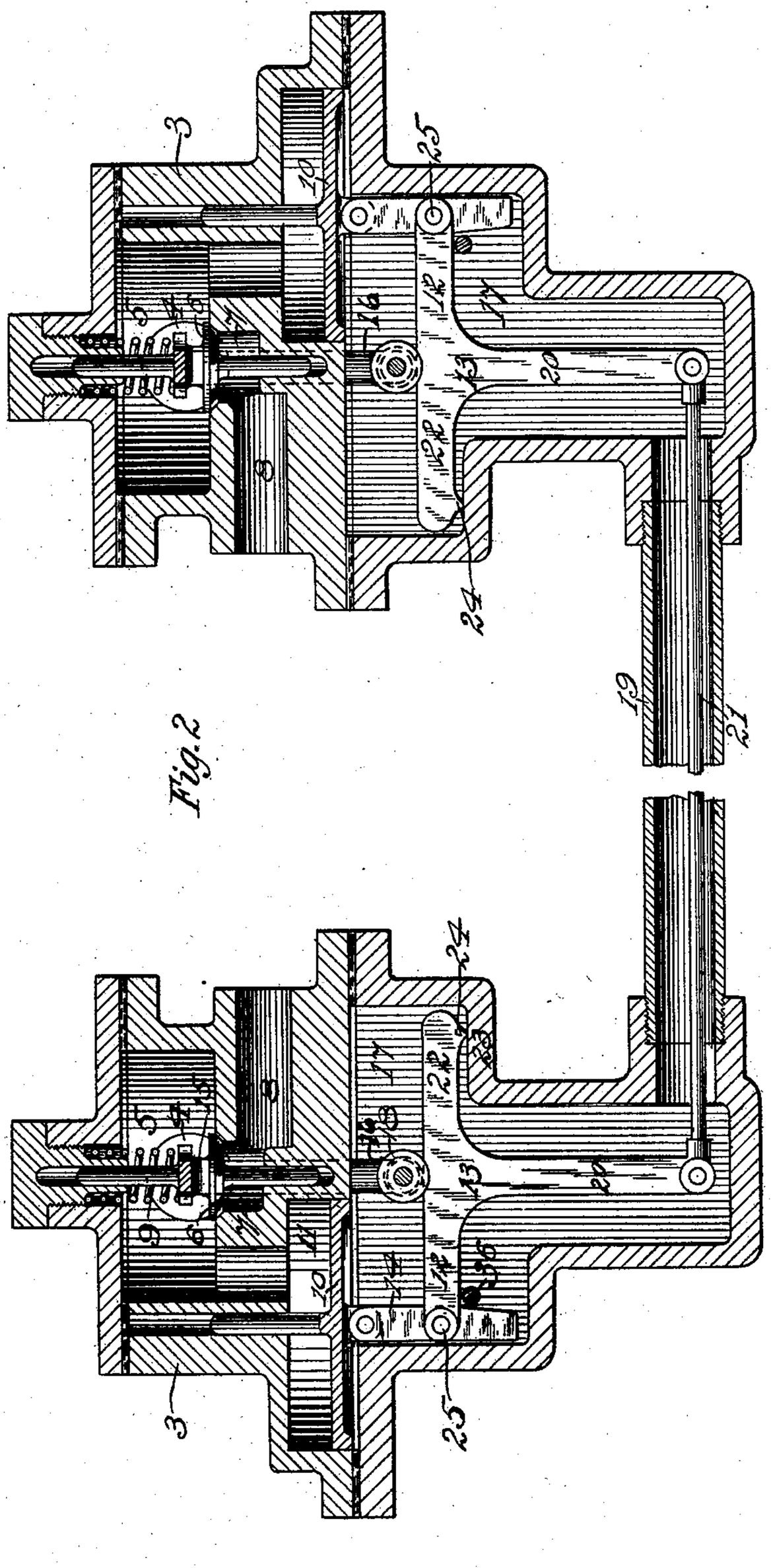

Fig. 2

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4

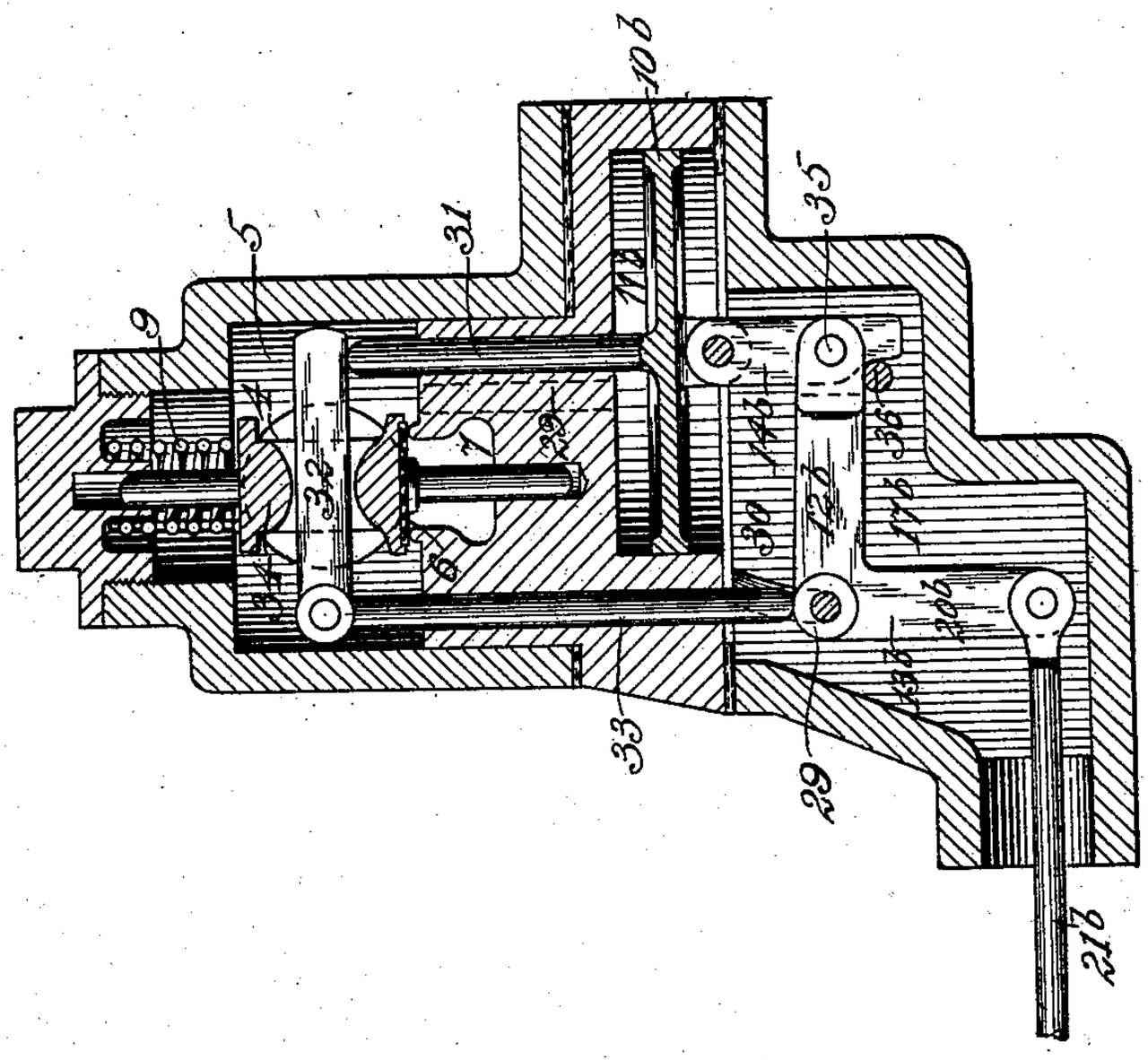
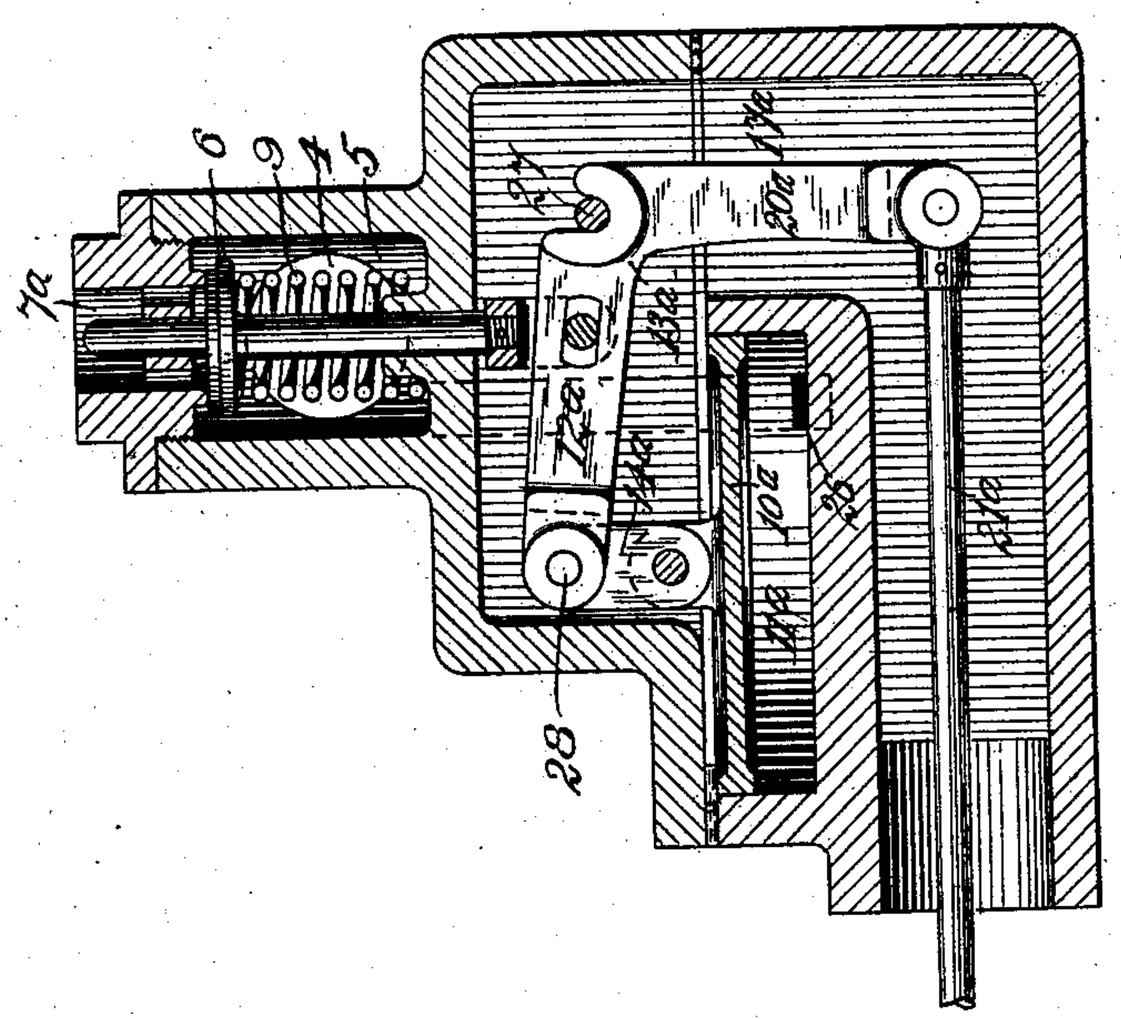


Fig. 3



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

AUTOMATIC FLUID-PRESSURE BRAKE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 604,861, dated May 31, 1898.

Application filed March 13, 1897. Serial No. 627,383. (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 a certain new and useful Improvement in Automatic Fluid-Pressure Brake Apparatus, of which improvement the following is a specification.

The object of my invention is to provide an improvement in automatic fluid-pressure brake apparatus for railway-cars; and to this end my invention consists in means whereby the brakes on the different cars of a train may be applied practically simultaneously or with a very much smaller interval of time than has been heretofore required.

My invention further consists in certain combinations and features of construction, all as hereinafter set forth.

In the accompanying drawings, which illustrate an application of my invention, Figure 1 is a diagrammatic plan view showing the brake apparatus under the cars of a train with my improvement applied thereto; Fig. 2, a central vertical section through a valve apparatus constructed in accordance with my invention and adapted to be applied to an automatic fluid-pressure brake apparatus; Figs. 3 and 4, sectional views showing modifications of the release-valve device of my improvement.

My invention comprises means for effecting simultaneously a local exhaust of fluid from the train-pipe at a plurality of points in each section of the train-pipe under each of the cars on a train, the exhaust-openings being preferably located as near to the ends of each section of train-pipe as possible, whereby the time usually required for the variation of pressure in the train-pipe to be transmitted from one end of the car to the other is entirely eliminated and the interval of time between the applications of the brakes on any two cars is so reduced that the application of the brakes on all the cars of a fifty-car train will be practically simultaneous. In the constructions which have been employed heretofore the time required for the application of the brakes on the last car of a train of fifty cars after the movement of the engineer's brake-valve for the purpose of applying the brakes has been something more than two seconds, and the brakes on each succeeding car in rear of the locomotive are applied after an interval of time corresponding to the distance of the triple valve on that car from the triple valve on the preceding car, or, more exactly, the difference of time in the operation of any two quick-action triple-valve devices is due to the length of train-pipe between the tri-valve devices. This length of train-pipe is equal to about the length of a car plus the length of flexible hose between the two cars by which the rigid sections of train-pipe under two different cars are connected together.

In a train of fifty cars equipped with the usual quick-action automatic fluid-pressure brake apparatus the variation of the pressure within the train-pipe, or what might be termed the "pressure-wave," by which the triple valves are operated, must travel a distance equal to about fifty times the length of train-pipe between the two triple-valve devices, and the time required to effect the application of the brakes on the last car of the train may be regarded as being fifty times the interval of time required for the transmission of the pressure-wave or reduction of train-pipe pressure from one triple-valve device to another on an adjacent car.

In accordance with my invention I connect with the train-pipe at or near each end of the car, but preferably as near as possible to the end of each section of train-pipe, a train-pipe release-valve device, each of which is adapted to be operated by a reduction of pressure in the train-pipe and which is so connected with the release-valve device at the other end of the car that the operation of either of these valve devices will effect the simultaneous operation of the other without even such an interval of time as would be required for the transmission of the variation of train-pipe pressure from one release-valve device to the other. By this means the time required for the transmission of the pressure-wave or of the variation of train-pipe pressure from that point in the train-pipe to which the release-

valve is connected to the corresponding point at the opposite end of the car is entirely eliminated, and the only time required for the transmission of the pressure-wave or variation in the train-pipe pressure from one car to another will be the time required for such transmission from the release-valve at one end of the car to the release-valve on the adjacent end of the next car, and the time required for the application of the brakes on the last car of a train of fifty cars will be something less than fifty times the time required for the transmission of the pressure-wave or variation of pressure in the train-pipe through this comparatively short portion of the train-pipe between the two release-valve devices on the adjacent ends of two cars in the train. If the total length of the section of train-pipe on each of the cars, including the flexible hose, be taken as forty-two feet, and if the release-valves be located in accordance with my invention, so that the length of train-pipe between the release-valves on the adjacent ends of two cars of a train be seven feet, the time required for the transmission of the pressure-wave or the variation in the train-pipe pressure will be one-sixth of that required under the present practice with the same length of train-pipe, and the time required for the application of the brakes on the fiftieth car of a train of fifty cars by the movement of the engineer's brake-valve should be one-third of a second, instead of being, as at present, something more than two seconds. It is possible that the interval of time required for the application on any number of cars may be diminished in a much greater proportion than this by means of my improvement, as the time saved will depend upon the position of the release-valve at each end of the car. The greater the distance between the connections of the release-valves on each car the greater will be the saving in time, since no time whatever will be required for the transmission of the pressure-wave through the length of train-pipe between the release-valves of each car, and the nearer each release-valve is placed to the end of the section of train-pipe with which it is connected the shorter will be the length of pipe through which the pressure-wave or variation of train-pipe pressure must be transmitted.

In Fig. 1 of the drawings the rigid sections of train-pipe 1 are shown connected by the sections 2 of flexible hose, and near each end of the car a release-valve device 3 is shown connected by a short pipe or passage 4 with the train-pipe, and the casings of the two release-valve devices are connected by a pipe 19. These release-valve devices may be of the same construction as shown in Fig. 2, or either of the constructions shown in Figs. 3 and 4 may be employed; but my invention is not limited to the particular construction of valve devices shown. The passage 4 communicates at one end with the train-pipe and at the other end with a chamber 5 within the casing of the release-valve device, and a valve 6 controls a passage 7, through which fluid under pressure may be released from the chamber 5 and from the train-pipe for the purpose of effecting a reduction of pressure therein and applying the brakes. As shown in Fig. 2, the valve 6 is normally held to its seat by the pressure of a spring 9 and the pressure of the fluid in the chamber 5. A piston 10 is fitted in a chamber 11, communicating with the train-pipe, and is exposed on one side to the pressure in the chamber 5 and in the train-pipe and is operatively connected by means of a link 14 with an arm 12 of a three-armed lever 13, as shown in Fig. 2. The valve 6 is connected with a yoke 15, having two parallel members or rods 16, which extend downward into the chamber or space 17, in which the lever 13 is located. A roller 18, which is mounted between the ends of the rods 16, is normally out of contact with though near to the lever 13, and is in a position to be engaged by the lever 13 and moved from the position shown in Fig. 2 to compress the spring 9 and open the valve 6. The chambers 17 of the two release-valve devices on any one of the cars are connected together by means of a pipe 19, and may be charged with fluid under pressure from the train-pipe either by leakage around or through the piston 10 or around the rods 16, and the capacity of these chambers 17 and of the pipe 19 may be made as great as desired or as is found necessary for a proper operation of the valve devices, the fluid under pressure in the pipe 19 and in the chambers 17 on one side of the piston 10 being utilized to move the pistons 10 when the train-pipe pressure on the other side has been sufficiently reduced. The arms 20 of the levers 13 are connected together by means of a rod or wire 21, passing through the pipe 19, and the arms 22 of the levers 13 rest on a ledge or projection 23 of the casing.

With this construction when a sufficient reduction of pressure is effected in the train-pipe near one of the release-valve devices the reduction of pressure in the chamber 5 and in the chamber 11 above the piston 10 will permit the fluid under pressure in the chamber 17, on the other side of the piston 10, to move the piston 10 upward, and with it the arm 12 of the lever 13. The upward movement of the arm 12, which turns about the knife-edge 24 as a fulcrum, will by contact with the roller 18 move the rods 16 and the yoke 15 upward against the resistance of the spring 9 and unseat the valve 6, thereby permitting a rapid escape of fluid from the chamber 5 and from the train-pipe at that end of the car through the passages 7 and 8. The fluid thus released may pass to the atmosphere, to the brake-cylinder, or to a reservoir or chamber, as desired.

If we suppose that the brakes are being applied from the locomotive and that the re-

lease-valve device shown on the right in Fig. 2 is located at the forward end of the car in the train, the valve of that release-valve device will be the first to be opened of the two release-valves on that car, and the upward movement of the piston 10 and of the lever-arm 12 of that valve device will cause the rod or wire 21 in the pipe 19 to be pulled to the right, and since there is no lost motion in the connections between the two lever-arms 20 of the two valve devices these two lever-arms will be moved together to the right and the valve 6 of the release-valve device near the rear end of the car will be opened by the upward movement of the lever 13, turning on the pin 25.

As shown in Fig. 2, as the two release-valve devices are similar in all respects the operation of either of the pistons 10 by a reduction of train-pipe pressure will cause the simultaneous opening of both the release-valves 6 at opposite ends of the car, and there will therefore be no loss of time such as would otherwise be required if, for example, the valve devices were not positively connected and each could operate only when a certain reduction in the train-pipe pressure had been effected in the train-pipe at the point to which the release-valve device is connected.

If the release-valve devices are connected exactly at the ends of the sections of train-pipe, there need be no interval or but a very slight interval of time between the applications of the brakes on the first and last or any of the other cars in a train provided with my improvement. In the drawings I have shown the release-valve devices at some distance from the ends of the sections of train-pipe merely for the purpose of showing them located in convenient positions under the cars.

It will be seen that with my improvement in a train of fifty cars fifty times the time ordinarily required for the transmission of train-pipe pressure from end to end of a car will be saved, and the only time required or the only variation from an absolutely simultaneous application of the brake on all the cars will be that due to the comparatively short portions of pipe or hose between the release-valves on the adjacent ends of the cars.

It is to be understood that admission of fluid to the chambers 17 and to pipe 19 may be as gradual or rapid as desired, so long as it does not interfere with the proper operation of the brake apparatus; but in order to secure a proper operation of the release-valve devices it is essential that there should be no sudden reduction of pressure in the chambers 17 and pipe 19 when the train-pipe pressure is reduced to apply the brakes, and for this reason the rods 16 should fit rather closely in the openings through which they pass, and the leakage-passage through or around the piston 10, if such passage be employed, should be small.

In Fig. 3 of the drawings I have shown a release-valve device in which the valve 6 for releasing the fluid from the train-pipe is connected with a two-armed lever 13^a, which may be actuated to open the valve 6 either by a downward movement of the piston 10^a or by a pull on the rod 21^a. The piston 10^a is exposed on one side to the pressure in the chamber 17^a and on its other side to the pressure in a chamber 11^a, which communicates with the chamber 5 through a passage 26 and with the train-pipe through the passage 4. When a sufficient reduction of pressure is effected in the train-pipe and in the chambers 5 and 11^a, the pressure in the chamber 17^a will move the piston 10^a downward, and with it one end of the lever-arm 12^a, which is connected with the piston by the link 14^a. The lever 13^a will at the same time turn on the pin 27, and the arm 20^a will move to the right and pull on a similar arm of the release-valve device at the other end of the car, to which the other end of the rod or wire 21^a is connected. As in the construction shown in Fig. 2, the casings of the two release-valve devices on each car are connected by a pipe (not shown in Fig. 3) through which the rod or wire 21^a passes and which forms a passage through which the chambers 17^a of the release-valve devices communicate.

When the release-valve 6 is operated by a pull on the rod 21^a instead of by a reduction of the pressure under the piston 10^a, the arm 20^a of the lever 13^a will be moved to the left or toward the piston-chamber. The pin 28 will then act as the fulcrum of the lever, the lever will be pulled down away from the pin 27, and the downward movement of the arm 12^a in turning about the pin 28 will unseat the valve 6.

In the construction shown in Fig. 4 the chamber 5 of the valve device is, as in the constructions in Figs. 2 and 3, connected by a passage 4 with the train-pipe, and the valve 6, located in the chamber 5, is held to its seat by the pressure of a spring 9 and controls the release of fluid from the train-pipe through a passage 7. The piston 10^b is located in a chamber 11^b, which is connected with the chamber 5 by a passage 29 (shown in dotted lines) and is exposed on one side to pressure in the train-pipe and on the other side to the pressure in the chamber 17^b, which is in communication with a similar chamber in the release-valve device at the other end of the car and which is connected therewith by a pipe through which the rod or wire 21^b passes, as in Figs. 2 and 3.

In Fig. 4 the piston 10^b is connected by means of a link 14^b with one arm of a lever 13^b, the other arm 20^b of which is connected with the rod or wire 21^b. When a sufficiently great and rapid reduction of pressure is effected in the train-pipe to cause the opening of the release-valve, the piston 10^b will be moved up by the pressure in the chamber 17^b. The stem 31 of the piston will push up the

arm 32, which is pivoted to a rod 33 and passes through a yoke 34, to which the valve 6 is secured. The upward movement of the arm 32 will unseat the valve 6 and permit the escape of fluid from the train-pipe. When the piston 10^b moves upward, the arm 12^b of the lever 13^b will be moved upward, the lever will turn on the pin 29, the ends of which rest in the bottom of grooves 30, formed in the walls of the chamber 17^b, the arm 20^b of the lever will be turned to the right, and the rod or wire 21^b will be pulled, so as to operate the valve device at the other end of the car. A pull on the rod 21^b will cause the lever 13^b to turn on the pin 35 as a fulcrum and to lift the rod 33 and the arm 32 so as to unseat the valve 6, the end of the piston-rod 31 then acting as a fulcrum for the arm or lever 32.

The pins 36 (shown on Figs. 2 and 4) serve as guides to prevent lateral movement of the links 14 and 14^b.

A very important feature of my invention is the simultaneous operation of the two release-valve devices on a car or the simultaneous exhaust of fluid and reduction of pressure at two or more points in the train-pipe under each car, and it is my intention to claim, broadly, means for effecting such operation or exhaust of fluid or reduction of pressure.

It is not an essential of the broad principle of my invention that the simultaneous operation of the two release-valve devices under a car be effected by means of a positive mechanical connection for transmitting movement from one release-valve to the other, since the provision of electrical or other means for the same purpose will come within the spirit of my invention.

Any two simultaneously-operated release-valve devices under the same car, whether operated by an electric current, however obtained, or by mechanical or other means, I regard as coming within the scope of my invention.

The connected valve devices by which the release of fluid under pressure is effected under each car constitute a duplex release-valve device in which the operation of either piston and its valve by variations in fluid-pressure causes the simultaneous operation of the other valve.

My improvement is specially adapted to quicken the serial application of the brakes on the several cars of a train on which the release-valve device on each car is operated in accordance with a variation of fluid-pressure dependent on or effected by the action of a similar device on another car in the train, usually the adjoining car, and my invention does not include such constructions as those in which the local release on each car is effected independently of the release on some other car, as in those cases in which the local release-valves on each car are operated by an electrical current controlled from the locomotive.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. In an automatic fluid-pressure brake apparatus, the combination, with a section of train-pipe, on a car, of operatively-connected means for simultaneously effecting a local release of fluid from the train-pipe at more than one point in the length of the train-pipe section, substantially as set forth.

2. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, of means, actuated by a reduction of train-pipe pressure, for locally exhausting fluid under pressure from the train-pipe simultaneously at two points in the length of the train-pipe, substantially as set forth.

3. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, of two release-valve devices connected therewith and adapted to effect a local exhaust of fluid therefrom, and means whereby the two release-valves may be operated simultaneously by a reduction of train-pipe pressure, substantially as set forth.

4. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, of two release-valve devices which are so connected that the operation of one may effect the simultaneous operation of the other, substantially as set forth.

5. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, of a release-valve device adapted to be operated by variations of fluid-pressure, and connected with and adapted to positively operate another release-valve device, substantially as set forth.

6. In an automatic fluid-pressure brake apparatus, the combination, with a train-pipe, of two release-valve devices, each adapted to be actuated by variations of fluid-pressure, and so connected together that the operation of one will effect a simultaneous operation of the other, substantially as set forth.

7. The combination, with two connected valve devices, of a fluid-pressure-actuated member, or abutment in each valve device, and a connection between the fluid-pressure-actuated members, or abutments, whereby the operation of either valve device by fluid-pressure may effect a simultaneous operation of the other, substantially as set forth.

8. The combination, with two valve devices, of a piston, or other fluid-pressure-actuated member, for each valve device and means connecting the pistons whereby each piston is adapted to operate both valve devices, substantially as set forth.

9. The combination, with a pipe connected with a number of valve devices adapted to be operated by variations of fluid-pressure in the pipe, of means, operative by variations of pressure in the pipe, and simultaneously actuated for effecting variations of fluid-pressure at different points in the pipe, substantially as set forth.

10. The combination, with a train-pipe, of

two valve devices for releasing fluid under pressure therefrom, a piston in each of the valve devices, a lever adapted to be actuated by each piston, and a connection between the levers, substantially as set forth.

11. The combination, with two valve devices, of two connected levers having changeable fulcrums, and a piston connected to each lever and adapted to operate both valves, substantially as set forth.

In testimony whereof I have hereunto set my hand.

THOMAS J. HOGAN.

Witnesses:
ETHEL GALLAGHER,
F. E. GAITHER.