No. 637,646. Patented Nov. 21, 1899.

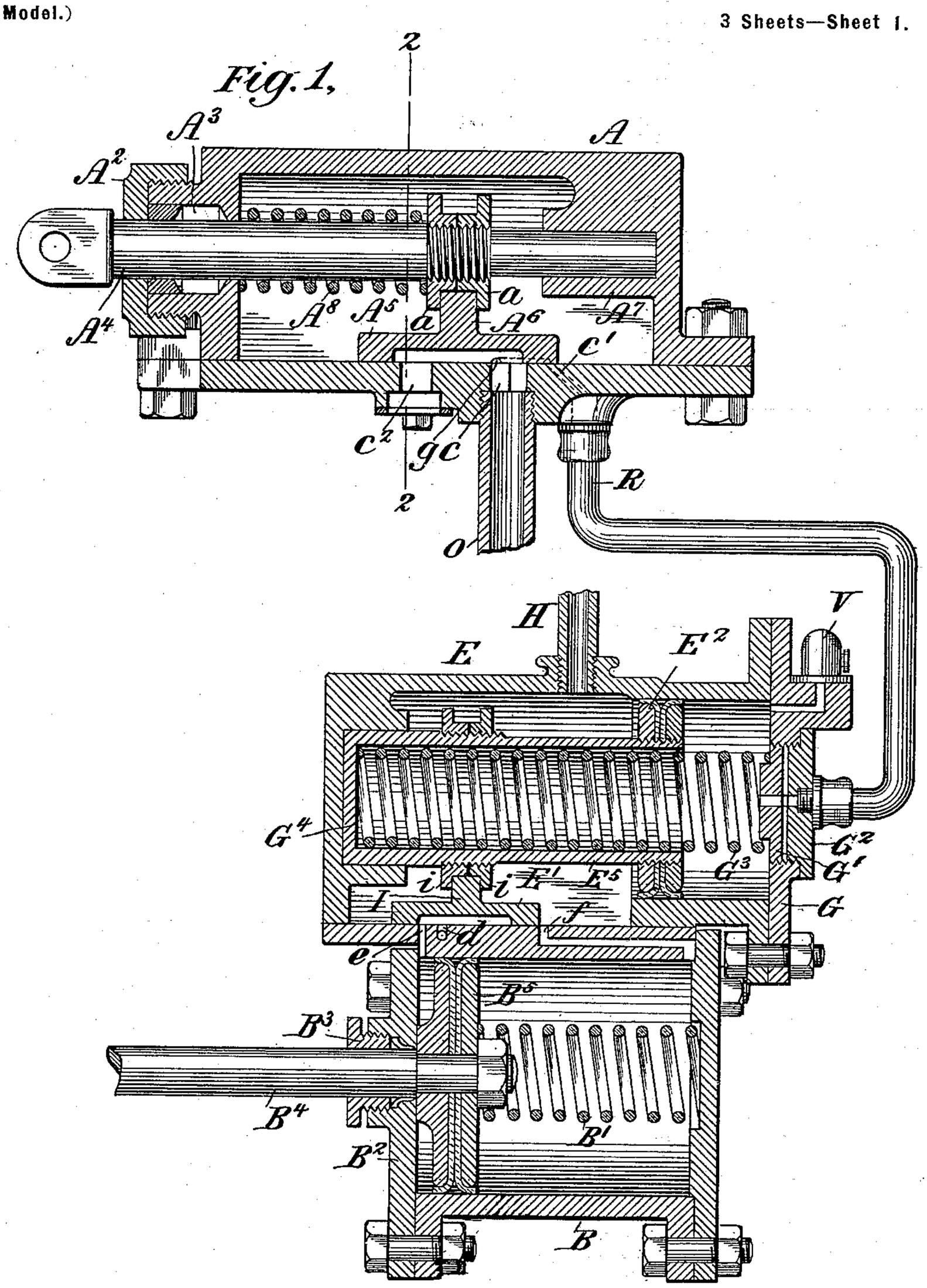
J. J. NEF.

AIR BRAKE.

(Application filed Oct. 2, 1896. Renewed Oct. 27, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

D. F. Hayward

Harry A. Goss.

INVENTOR

John J Nef

BY

James C. Chapin

His ATTORNEY

No. 637,646. Patented Nov. 21, 1899.

J. J. NEF.

AIR BRAKE.

(Application filed Oct. 2, 1896. Renewed Oct. 27, 1899.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

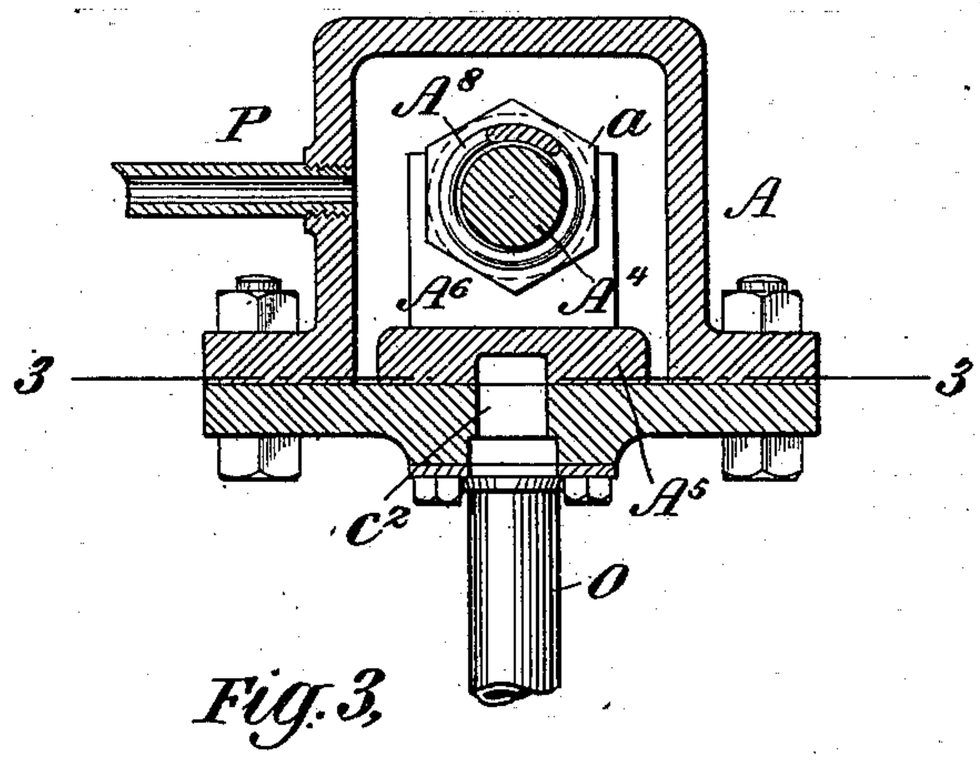
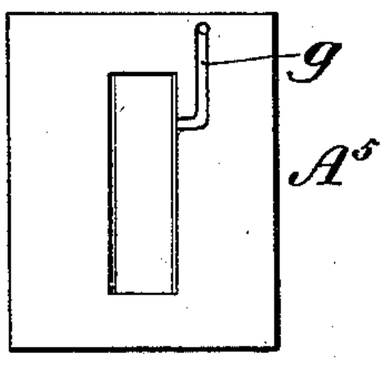


Fig. 3.

Fig. 4.



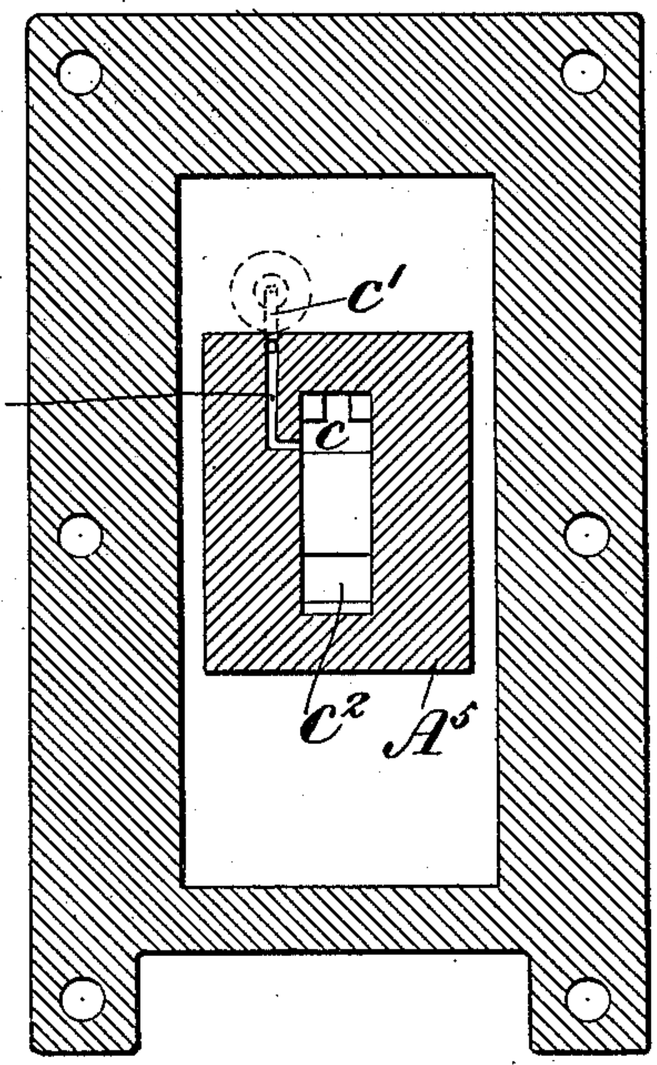
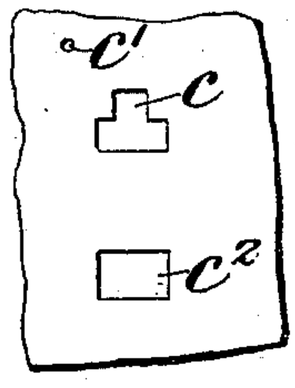


Fig. 5.



WITNESSES:

D. H. Haywood

Harry A. Goss

INVENTOR

John J. Nef

BY

James C. Chapin

His ATTORNEY

No. 637,646. Patented Nov. 21, 1899.

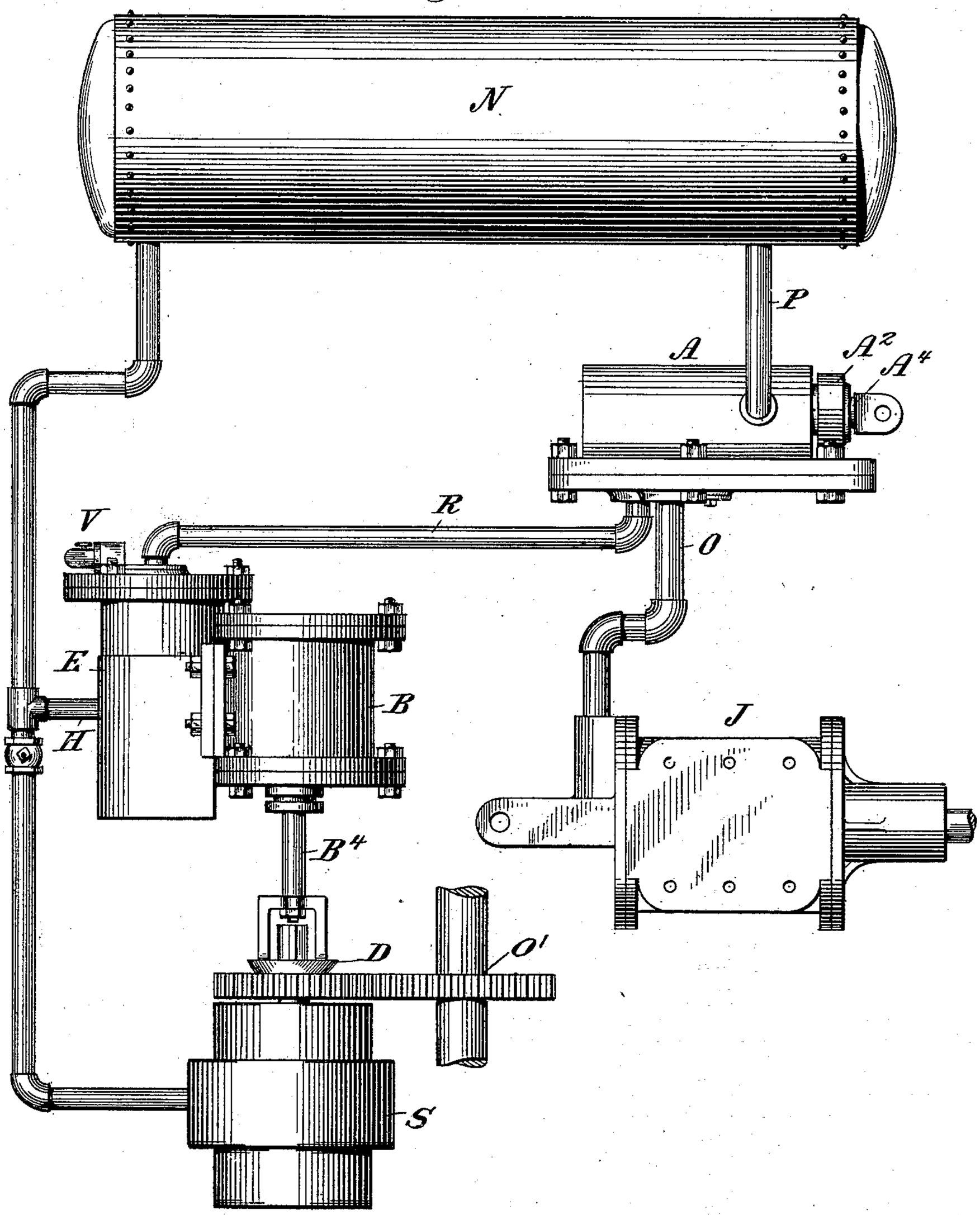
J. J. NEF.

AIR BRAKE.

(Application filed Oct. 2, 1896. Renewed Oct. 27, 1899.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 6,



WITNESSES:

O. F. Hayward

Harry A. Goss.

INVENTOR

John J. Nef

BY

James C. Chapin

His ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN JACOB NEF, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE PACIFIC INVESTMENT COMPANY, OF NEW JERSEY.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 637,646, dated November 21, 1899.

Application filed October 2, 1896. Renewed October 27, 1899. Serial No. 734,986. (No model.)

To all whom it may concern:

Be it known that I, JOHN JACOB NEF, a citizen of the United States, residing at the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Air-Brakes; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to air-brakes for railway-cars, and particularly for cars of cable or electric railways; and it consists in the novel construction of the service-valve controlling the passage of air to and from the brake-cylinder and in novel means for throwing the pump into action and for doing this by the same operation by which the brakes are applied, so that the momentum of the car after the application of the brakes will operate the pump.

It also consists in the novel construction, combination, and arrangement of parts hereinafter described.

In the accompanying drawings, Figure 1 is a central longitudinal sectional view of a service-valve and governor. Fig. 2 is a sectional view of the service-valve of Fig. 1 at line 2 2. Fig. 3 is a sectional view of Fig. 2 through line 3 3. Fig. 4 is a face view of slide-valve A^5. Fig. 5 is a plan view of ports in Fig. 3. Fig. 6 shows the different parts and their relation toward each other.

A designates a square valve-chamber having a head A^2 with stuffing-box A^3, through which passes a rod A^4, carrying a specially-adjustable slide-valve A^5.

a a are hexagonal nuts with shoulders screwed on the rod A^4 and embracing the projection from the back of slide-valve A^5.

A^7 is cast boss bored to guide the motion of the rod A^4, one end of which is fitted therein.

C is a T-shaped port from which a pipe O leads to the brake-cylinder.

C' is a small port into which is inserted a rubber hose R, leading to the top of the governor device.

G is an L-shaped groove or recess in seat of slide-valve A^5, Figs. 3 and 4.

C^2 is an exhaust-port.

P is a supply-pipe from the reservoir N, Fig. 6.

The rod A^4 is connected to a rod or chain leading to the platform of the car on which is mounted the valve-operating lever. A spiral spring A^8 encircles the rod A^4, carrying the slide-valve A^5, and tends to force the valve to the position shown in the drawings. When the valve is in this position, the brake-cylinder is open to the exhaust, the air escaping through the pipe O and out through the exhaust-port C^2 to the open air. This position also brings one end of L-shaped groove *g* in slide-valve, Fig. 4, directly opposite the port C', Fig. 1, thus forming a communication from the rear end of governor device and exhausts the air therefrom through the port C^2.

B designates a cylinder having a head B^2 with stuffing-box B^3, through which passes a piston-rod B^4, carrying a piston B^5.

B' is a spring interposed between the head of cylinder B and piston B^5.

The piston-rod B^4 is connected to a clutch D or other connecting device interposed between the moving parts of the pump S and its actuating mechanism O'.

Upon the side of cylinder B is bolted a valve-chamber E, which contains a specially-adjustable slide-valve E'. One end of the cylinder E is cylindrical and contains a properly-packed piston E^2, into which is screwed a hollow piston-rod E^5, on which are screwed two hexagonal nuts *i i* with shoulders that inclose the projection I from the back of slide-valve E'. One end of the chamber E is closed by a flanged head G, in the center of which are two screw-plugs G' and G^2, the plug G' being adjustable. A spring G^3 is interposed between the plug G' and a seat G^4 at the bottom of hollow piston-rod E^5, so that by the adjustment of the plug the resistance of the spring may be increased or diminished. In plug G^2 there is a centrally-tapped hole to receive the other end of pipe R running from valve-chamber A, and this tapped hole communicates with the interior of chamber E through a hole drilled directly opposite in plug G'.

Ports *e* and *f* lead from the valve-chamber

to the cylinder B, but to different sides of the piston contained in said cylinder, and a passage *d* leads from the hollow of slide-valve E′ to the open air.

H is a pipe leading from the same source of compressed air as the pipe P, Fig. 6. The position of the ports *e f* are such that when the piston E^2 is moved by the increase of pressure in pipe H, leading from the reservoir, the hollow piston-rod E^5 and the slide-valve E′ connected thereto are carried backward by the piston, thereby closing the port *f* from the stored energy in the reservoir, opening an escape to the atmosphere through port *d* for air on the rear side of piston B^5. At the same time the port *e* is opened, admitting air to front side of piston B^5. When the port *e* is admitting air to the front side of piston B^5, should the pressure fail to disengage the moving parts of the pump from its actuating mechanism, thereby allowing the pump to compress air above the maximum point, the surplus pressure will, through its action on piston E^2, carry the slide-valve above the exhaust-port *d* and form a free escape to the open air.

Operation: The parts being in position, as shown in drawings, let it be supposed that the reservoir N contains no air and the pump is thrown into action by the spring B′, interposed between the head of cylinder B and piston B^5, which is of sufficient tension to connect the moving parts of the pump with its actuating mechanism until sufficient air has been accumulated to hold this connection. As the air from pipe H enters the valve-chamber E it passes through port *f*, leading to the rear end of piston B^5. This position is maintained until the pressure reaches a predetermined maximum, whereupon the piston E^2 is forced back against the resistance of the spring G^3, closing the port *f* from the stored energy and forming a communication from rear end of cylinder B through it to the open air through passage *d*. At the same time port *e* is opened, allowing the air to enter the cylinder B in front of the piston B^5 and move the same. The position of the parts last described is maintained while the pressure is at the maximum, and the pump having been stopped by the movement of the piston B^5 remains inactive so long as the piston remains in this position. The gradual decrease of the air-pressure in reservoir N to the minimum point, due to the operation of the brake, results in the gradual movement of the piston E^2 and slide-valve E′ toward the position shown in drawings, which closes communication between the reservoir and the front end of cylinder B and opens communication through passage *d* to the open air, whereupon the air passes through the port *f*, which has been opened by the operation just explained, and, entering at the rear of piston B^5, pushes it forward and starts the pump. When the brakes are to be applied, the rod A^4 is pulled forward and the slide-valve A^5 is carried past the port C, admitting air under pressure through the pipe O to the brake-cylinder J, Fig. 6. Before the port C is thus opened the small port C′ is uncovered by the valve and air under pressure is admitted through the pipe R to the rear end of piston E^2 of valve-chamber E, thus equalizing the pressure on both sides of the piston. If this occurs while the ports are in the position shown in the drawings, it has no effect on said piston. If, however, it occurs while the pump is out of operation and the said piston held against the resistance of the spring G^3 by the maximum pressure of the air in the reservoir, the pressure on both sides of the piston being thus equalized, the spring will act to force the piston back to the position shown in drawings and start the pump to supply the reservoir with air. Thus the application of the brake automatically throws the pump into action, and the momentum of the car after the brakes are applied operates the pump to restore to the reservoir the air lost in the operation of applying the brakes. When the rod A^4 is released, the spring A^8 returns it to the position shown in the drawings, carrying with it the valve A^5 to close the port C and to close also small port C′. With the valve in this position the air from the brake-cylinder exhausts through the pipe O underneath hollow in slide-valve A^5 through exhaust-port C^2, and the air from rear end of piston E^2 in valve-chamber E exhausts through pipe R, port C′, L-shaped groove *g*, hollow in slide-valve A^5, and exhaust-port C^2.

If it be desired to start the pump without applying the brakes, the rod A^4 is pulled forward only sufficiently to move the slide-valve A^5 past the small port C′, and air will be admitted through said port to the rear end of piston E^2 and the pump started in the manner already described.

A safety-valve V is provided in the head of valve-chamber E to relieve said chamber, and through it reservoir N, if the pressure becomes too high through the operation of the pump, due to the continued application of the brakes while the car is running on a long decline. The port C is T-shaped, and the amount of air passing through it is regulated by the distance the slide-valve is moved with relation to said port. The valve being under the control of the operator, the brakes may be applied gradually with increasing force or suddenly under full force.

Having described my invention, I claim—

1. In an air-brake system the combination with an air-reservoir, a pump and pump-operating mechanism and an automatic pump-governor, of a service-valve, said service-valve consisting of a valve-chamber in open communication at all times with the said air-reservoir, a port leading from said valve-chamber to the pump-governor, an exhaust-port, a slide-valve adapted to open said pump-gov-

ernor port alternately to said valve-chamber and said exhaust and means for operating the said valve, substantially as described.

2. In an air-brake system the combination with a pump and pump-operating mechanism, an automatic pump-governor and a brake-cylinder, of a service-valve, means upon the partial movement of said service-valve whereby air may be admitted to the valve-chamber of the governor causing the same to throw the pump into operation and means upon the further movement of the service-valve whereby air may be admitted to the brake-cylinder, substantially as described.

3. In an air-brake system the combination with a pump and pump-operating mechanism, an automatic pump-governor and a brake-cylinder, of a service-valve, means upon the movement of the service-valve whereby air may be admitted to the brake-cylinder and at the same time to the valve-chamber of the governor causing same to throw the pump into operation, substantially as described.

4. In an air-brake system the combination with an air-reservoir, a brake-cylinder and an automatic pump-governor, of a service-valve, said service-valve consisting of a valve-chamber, a reciprocating slide-valve operating therein, a valve-rod to which said slide-valve is attached, a spring adapted to move the slide-valve in one direction, a supply-pipe between said valve-chamber and said reservoir, ports leading from said valve-chamber to the brake-cylinder and the governor respectively and an exhaust-port, substantially as and for the purpose set forth.

5. In an air-brake system the combination with an air-reservoir, a pump and pump-operating mechanism, an automatic pump-governor having a valve, said valve being impelled in one direction by air under pressure from the air-reservoir and in the opposite direction by a spring, of a service-valve having a valve-chamber in open communication with the air-reservoir at all times, a port leading to the valve-chamber of the governor and a valve arranged within the service-valve chamber adapted upon its movement to admit air to the brake-cylinder and also to the valve-chamber of the governor whereby the air-pressure impelling the valve in one direction is counterbalanced and the action of the spring is permitted to operate said valve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN JACOB NEF.

Witnesses:
FANNIE R. PERKINS,
JNO. S. PORTER.