No. 675,870.

Patented June 4, 1901.

C. A. BALL.

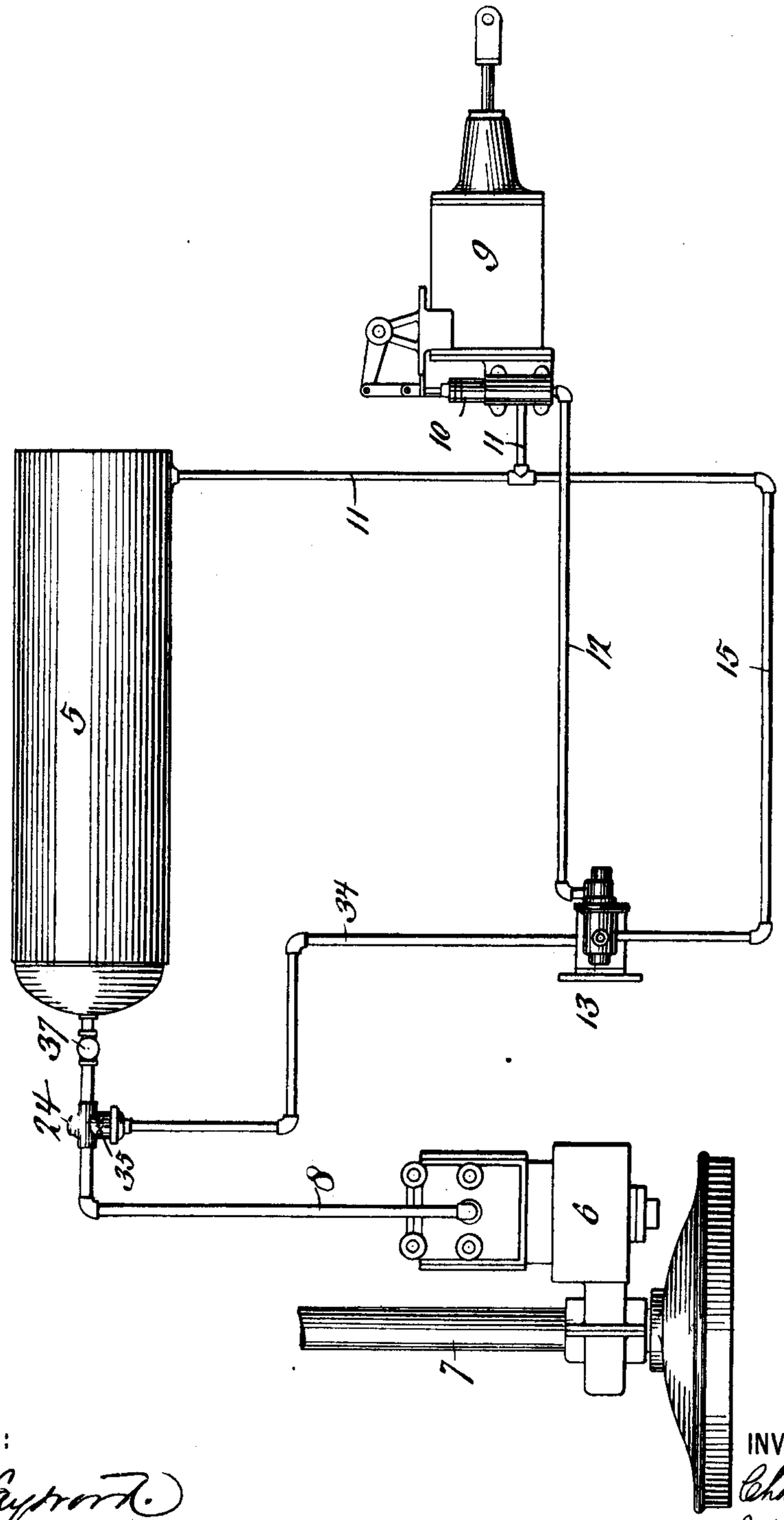
AIR BRAKE.

(Application filed Apr. 6, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

D. N. Maynard.

C. F. Carrington.

INVENTOR.

Charles A. Ball

BY J. C. Chaplin

His ATTORNEY

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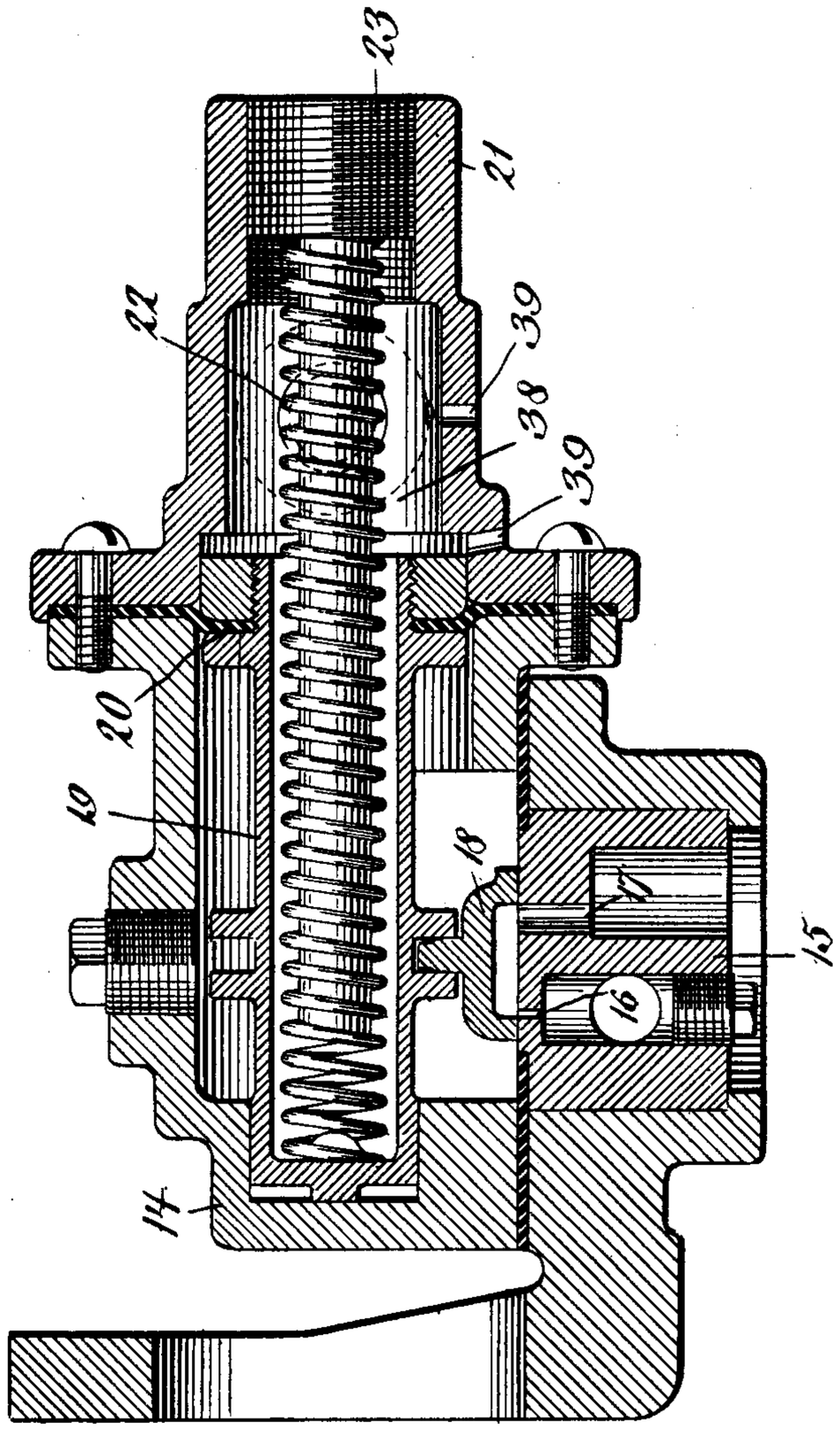
(No Model.) 3 Sheets—Sheet 2.

Fig. 2.



WITNESSES:

D. H. Haywood.

C. F. Carrington

INVENTOR

Charles A. Ball

BY J. C. Chapin

His ATTORNEY

No. 675,870.

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C. A. BALL.

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3 Sheets—Sheet 3.

Fig. 4,

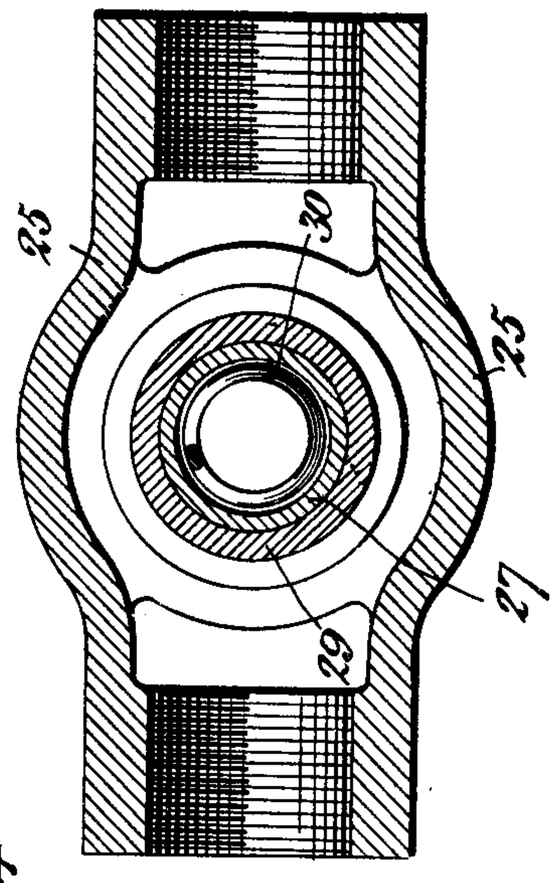
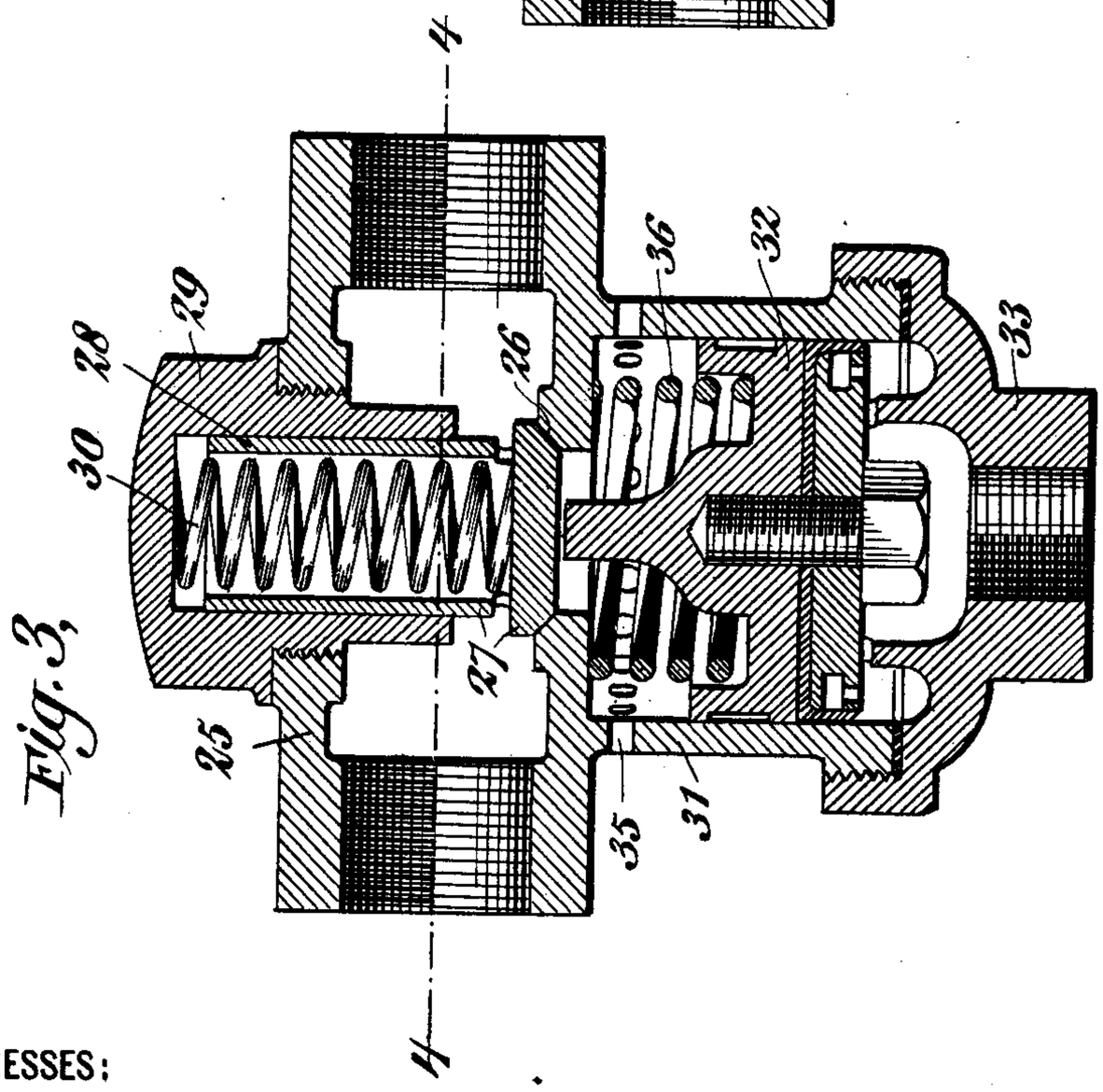


Fig. 3,



WITNESSES:

D. H. Maynard.

C. F. Carrington

INVENTOR

Charles A. Ball

BY J. C. Chapin

His ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES A. BALL, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE STANDARD AIR BRAKE COMPANY, OF NEW YORK, N. Y.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 675,870, dated June 4, 1901.

Application filed April 6, 1900. Serial No. 11,852. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. BALL, a citizen of the United States of America, and a resident of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Air-Brakes, of which the following is a specification.

My invention relates to improvements in air-brakes; and my invention consists in the provision of improved means under the control of variations of pressure in the air-reservoir whereby the pump of an air-brake system may be placed in and out of operative connection with the air-reservoir. By my invention the pump is permitted to run at all times without regard to the pressure in the air-reservoir; but when the pressure in the air-reservoir rises above a predetermined point the means which are provided intermediate of the delivery of the pump and the air-reservoir cause the delivery to be made to the atmosphere or other exhaust instead of to the air-reservoir.

My invention further consists in the provision of means whereby the exhaust from the air-brake cylinder may be used to assist in the operation of the governor in one direction, whereby the pump shall always be placed in operative connection with the air-reservoir after the release of the brakes, and consequently after a certain amount of air from the reservoir has been withdrawn therefrom for the purpose of setting the brakes.

The objects of my invention are, first, to do away with a mechanical clutch and release mechanism between the motor and its source of power; second, to simplify the means for relieving the pump from working when the pressure in the air-reservoir has reached a predetermined point, and, third, to force the movement of the governor which controls the said means after air has been withdrawn from the air-reservoir.

My invention further consists in certain novel construction and combination of parts, as shall hereinafter be more fully described.

I shall now proceed to describe an air-brake system embodying my invention and will then point out the novel features in the claims.

In the drawings, Figure 1 is a diagrammatic view of a brake system embodying my invention, showing an air-reservoir, a pump and a pump-operating means, a governor, an air-brake cylinder, a service-valve, a relief-valve, and suitable pipe connections between the same. Fig. 2 is a central longitudinal section of a governor which I employ. Fig. 3 is a central vertical section of a relief-valve. Fig. 4 is a horizontal section on the plane of the line 4 4 of Fig. 3.

Similar reference characters designate corresponding parts in the several figures.

Referring at first more particularly to Fig. 1, reference character 5 designates a storage-reservoir for air under pressure. 6 designates a pump or compressor deriving motion from the axle 7 of a car in a manner well known. The pump or compressor 6 delivers air under pressure through the delivery-pipe 8 into the reservoir 5.

Reference character 9 designates an air-brake cylinder, and 10 a service-valve for controlling the inlet and exhaust of air to and from the same. A pipe 11 connects the inlet side of the service-valve 10 with the air-reservoir 5, and the pipe 12 connects with the exhaust thereof. The service-valve is of too well known a form to require detail illustration or description herein. Suffice it to say that in the running or normal condition of the parts the inlet of air through the pipe 11 is closed to the brake-cylinder 9 and the exhaust from the said brake-cylinder is opened to the atmosphere or exhaust-pipe 12. When the brakes are to be set, the exhaust from cylinder 9 is closed and air is allowed to rush into the cylinder through the pipe 11 from the reservoir 5.

Reference character 13 designates an automatic governor of peculiar construction, which is illustrated in detail in Fig. 2. As will be seen more clearly by reference to Fig. 2, the said governor comprises a valve-chamber 14, which is in open communication with the reservoir 5 through a branch pipe 15, which connects the interior of the said valve-chamber with the pipe 11. The valve-chamber 14 is mounted on a suitable base, within which is arranged a valve-seat. The valve-seat has a discharge-port 16 and an exhaust-port 17. A reciprocating slide-valve 18 is

arranged to have a movement on the valve-seat 15 and in its movement to control the ports 16 and 17. The slide-valve 18 engages with and is operated by a hollow operating-rod 19. To one end of the hollow operating-rod 19 is provided a diaphragm 20, the said diaphragm being secured at its outer ends between the flanged end of the valve-chamber 14 and the flanged end of a head 21, which closes the said end of the valve-chamber. A governor-spring 22 is arranged within the hollow operating-rod 19 and bears at one end against the said rod and at the other end against a regulating-screw 23, with which the head 21 is provided. The tension of the spring is exerted to force the hollow operating-rod and the valve carried thereby to such a position as to connect the discharge-passage 16 with the exhaust-port 17 through the exhaust-cavity of the said valve. As before stated, the valve-chamber 14 is in open communication with the air-reservoir 5. The tension of the spring 22 is so regulated that when the pressure in the air-reservoir rises to the predetermined point at which it is desired to hold the said pressure and above which it is not desired that the pressure shall rise the said pressure shall overcome the force of the said spring 22 and reverse the position of the parts. This will close the exhaust-port 17 and open the discharge-port 16 to the interior of the valve-chamber, and hence to the reservoir 5.

Located in the delivery-pipe 8 is a relief-valve 24. This relief-valve is shown more clearly in detail in Figs. 3 and 4, to which reference is now more particularly made.

25 designates a casing having internally-screw-threaded ends for engaging with the sections of the pipe 8. The casing 25 has arranged within it a valve-seat 26, and a valve 27 is fitted to said valve-seat 26. The valve 27 has a hollow stem 28, which is fitted to and has movement in a head 29. A spring 30 normally holds the valve 27 closed.

The casing 25 is provided with a hollow cylindrical projecting portion 31, in which is arranged pressure-actuated means, here shown as a piston-head 32. The pressure-actuated means 32 in its out-of-operative position, which is the position in which it is shown in Fig. 3, is arranged to be out of engagement with the valve 27. The cylindrical extension 31 is closed at its outer end by a head 33. The head 33 is provided with an internal screw portion, with which engages the end of a pipe 34, the opposite end of which connects with the discharge-port 16 of the governor 13. When air under pressure is introduced into the pipe 34, it will operate against the under side of the piston 32 and will force the same upwardly, thereby opening the valve 27. When the valve 27 is open, the air which is forced along the pipe 8 by the pump 6 will pass down through the valve-seat 26 and out to atmosphere through ports 35, arranged in the walls of the extension 31. A spring 36 operates to return the piston 32 to its lowermost position when the pressure below the piston is relieved. When the piston is so returned to its lowermost position, the valve 27 will be returned to its seat by the action of the spring 30.

A check-valve 37 is provided in the pipe 8 between the relief-valve 24 and the air-reservoir 5. This check-valve will prevent the escape of air from the reservoir through the relief-valve 24 at such times as the said valve is discharging to atmosphere.

The operation of the parts is as follows: The pump 6, by reason of its direct communication with the axle 7, will be running at all times that the said axle is turning, and the said pump will continue to force air under pressure into the air-reservoir 5 until the pressure therein has reached a predetermined point, as, say, sixty pounds to the square inch. When this sixty pounds has been reached, the pressure transmitted through the pipes 11 and 15 to within the chamber 14 of the governor 13 and bearing against the front of the diaphragm or other pressure-actuated means 20 will overcome the resistance of the spring 22 and will force the operating-rod 19 and the valve 18, carried thereby, over to such a position that the port 17 in the valve-seat 15 will be closed and the port 16 will be opened to the interior of the valve-chamber 14. Air under pressure from the interior of the valve-chamber 14 will immediately rush through the port 16 and the pipe 34 to the under side of the piston 32, raising the piston 32 and opening the valve 27. The pump now, though it will continue to force air along the pipe 8, will not force it into the air-reservoir 5, but will discharge it through the ports 35 in the extension of the casing 25. So long as the pressure is maintained in the reservoir 5—that is to say, so long as no air is withdrawn therefrom for use in the brake-cylinder 9 or for other purposes—the valve 27 will continue to be held open and the pump 6 relieved by reason of the fact that no resistance is offered to the discharge of the air. Should the air in the reservoir 5 fall below the said pressure of sixty pounds, the spring 22 in the governor 13 will react and force the valve 18 over, so as to close the port 16 to the interior of the chamber 14 and to open the said port 16 through the exhaust-cavity in the valve 18 to the exhaust-port 17. The air-pressure beneath the piston 32 will then be relieved by reason of the fact that the space below the piston is open to the exhaust through the pipe 34 and the ports 16 and 17. The pump 6 will now commence to again pump effectively and to force the air under pressure into the reservoir 5 to replace the air which has been withdrawn and will continue to so pump until the predetermined pressure of sixty pounds has been reattained.

I have provided a special means to insure the proper working of the governor after the

brakes have been relieved and to prevent the liability of the sticking of parts in the governor. This means consists in the connection of the exhaust side of the brake-cylinder 9 to that side of the diaphragm 20 which is opposed to the pressure of the air-reservoir through the chamber 14. The head 21, as before stated, closes the end of the casing 14, and the space between the said head and the diaphragm-chamber constitutes a diaphragm-chamber 38. This chamber 38 I have placed in communication with the brake-cylinder exhaust through the pipe 12. Suitable leakage or discharge ports 39 are arranged in the head 21 for the final discharge or exhaust of the air from the brake-cylinder.

It is obvious that whenever air has been used in the brake-cylinder 9 to set the brakes there must have been a corresponding drop in pressure in the reservoir 5. Thus when the brakes are released the exhaust from the brake-cylinder 9 instead of being exhausted directly to the atmosphere may be discharged through the pipe 12 into the diaphragm-chamber 38, and so lend its pressure to combine with the pressure of the spring 22 to force the valve 18 to the desired position.

Should the parts in the governor be inclined to stick in their movements in the opposite direction, no serious results would accrue, as the air-pressure would continue to rise until the parts would be forced over; but if such condition existed in the opposite direction there would be danger of the pressure in the air-reservoir falling to an undue amount before the parts were operated. The provision of means as herein mentioned entirely obviates the danger.

It may here be stated that I do not desire to limit myself to the exact details of construction as herein described, as many of them may be obviously varied within wide limits without departing from the spirit and scope of my invention.

What I claim is—

1. In an air-brake system, the combination with an air-reservoir, a pump and pump-operating mechanism, of a relief-valve located in the delivery of the pump, pressure-actuated means for opening and closing the said relief-valve and a governor controlling the admission and exhaust of fluid-pressure to and from the said pressure-actuated means.

2. In an air-brake system, the combination with an air-reservoir, a pump and pump-operating means, of a relief-valve located in the delivery of the pump, a cylinder and a piston mounted therein, said piston adapted in its movement to open and close the said valve, and a pump-governor adapted to control admission and exhaust of fluid under pressure to the said cylinder.

3. In an air-brake system, the combination with an air-reservoir, a brake-cylinder, a pump and a pump-operating mechanism, of a relief-valve located in the pump-delivery and opening to exhaust, fluid-pressure-actuated means for operating the valve, a pump-governor for controlling the admission and exhaust of fluid-pressure to and from the pressure-actuated means, and means operated by the exhaust from the brake-cylinder for enforcing the movement of the governor in one direction.

4. A relief-valve comprising a casing having a clear run therethrough, and having a cylindrical extension projecting downwardly therefrom, a valve fitted to said casing and arranged to open against the fluid-pressure within the casing to within the upper part of the said cylindrical extension, the said upper part of the cylindrical extension having an exhaust to atmosphere, and a piston mounted in the lower part of the cylindrical extension and adapted under fluid-pressure to open the said valve and to permit the closing of the said valve upon the relief of said pressure.

Signed by me at New York, N. Y., this 5th day of April, 1900.

CHAS. A. BALL.

Witnesses:
C. I. EARLL,
C. F. CARRINGTON.