(No Model.) 5 Sheets—Sheet 1.

J. K. LENCKE & F. D. MERCHANT.

CONTROLLER AND ARIGHTER FOR AIR BRAKE RETAINERS.

No. 517,954. Patented Apr. 10, 1894.

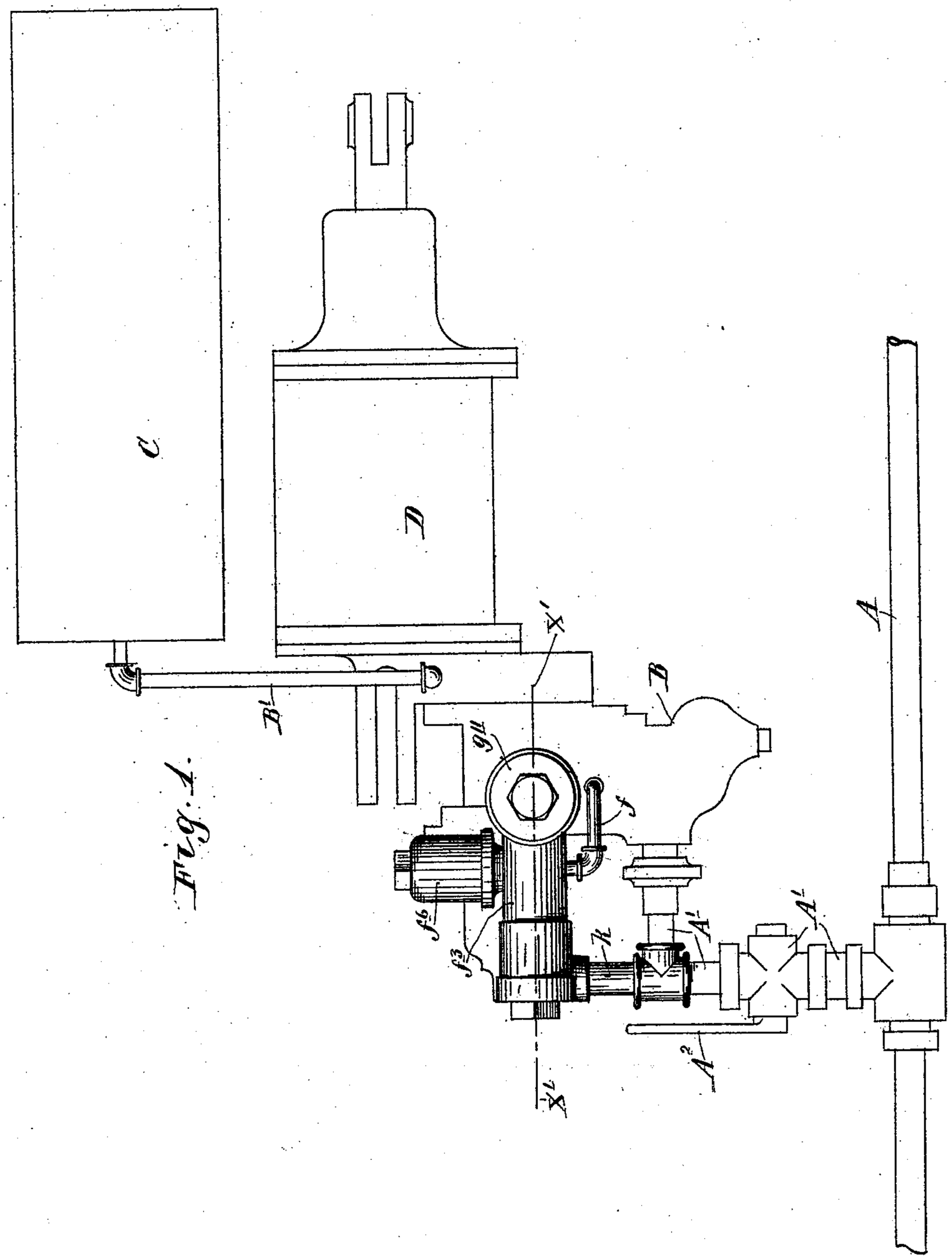

Fig. 1.

Witnesses.
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THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 2.

J. K. LENCKE & F. D. MERCHANT.

CONTROLLER AND ARIGHTER FOR AIR BRAKE RETAINERS.

No. 517,954. Patented Apr. 10, 1894.

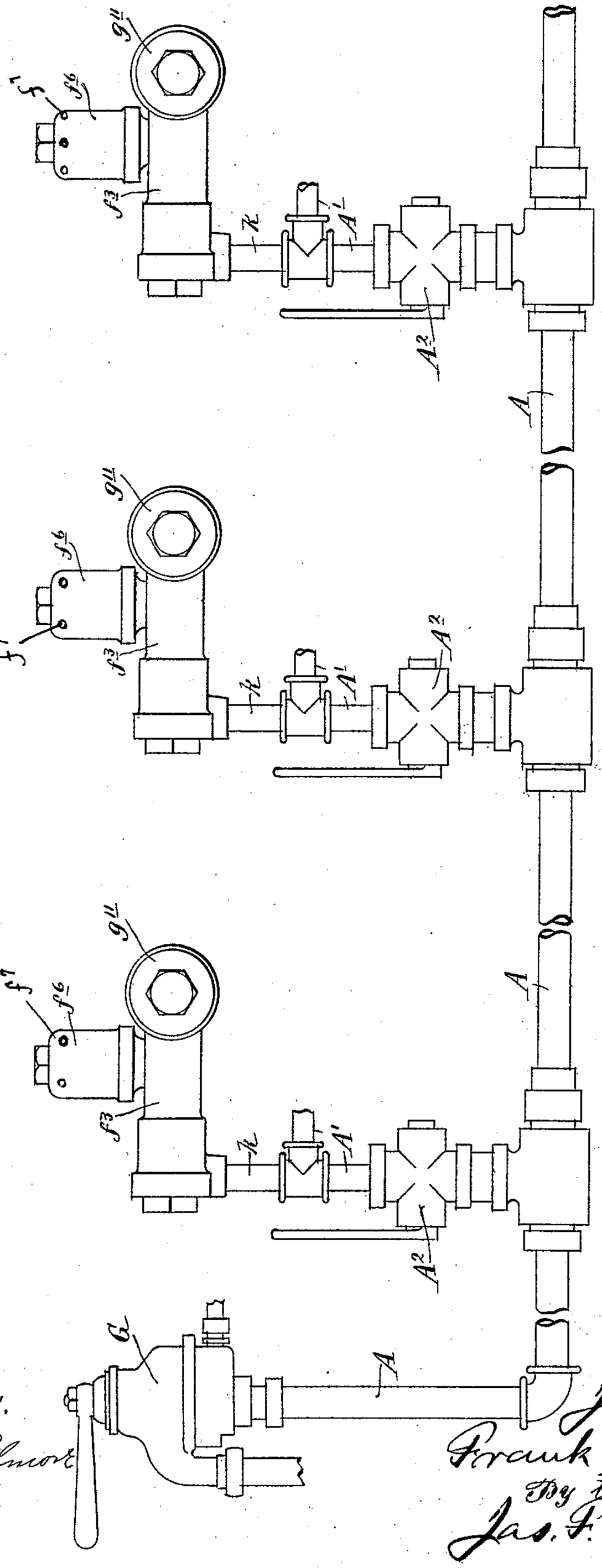

Fig. 2.

Witnesses.
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(No Model.) 5 Sheets—Sheet 3.

J. K. LENCKE & F. D. MERCHANT.

CONTROLLER AND ARIGHTER FOR AIR BRAKE RETAINERS.

No. 517,954. Patented Apr. 10, 1894.

Fig. 3.

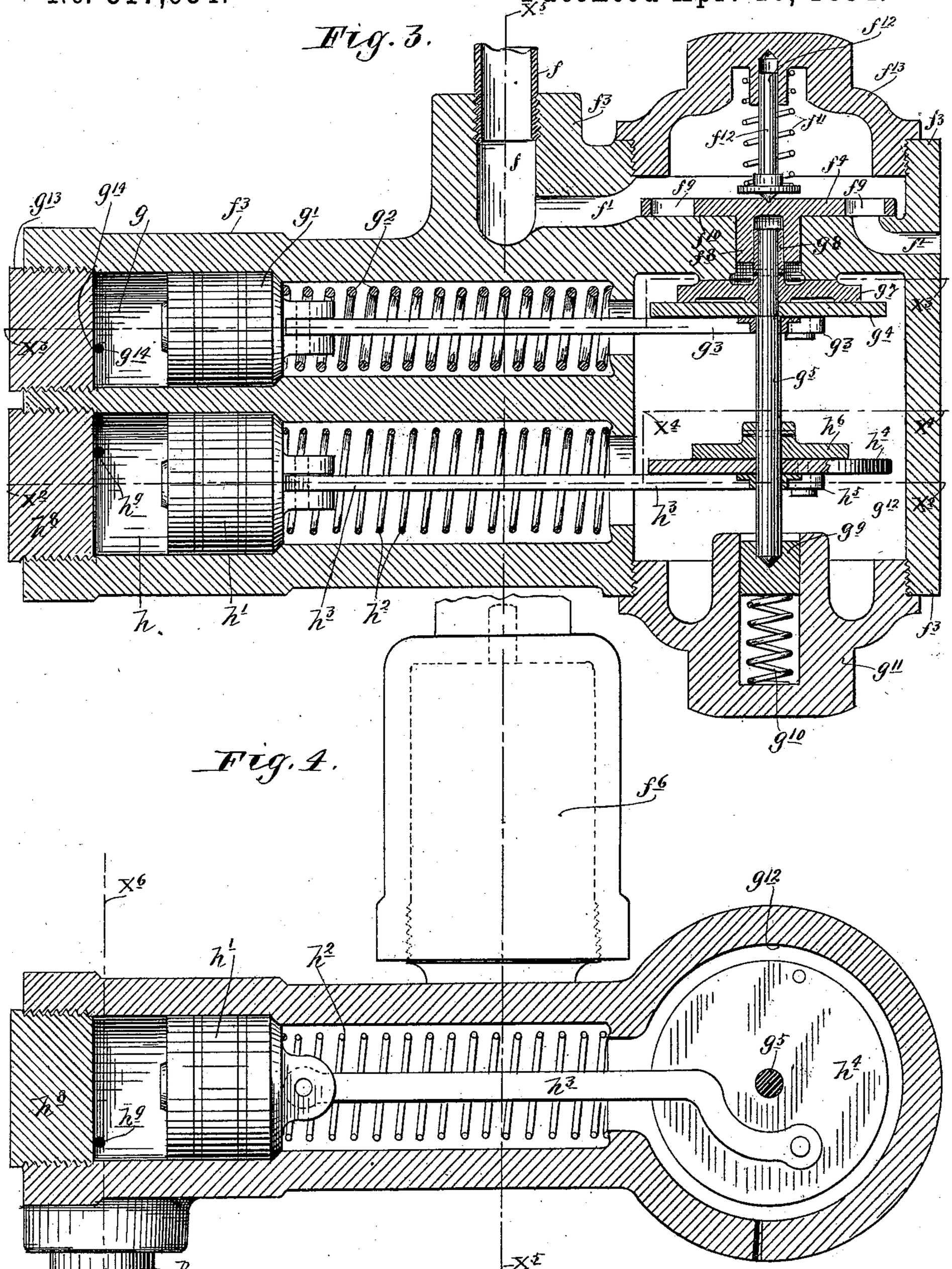

Fig. 4.

Witnesses.
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(No Model.) 5 Sheets—Sheet 4.

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CONTROLLER AND ARIGHTER FOR AIR BRAKE RETAINERS.

No. 517,954. Patented Apr. 10, 1894.

Fig. 7.

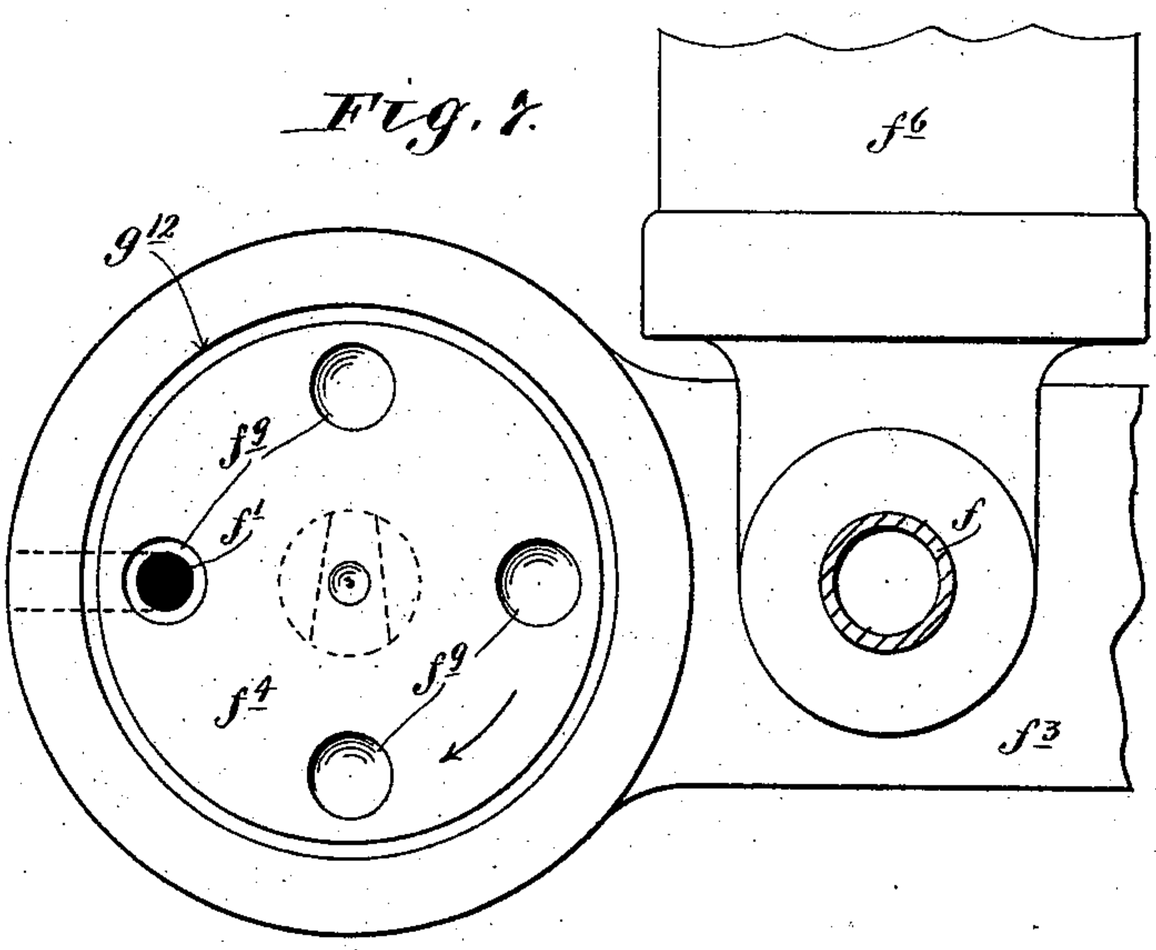


Fig. 8.

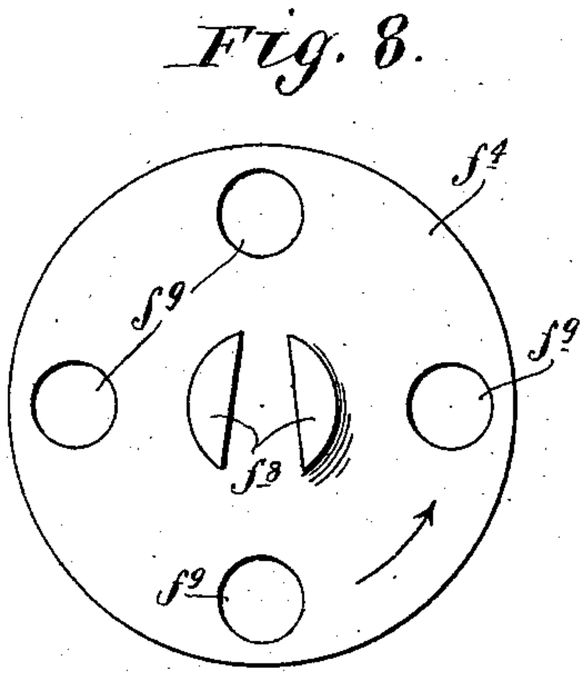


Fig. 5.

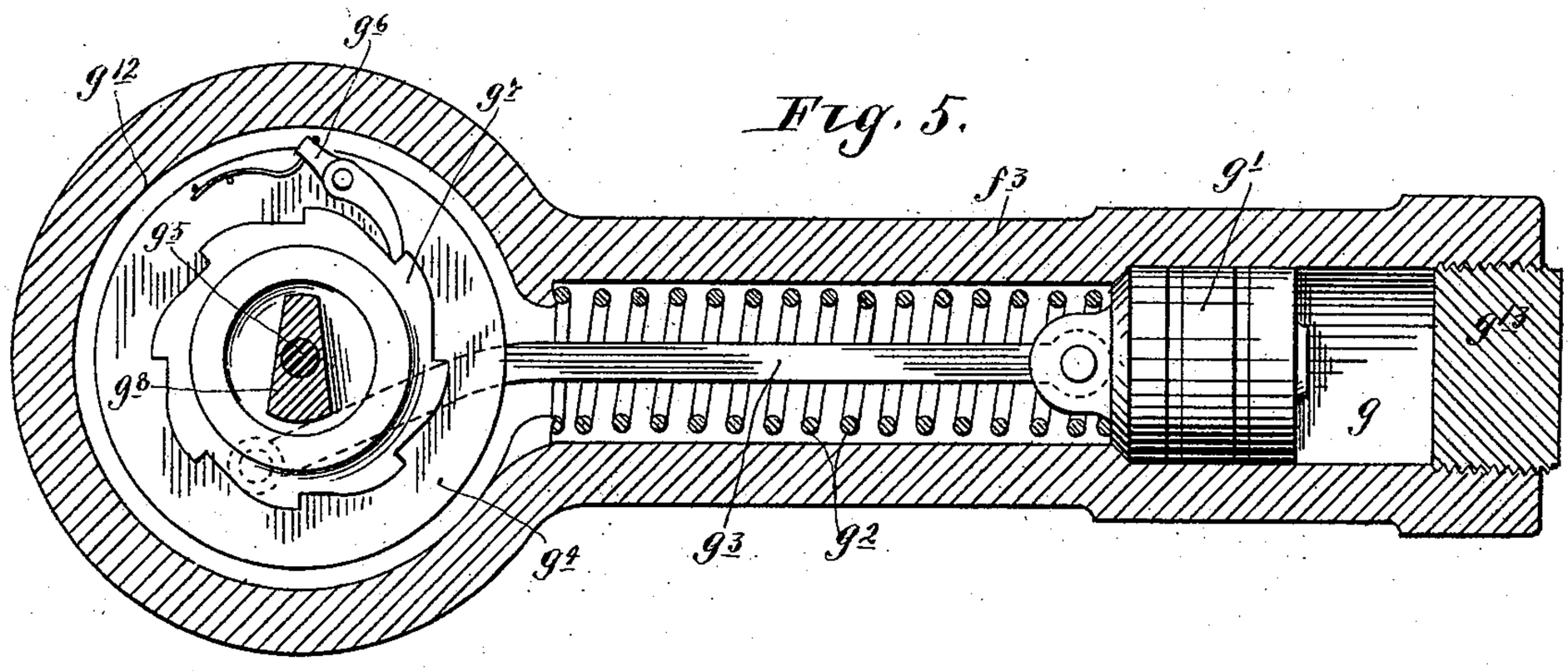
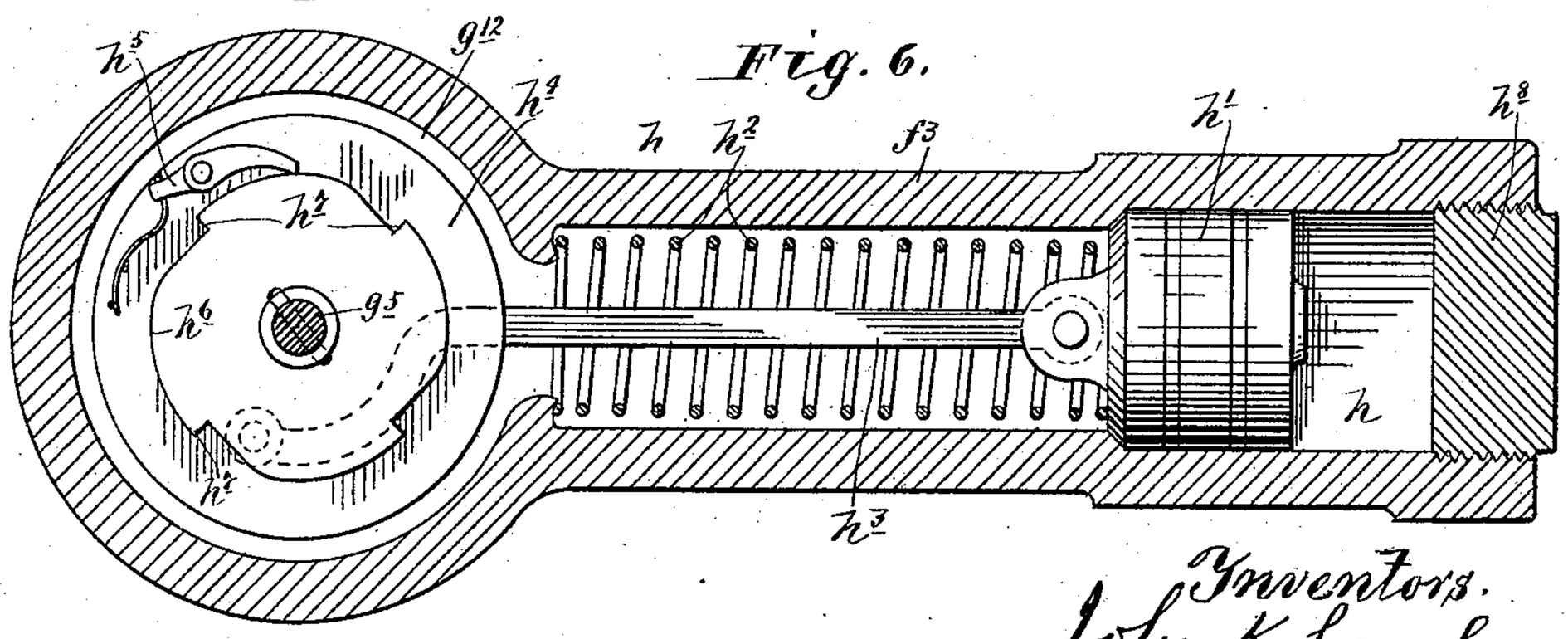


Fig. 6.



Witnesses.
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J. K. LENCKE & F. D. MERCHANT.

CONTROLLER AND ARIGHTER FOR AIR BRAKE RETAINERS.

No. 517,954. Patented Apr. 10, 1894.

Fig. 9.

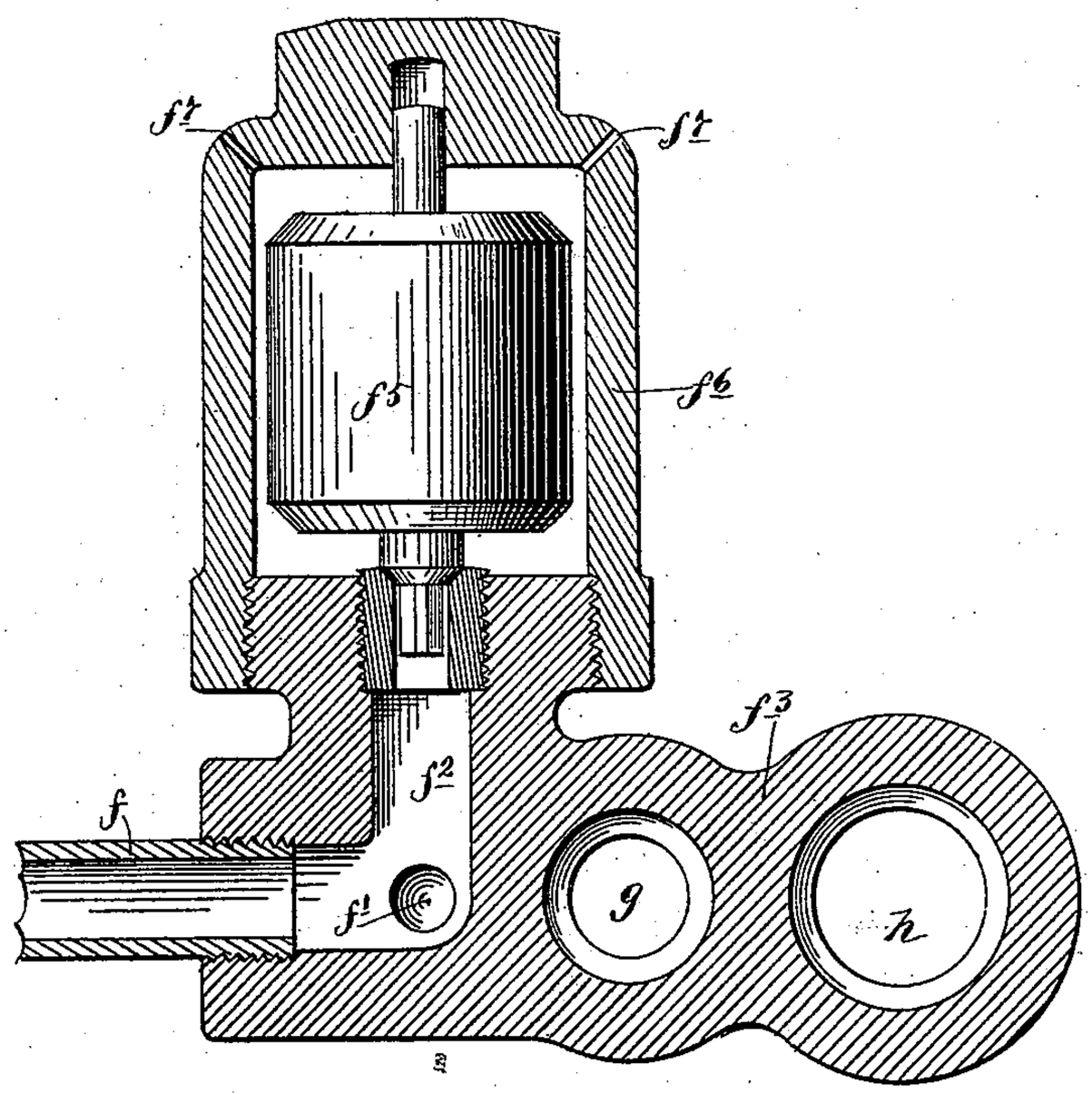
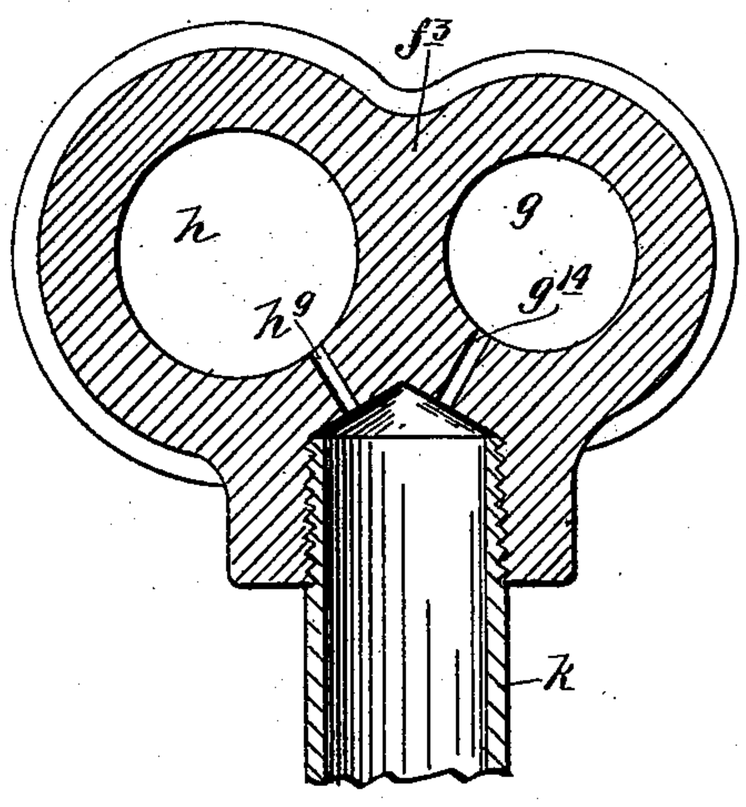


Fig. 10.



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UNITED STATES PATENT OFFICE.

JOHN K. LENCKE AND FRANK D. MERCHANT, OF MINNEAPOLIS, MINNESOTA;
SAID MERCHANT ASSIGNOR TO SAID LENCKE.

CONTROLLER AND ARIGHTER FOR AIR-BRAKE RETAINERS.

SPECIFICATION forming part of Letters Patent No. 517,954, dated April 10, 1894.

Application filed July 10, 1893. Serial No. 480,027. (No model.)

To all whom it may concern:

Be it known that we, JOHN K. LENCKE and FRANK D. MERCHANT, citizens of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Controllers and Arighters for Air-Brake Retainers; and we do hereby 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.

Our invention relates to fluid pressure brake apparatus; and is in the nature of an addition to the controller for pressure retaining valve-mechanism, shown and described in the sole application of the applicant John K. Lencke, filed October 2, 1891, under Serial No. 407,587. Pressure retaining valve mechanism, as persons skilled in the art well know, are provided on the Westinghouse system and the New York Air Brake Company's system, for the purpose of giving better control of a train, in running down long and steep grades. This pressure retaining valve mechanism is so arranged that, when set for use, a limited pressure may be held on the brake-motors and brakes, while the train-pipe and auxiliary reservoirs are being recharged. The controller, described in the said above identified application of John K. Lencke, had for its object to control this retaining valve mechanism, for the entire train, by the reduction of train-pipe pressure, at the will of the engineer, through the engineer's brake-valve. This controller was found, in practice, to be completely operative, for the purpose intended. It had this limitation, however, to-wit: that attention of inspectors was required, at the time of the making up the train, to insure all the controllers of the different cars occupying common positions. Of course, it was necessary that all the controllers should occupy common positions, for the successful operation of the device on a train of cars. Otherwise, when the engineer reduced the train-pipe pressure, in order to throw the controllers into action and again recharge the train-pipe, some of the retaining valve-mechanisms would be thrown into their closed and others into their open position; and when he desired to throw off the retainers, the like results would follow, some being thrown off and others turned on. In handling freight-trains, on account of the repeated cutting out and taking in of cars, the inspection, referred to, would be a serious drawback.

Our present invention has for its object, to overcome the said limitation, which we accomplish by providing an arighter or arighting device, for co-operation with the said controller on the said retaining valve mechanism; by the addition of which, whenever the arighter is actuated, the retaining valve mechanisms will be thrown or left standing in a common class of positions, either opened or closed, regardless of the particular positions, whether opened or closed, in which any of the said retaining valve mechanisms may have been thrown and left by the controllers, at their last preceding action. No attention, therefore, need be given to the pressure retaining valve mechanisms, on the various cars, when making up the train, by the brakeman or other inspectors. The recharging of the empty train-pipe will, of itself, through the arighters and controllers, insure the normal or open positions of the retaining valve mechanisms. Our preferred mechanism, for this purpose, will be hereinafter described in detail; and the novel features of the same will be defined in the claims.

Our invention is illustrated in the accompanying drawings, wherein, like letters referring to like parts throughout the several views—

Figure 1 is a diagram view of a brake apparatus, with the pressure retaining valve mechanism and our device, shown, in side elevation, in fully worked up lines. Fig. 2 is a diagram view, showing a series of our devices, in their relation to the common train-pipe and engineer's brake-valve, some parts being broken away. Fig. 3 is a horizontal section through our device, on the line X′ X′ of Fig. 1. Fig. 4 is a vertical section, on the line X^2 X^2 of Fig. 3, looking from the front. Fig. 5 is a vertical section, on the line X^3 X^3 of Fig. 3, looking from the rear. Fig. 6 is a vertical section, on the line X^2 X^4 of Fig. 3, looking from the rear. Fig. 7 is a view, in rear elevation, showing the shut-off valve and a part of the casing. Fig. 8 is a detail, showing the shut-off valve in

front elevation detached. Fig. 9 is a vertical section through our device, on the line X^5 X^5 of Figs. 3 and 4, looking toward the right; and Fig. 10 is a vertical section, on the line X^6 X^6 of Fig. 4, looking from the right toward the left.

Referring especially to Figs. 1 and 2, A represents the train-pipe, B the triple-valve, C the auxiliary reservoir, and D the brake-motor, of one of the standard Westinghouse air brake apparatus.

A′ represents the train-pipe connection to the triple valve, provided with the ordinary stop-cock A^2; and B′ represents the connection from the auxiliary reservoir C to the triple-valve B.

G, Fig. 3, is the engineer's brake valve.

The relation and general operation of these parts, is well known. It may, with advantage, however, be recalled to mind, that the train-pipe and auxiliary reservoirs are charged to equal pressures, from the main reservoir, through the triple-valve, which, in ordinary practice, is seventy pounds; that the brakes are set by a reduction of train-pipe pressure, the brake-motor cylinder being thrown into communication with the auxiliary reservoir, through the triple valve, under the equalizing action, on said valve, between the auxiliary reservoir and the train-pipe; that the proportions between the auxiliary reservoir and the brake-motor cylinders are ordinarily such, that, when the train-pipe pressure has been reduced sufficiently for maximum service application, the pressures in the auxiliary reservoir and brake-motor cylinder will equalize at fifty pounds. Hence, disregarding emergency applications, any further reduction of train-pipe pressure below fifty pounds, will have no additional effect on the brake-motor, but will simply bleed the train-pipe or unnecessarily waste air. Between seventy pounds and fifty pounds, the force with which the brakes will be set is dependent, in "service applications," on the amount of the reduction in the train-pipe pressure.

In our controller and arighter, we utilize only gradual train-pipe reductions below fifty pounds. Hence, our device does not in anywise interfere with the ordinary actions of the brake apparatus. "Service applications" are not interfered with, because our device is not thrown into action, unless the train-pipe pressure is reduced below fifty pounds, or the maximum reduction required for maximum "service application;" and the "emergency action," is not interfered with, as the reduction to set "emergency" must be very quick, while the reductions to operate our device may be made gradual. "Emergency" will throw our device into action; but the reduction for operating our device will not set the "emergency."

It may be here premised, that we employ the expression "retaining valve mechanism," to cover and include all constructions—whether employing one or more valves—capable of controlling the exhaust passage or passages, from the brake-motor, external of the triple valve, to give a free exhaust or retain a limited pressure, as may be desired. The expression "retaining valve proper" will be employed, where necessary for distinction, to designate that particular valve or element of the "retaining valve mechanism," which of itself, when active, permits a limited escape while retaining a limited pressure in the brake cylinder.

Having regard, now, to the standard pressure retaining mechanisms, to which our device is shown as applied, the brake-motors have a two-way exhaust passage external of the triple-valve, in one of which ways is located a rotary shut-off valve, and in the other, a retaining valve proper.

In the drawings, f represents a pipe leading from the exhaust opening of the triple-valve to the two-way exhaust passage $f'f^2$, formed in the case or housing f^3.

f^4 represents a rotary shut-off valve, capable of a step-by-step movement in the exhaust way f'; and f^5f^6 represents the retaining valve proper in the exhaust way f^2, of which parts f^5 is the valve proper, constructed of such weight as to close at the desired limit of pressure, say of fifteen pounds, and f^6 is the cap for the same provided with external escape openings f^7. Normally, the shut-off valve f^4 is in its open position. If the same be thrown into its closed position, the exhaust from the brake motor must pass through the retaining valve proper f^5 f^6, and will be stopped when the pressure is reduced to fifteen pounds in the brake motor cylinder.

Turning now to our device, the housing f^3 is provided with a cylinder g, fitted with a valve seated piston g', subject to train-pipe pressure on one side, and to a pre-determined back pressure on the other, obtainable as shown, by a resistance spring g^2 suitably seated in the housing f^3. The piston g' is connected by a rod g^3 with a crank-disk g^4 loose on a ratchet-shaft g^5. The crank-disk g^4 is provided with a spring-held pawl g^6, which is engageable with the teeth of a ratchet disk g^7, made rigid with the shaft g^5. As shown, the ratchet g^7 has a projecting angular hub g^8, fitting between projecting clutch-lugs f^8, on the rotary shut-off valve f^4. The parts g^8 and f^8 are fitted together and turned up, to form a journal for the shaft g^5 and the valve f^4. The ratchet g^7 being keyed to the shaft g^5 and the parts f^8 and g^8 engaging as described, the valve f^4 will be turned, with a step-by-step action, whenever the ratchet g^7 is moved with the pawl g^6. The shut-off valve f^4 is provided with several openings f^9, equi-distant from each other, and is held against a flat or face seat f^{10}, by a spring f^{11} and co-operating centering pin f^{12}, seated for a sliding movement in the valve-seat cap f^{13}. The shaft g^5 is seated at its front end in a sliding bearing block g^9, which is subject to a spring g^{10}. Both the block g^9 and the spring g^{10} are seated in

the front cap g^{11}, closing the seat g^{12}, of the housing f^3, for the pawl and ratchet devices. The spring g^2 has a tension of less than fifty pounds.

With the exception of certain details in the construction, the cylinder g and the piston g', subject to train-pipe pressure on one side and the resistance spring g^2 on the other, with the pawl and ratchet mechanism, for applying its motion to the shut-off valve f^4, constitute the controller for the pressure retaining valve mechanism fully described and claimed in the said pending sole application of John K. Lencke, Serial No. 407,587. It is obvious, that with this device, so far described, whenever the train-pipe pressure is reduced below the tension of the spring g^2, say forty pounds, the said springs will throw the said piston backward against the train-pipe pressure, and permit the pawl g^6 to catch its notch in the ratchet g^7; and when the train-pipe is again recharged to a point above forty pounds, the piston g' will be given its out-stroke against the resistance of the spring g^2 and will be there held. This out-stroke will cause the pawl g^6 to turn the ratchet g^7 and the valve f^4 one step or into its closed position. This, as hitherto described, will force the exhaust from the brake-motor to pass through the retaining valve proper f^5, the effect of which will be to hold fifteen pounds pressure on the brake-motor. At the next reduction of train-pipe, below forty pounds and subsequent recharging of the train-pipe, the valve f^4 would be thrown by the said controller, forward another step or into its open position. While the valve f^4 was closed, or the "retainer" was on, the engineer might have made any number of "service applications" by train-pipe reductions between seventy and fifty pounds.

From the foregoing, it is obvious that all the valves f^4 on the train, would be thrown into common positions, either opened or closed, by the said controller, provided they were started from a common position, either opened or closed. But suppose they had not been started from a common position, as would surely happen, in coupling in cars, without hand setting the valves f^4; then, by the operation of the controllers, some of the valves f^4 would be thrown into their closed, and some into their open position. We obviate this trouble, by the co-operation of our arighter, which is mounted in the same housing f^3, as shown, with the controller. The arighter cylinder h is fitted with a valve-seated piston h', subject to train-pipe pressure on one side and to a predetermined yielding back pressure on the other, obtained as shown from a resistance spring h^2 of considerable less tension than the controller spring g^2. The motion from the piston h' is applied to the shaft g^5 and the valve f^4, through a connecting rod h^3, crank-disk h^4, loose on the shaft g^5, a spring-held pawl h^5, carried by the said crank disk and engaging with a ratchet h^6 fixed to the shaft g^5. The ratchet h^6 has teeth h^7, corresponding to only one class of the positions, which the valve f^4 may assume. Both the cylinders g and h, are provided with removable plugs g^{13} and h^8 respectively, and communicate with the train-pipe through passages g^{14} and h^9, respectively, and a common union pipe section k. If the controller spring g^2 has a tension of forty pounds, the arighters spring h^2 might have a tension of say, fifteen pounds. Both the ratchets g^7 and h^6, under the action of their respective pawls g^6 and h^5, turn the shaft g^5 and the valve f^4 in a common direction. Either pawl g^6 or h^5, may operate, of course, independently of the other, the idle pawl slipping over its ratchet. Turning now to the action, it is very important to note, that the controller ratchet g^7 has teeth corresponding both to the open positions and the closed positions of the valve f^4, while the arighter ratchet h^6 has teeth corresponding only to one class of said positions of the said valve f^4. Otherwise stated, the valve f^4 is shown as provided with four openings f^9; and hence has four open and four closed positions. The controller ratchet g^7, has therefore eight teeth, which teeth are alternately arranged with adjacent teeth corresponding respectively to the open and to the closed positions of said valve f^4; and the arighter ratchet h^6, has only four teeth corresponding to one class of the said valve's positions. It should be here noted, that the extreme strokes of the controller and arighter pistons are only sufficient to turn their respective ratchet disks, one-eighth of a revolution. As shown, on account of the relation of the controller and the arighter, in their respective times of action, the teeth on the arighter ratchet h^6 correspond to the closed position of the valve f^4, the exact purpose of which will presently appear. Suppose now that an engineer wants to make sure that the "retainers" are all off, or in other words, that all the valves f^4 are in open positions; then, he will simply reduce his train-pipe pressure below fifteen pounds, and again recharge his train-pipe to normal pressure. The effect of the reduction would have been to have permitted the pawls g^6 of the controller to have caught a notch on its ratchet g^7, (when the pressure fell below forty) and the pawl h^5 to have caught its notch on the arighter ratchet h^6, if necessary. Hence, on recharging the train-pipe, on reaching fifteen pounds, the arighter piston h' will be given an outstroke, and the ratchet h^6 will be turned, if the same was caught by the pawl h^5, one step or an eighth turn, imparting a corresponding movement to the valve f^4; and on passing forty pounds, the controller piston g' would be given an outstroke, and its pawl g^6 will move its ratchet g^7 one step or one-eighth turn and impart one step of movement to the valve f^4. Hence, if the valve f^4 was originally open, by the reduction and recharging, as just described, it will be given two

additional steps of movement, one through the arighter, and the other through the controller, thus bringing it back to its open position; but if it was originally closed, the arighter pawl h^5 being thrown back only an eighth turn, will fail to catch a notch, and hence, the valve f^4 will receive only one step of movement imparted by the controller, and will be thereby brought into its open position. Hence, with a series of controllers on the several cars of the train and a corresponding series of arighters, whenever the train-pipe pressure is reduced below fifteen pounds, and the train-pipe is again recharged above forty or to the normal pressure of seventy pounds, the valves f^4 of all the retainers are bound to be thrown into their open positions, regardless of the positions whether open or closed, which the said valves may have occupied before said reduction and recharge.

Of course, it will be noted, that inasmuch as when cars are uncoupled, the train-pipe pressure is off, both the controller and the arighter will have been thrown backward by their respective springs g^2 and h^2, into position for action; and hence, when the engineer charges his train-pipe, in the usual way, the retaining valve mechanism on all the cars will be thrown into their open or normal position. For "service application," the engineer will then manipulate the brake-lever, exactly as if no retainers or controllers or arighters were employed, taking care, however, not to reduce the train-pipe pressure quite to or below forty pounds. When he wishes to set the retainers, he simply reduces the train-pipe pressure below forty pounds, taking care not to go down to fifteen pounds, and then recharges his train pipe and auxiliary reservoir; and when he wants to throw the retainers off, he repeats that action. In the "emergency action" of the brakes, the combined controllers and arighters become automatic, to throw the retaining valve mechanism into its open position, when the train-pipe is recharged at the release of the brakes; which is due to the fact well-known, of course, that in the "emergency action" the train-pipe is emptied by a sudden reduction.

The fact that the teeth of the arighter ratchet h^6 correspond to the closed positions of the valve f^4, is due to the fact, that the controller on the recharging action operates subsequent to the arighter, and is bound to give to the valve an additional step of movement. Hence, the arighter may be said to aright the retaining valve mechanism in its closed position, and the controller to throw the same, when the train-pipe is recharged to normal pressure into their open position. If the controller acted first on the valve f^4, when the recharge is made, the teeth of the arighter ratchet h^6, would have to correspond to the open class of positions of the valve f^4.

It will, of course, be understood, that our device may be applied to any form of pressure retaining valve mechanism; and that the detail construction of our device may be changed, in various ways, without departing from the spirit of our invention.

The term predetermined back pressure, as used through the specification and claims, is a relative term. In other words, the "predetermined back pressure," as illustrated in the accompanying drawings, is predetermined with reference to a constant quantity, but this back pressure might, of course, be predetermined with reference to a variable quantity, and hence be variable itself.

What we claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with pressure retaining valve mechanism, for fluid pressure brake-motors, of a controller and an arighter constructed and operating, the former, to throw said valve mechanism alternately into open and into closed positions, and the latter, to insure the positioning of said valve mechanism always in one class of said positions, substantially as and for the purpose set forth.

2. The combination with pressure retaining valve mechanism, for fluid pressure brake motors, of a controller and an arighter for said valve mechanism both having reciprocating parts subject to fluid pressure, variable from a common source, on one side, and to different predetermined yielding back pressures on the other, and arranged, with the reciprocating part of the controller operative to throw said valve mechanism alternately into its closed and its open positions, and with the reciprocating part of the arighter operative to insure the positioning of said valve mechanism in one of said classes of positions, substantially as and for the purpose set forth.

3. The combination, with pressure retaining valve mechanism, for fluid pressure brake motors, of a primary or controller pawl and ratchet device, operative to alternately throw said valve mechanism both into open and into closed positions, and a secondary or arighter pawl and ratchet device, operative to insure the positioning of said valve mechanism in one of said classes of positions, substantially as and for the purpose set forth.

4. The combination with pressure retaining valve mechanism for fluid pressure brake motors, of a primary or controller pawl and ratchet device, the ratchet member of which has teeth corresponding both to the open and to the closed positions of said valve mechanism, and a secondary or arighter pawl and ratchet device, the ratchet member of which has teeth corresponding to only one class of said positions of said valve, both of said devices being operative on said valve mechanism, whereby, regardless of the position into which said valve mechanism may have been thrown by the controller pawl and ratchet device, the arighter pawl and ratchet device, when operated, will insure the positioning of

said valve mechanism in one class of said positions, substantially as and for the purpose set forth.

5. The combination with a train-pipe and a brake motor having pressure retaining valve mechanism, of a controller and an arighter for said valve mechanism, both operative from the train pipe, at different pressures, the said controller being applied to alternately throw said valve mechanism into closed and open positions and the said arighter being applied to said valve to insure the positioning of said valve mechanism in one class of said positions, substantially as and for the purpose set forth.

6. The combination with a train-pipe and a brake-motor having pressure retaining valve mechanism, of a controller and an arighter, for said valve mechanism, both having pistons subject to train-pipe pressure on one side, and to different predetermined yielding back pressures on the other, and pawl and ratchet devices, connecting said pistons with said valve mechanism, the ratchet member connecting the controller having teeth corresponding both to the open and the closed positions of said valve mechanism, and the ratchet connecting the arighter piston having teeth corresponding only to one class of said positions of said valve mechanism, substantially as and for the purpose set forth.

7. In a fluid pressure railway brake system, the combination with the train-pipe, of a series of brake motors, each having pressure retaining valve mechanism, a corresponding series of controllers operative, by train-pipe pressure, to throw the whole series of said valve mechanisms alteruately into open and closed positions and a corresponding series of arighters, operative from the train pipe, at different pressure than the controllers, to insure the setting of all of said valve mechanisms in one class of said positions, substantially as and for the purpose set forth.

8. The combination with a common train-pipe and a series of brake-motors, each having pressure retaining valve mechanism of a corresponding series of controllers and arighters, both having pistons subject to train-pipe pressure on one side, and to resistance springs of different tension on the other, and pawl and ratchet devices connecting said piston with said valve mechanism, the controller ratchet having teeth corresponding both to open and closed positions of said valve mechanisms, and the arighter ratchet having teeth corresponding only to one class of said positions of said valve mechanisms, substantially as and for the purpose set forth.

9. In a fluid pressure railway brake system, wherein the setting of the brakes is dependent on reduction of train-pipe pressure, the combination with a train-pipe and brake motors having pressure retaining valve mechanism, of a corresponding series of controllers and arighters for said valve mechanisms, both having pistons subject to train-pipe pressure, on one side, and to different predetermined yielding back pressures on the other, both of less power than train-pipe pressure at the minimum reduction required for maximum brake setting action, whereby said controllers and arighters only become operative, at different reductions of train pipe pressure, below the range required for the manipulation of the brakes in "service application," substantially as described.

10. The combination with a train-pipe and a brake-motor having a two-way exhaust passage, of a retaining valve proper in one of said ways and a rotating shut-off valve in the other, and a controller and an arighter both applied to said shut-off valve, consisting of pistons subject to train-pipe pressure on one side, and to springs of different resistance on the other, both of less tension than train-pipe pressure at minimum reduction required for "service applications," and pawl and ratchet devices connecting the said pistons with said shut-off valve, of which devices the controller ratchet has teeth corresponding both to open and closed positions of said shut-off valve and the arighter ratchet has teeth corresponding only to one class of said positions, all the said parts operating substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN K. LENCKE.
FRANK D. MERCHANT.

Witnesses:
JAS. F. WILLIAMSON,
EMMA F. ELMORE.