No. 620,201. Patented Feb. 28, 1899.

J. V. WELLS.

TRIPLE VALVE.

(Application filed Apr. 13, 1898.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

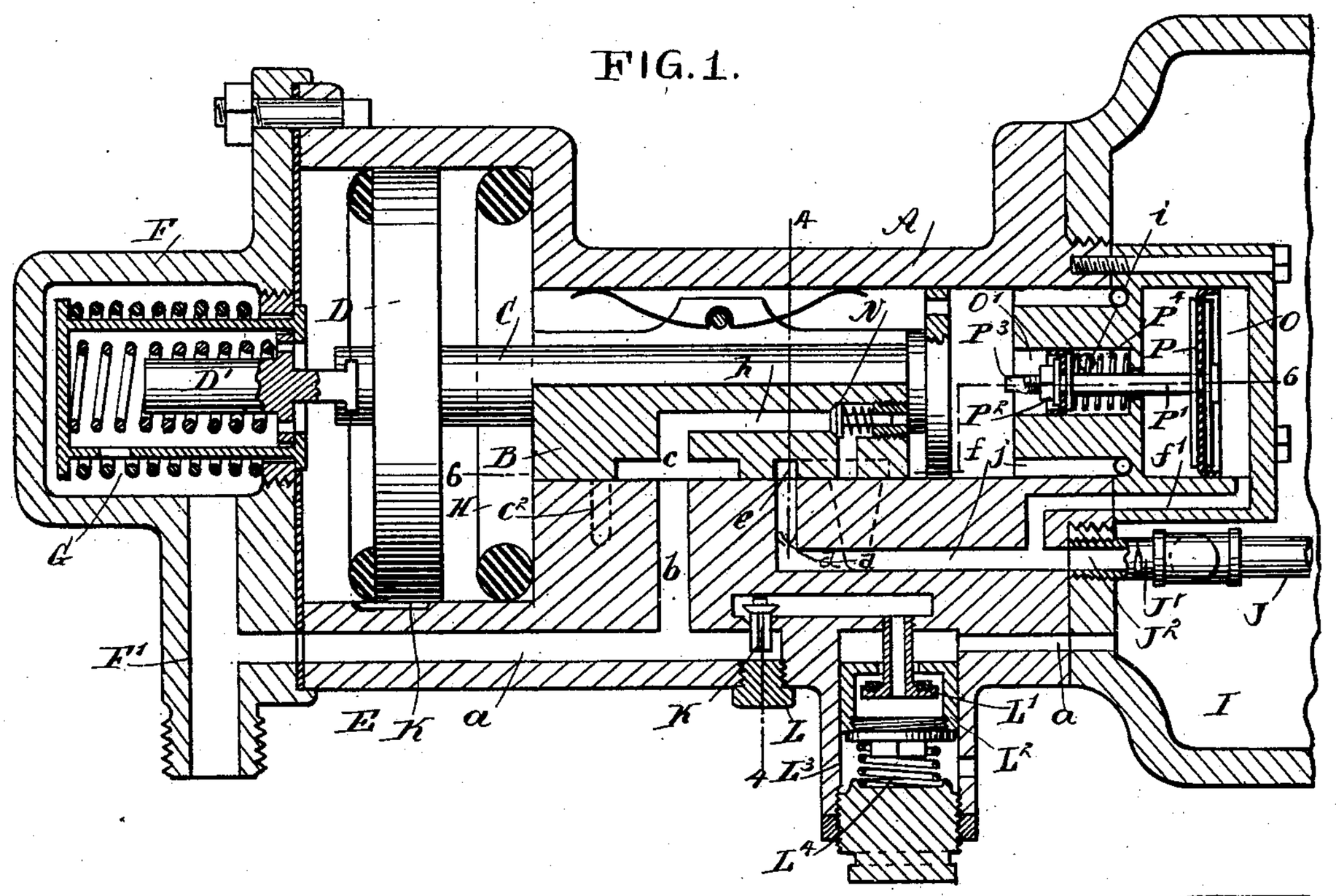
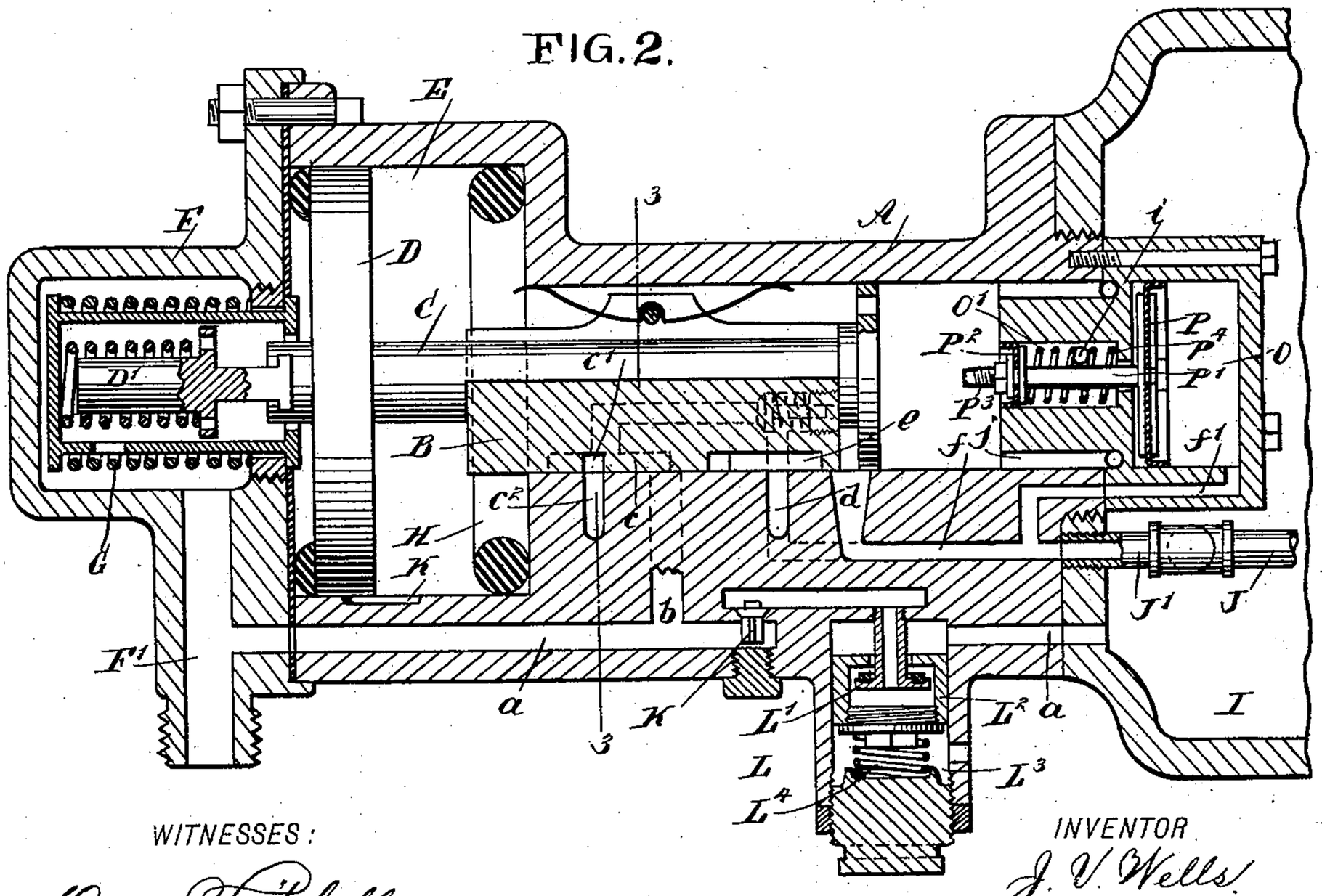


FIG. 2.



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(No Model.) 3 Sheets—Sheet 2.

FIG. 3.

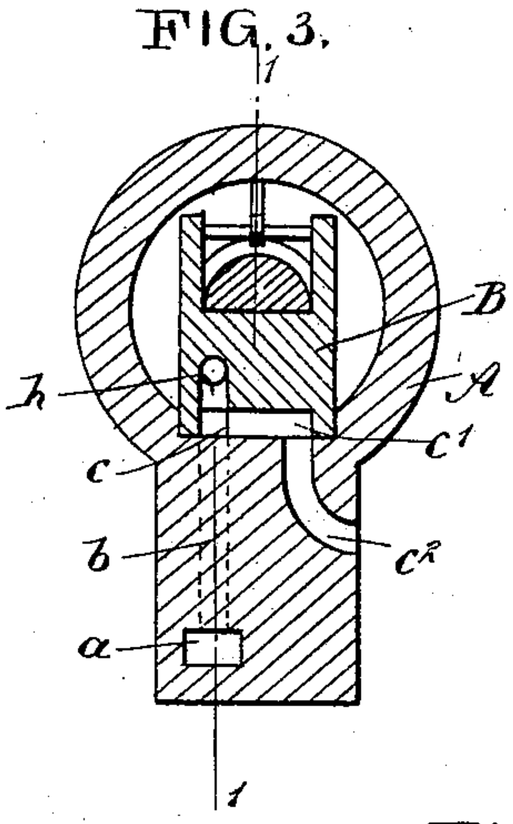


FIG. 4.

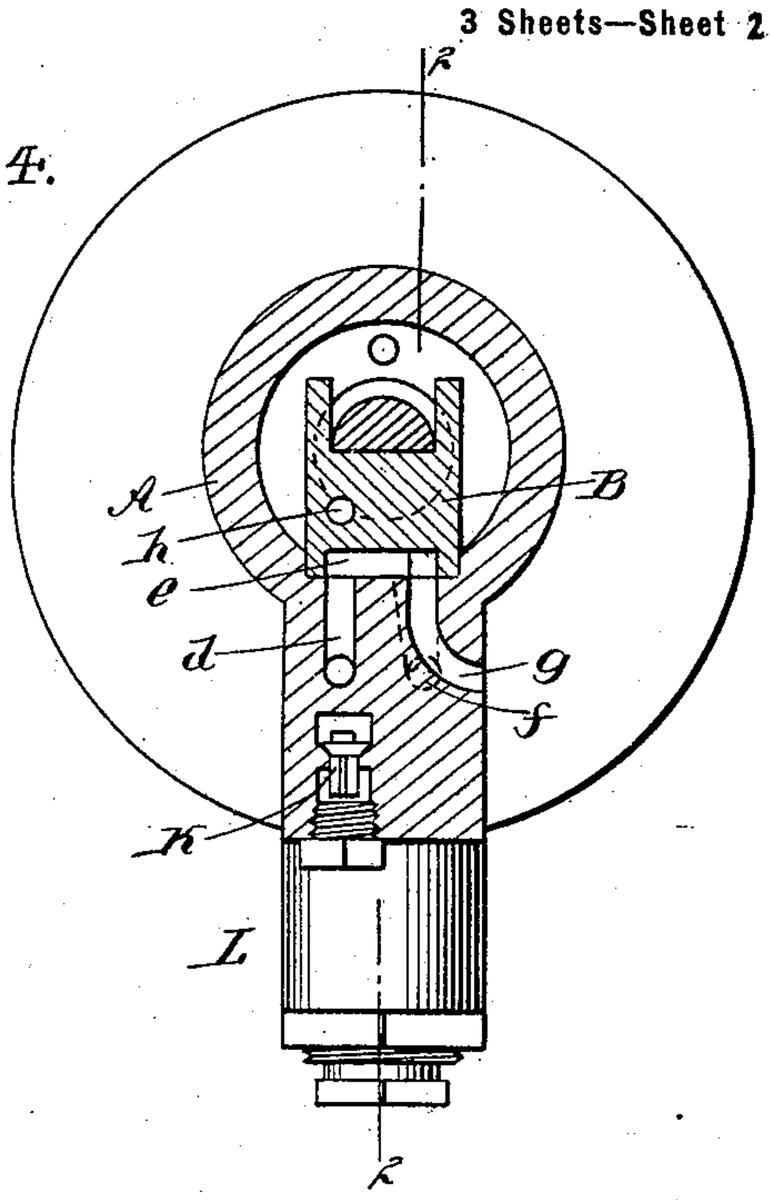


FIG. 5.

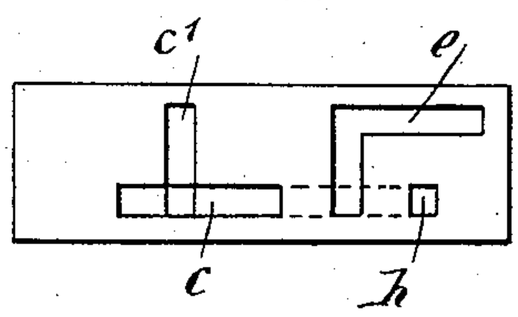
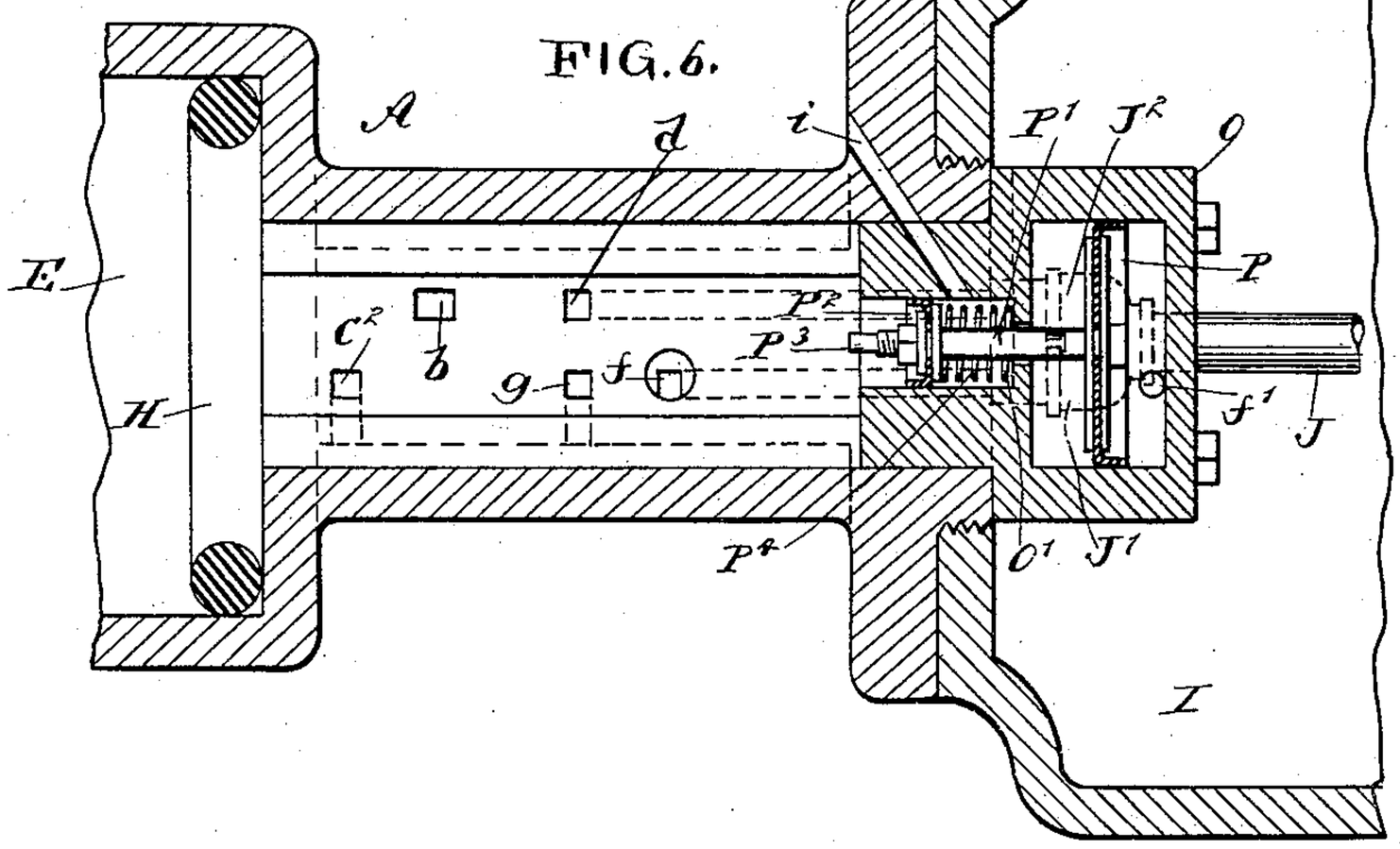


FIG. 6.



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No. 620,201. Patented Feb. 28, 1899.

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(No Model.) 3 Sheets—Sheet 3.

FIG. 7.

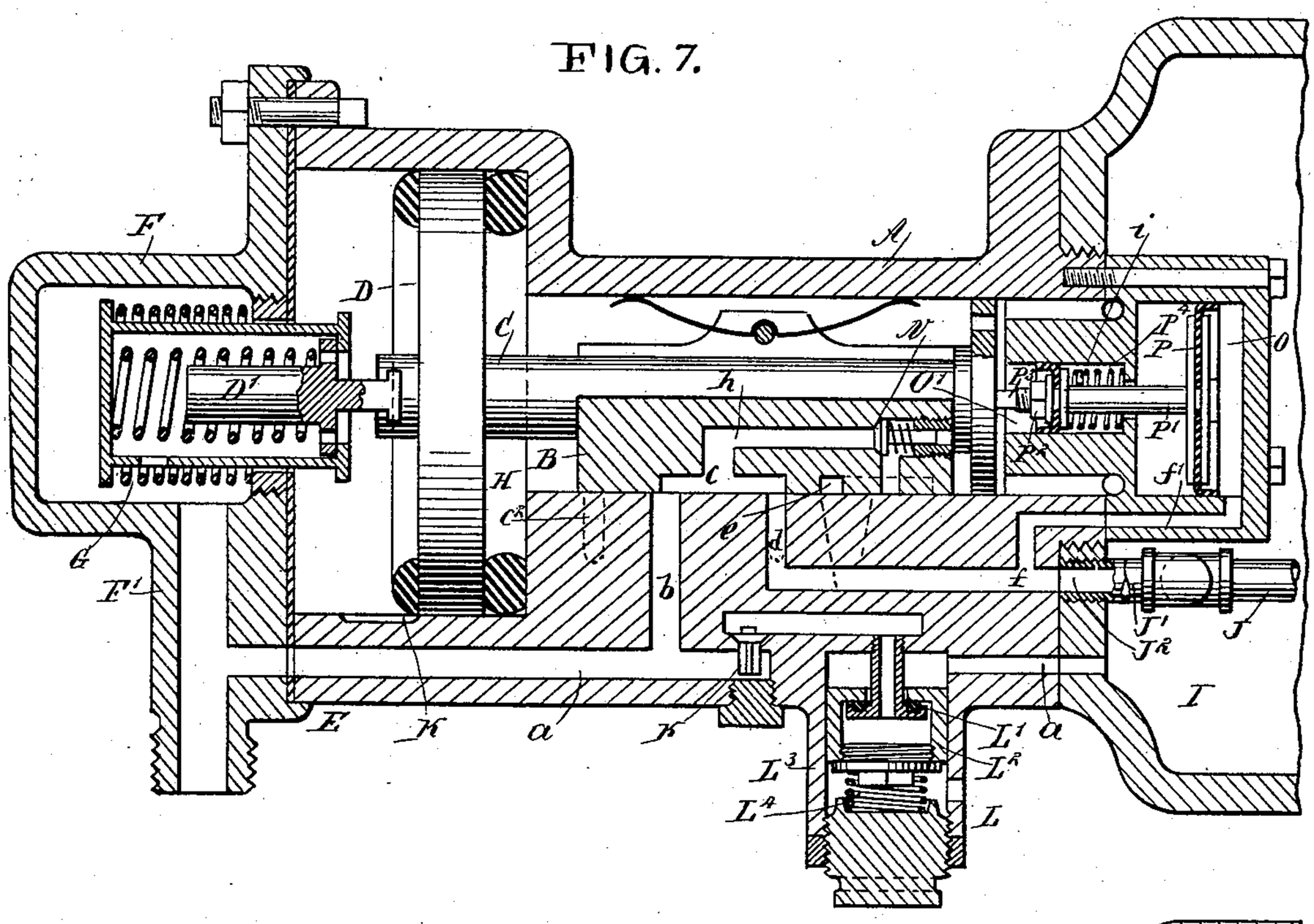
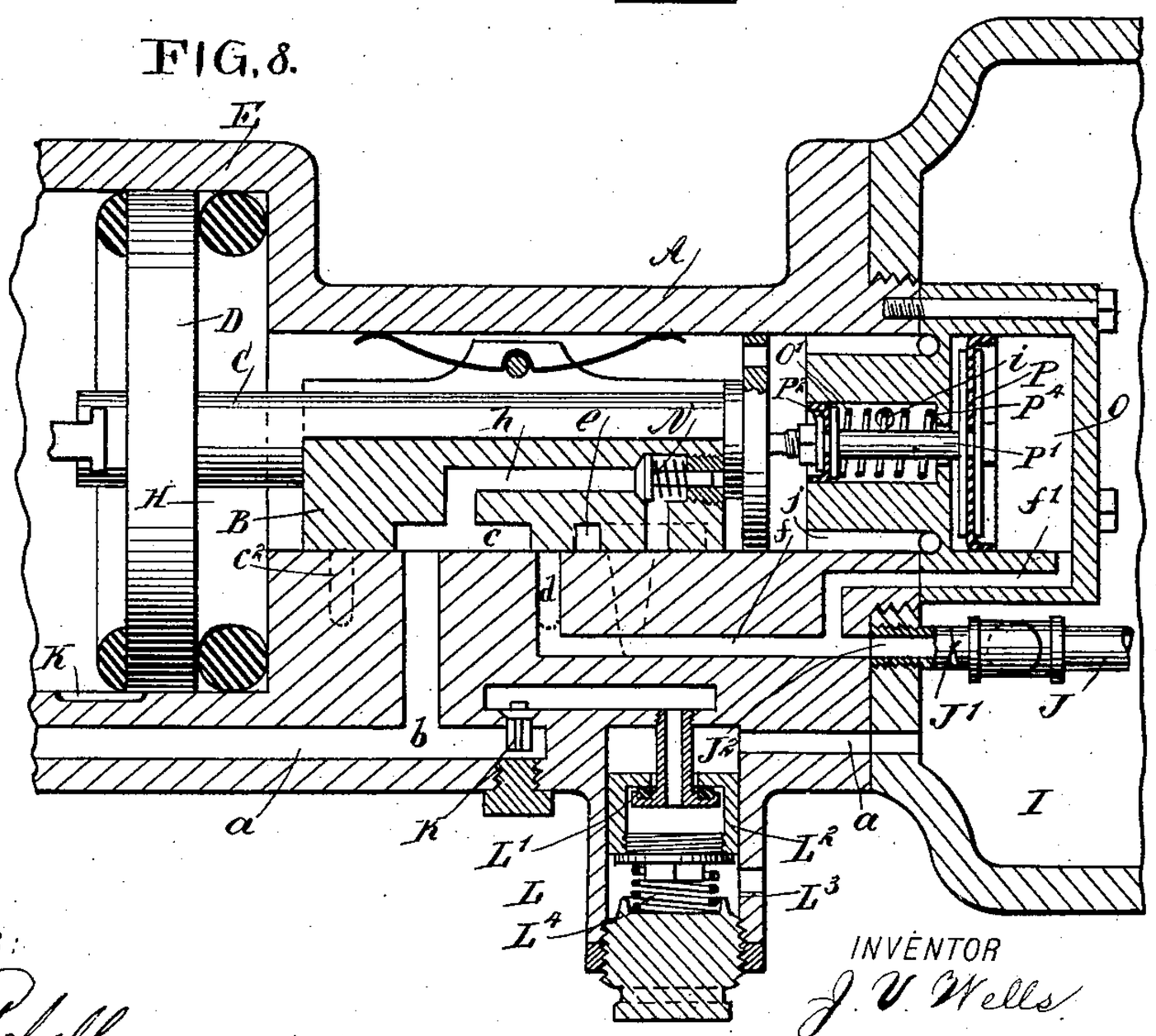


FIG. 8.



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UNITED STATES PATENT OFFICE.

JOHN V. WELLS, OF WILMERDING, PENNSYLVANIA.

TRIPLE VALVE.

SPECIFICATION forming part of Letters Patent No. 620,201, dated February 28, 1899.

Application filed April 13, 1898. Serial No. 677,411. (No model.)

To all whom it may concern:

Be it known that I, JOHN V. WELLS, of Wilmerding, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Triple Valve, of which the following is a full, clear, and exact description.

The invention relates to fluid-pressure brakes, and more particularly to triple valves such as shown and described in the application for Letters Patent of the United States, Serial No. 653,814, filed by me on October 7, 1897, and allowed on January 28, 1898.

The object of the present invention is to provide certain new and useful improvements in triple valves, whereby the auxiliary reservoir is cut off from the train-pipe on an increase or excess of pressure, the main piston and slide-valve being held in lap position at whatever pressure there is in the auxiliary reservoir and brake-cylinder, whereby more uniform braking throughout the several cars of the train is obtained.

The invention consists of novel features and parts and combinations of the same, as will be described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement in a release position, the section being taken on the line 1 1 of Fig. 3. Fig. 2 is a similar view of the same in an emergency position, the section being taken on the line 2 2 of Fig. 4. Fig. 3 is a cross-section of the improvement on the line 3 3 of Fig. 2. Fig. 4 is a similar view of the same on the line 4 4 of Fig. 1. Fig. 5 is an inverted plan view of the slide-valve. Fig. 6 is a sectional plan view of the improvement on the line 6 6 of Fig. 1 with the main piston and slide-valve removed. Fig. 7 is a sectional side elevation of the improvement in position for applying the brakes under full train-pipe pressure, and Fig. 8 is a similar view of the same in lap position.

The improved triple valve illustrated in the drawings is provided with a triple-valve body A, containing a slide-valve B, connected by a stem C with a piston D, mounted to travel in a cylinder E in communication with a drain-cup F, having an inlet-port F′, connected with the train-pipe. The left-hand end of the piston D is connected by a short stem D′ with a spring device G, arranged in the drain-cup F, it being understood that the device serves to overcome the friction on the face of the slide-valve B when the pressure is equal on both sides of the piston D, the latter then standing in the release position. (Shown in Fig. 1.) The air from the drain-cup F passes through the device G into the left-hand end of the cylinder E to press on the piston D and shift the same from left to right upon applying the brakes, as hereinafter more fully described, the piston D then moving with its right-hand face in contact with a gasket H, held in the cylinder E and adapted to be compressed by the piston, provided sufficient force is employed for the purpose.

The auxiliary reservoir I is attached to the right-hand end of the valve-body A, and the brake-cylinder (not shown) may be attached to the said reservoir. From the latter leads a pipe J, extending through the auxiliary reservoir I and terminating in two branch pipes J' J^2, connected with ports, as hereinafter more fully described.

The auxiliary reservoir I is connected with the inlet-port F′ by an inlet-port *a*, extending through the valve-body A and containing a check-valve K and a feed-valve L. The feed-valve L is provided with a fixed valve-seat L′, having a rubber gasket on which is adapted to be seated the inner face of the apertured valve of a hollow piston L^2, mounted to slide in a cylinder L^3, having in its lower portion an opening leading to the atmosphere to allow the piston L^2 to readily yield on an increase of pressure, the piston being pressed on by a spring L^4, set equal to the normal pressure in the train-pipe. Now when an increase of pressure takes place in the train-pipe, then the air passing from the port F′ through the port *a* and past the check-valve K finally passes into the cylinder L^3 and forces the piston L^2 downward against the tension of the spring L^4 to finally seat the valve of said piston L^2 on the rubber gasket of the seat L′, so that the port *a* is closed to the auxiliary reservoir, and the heavier the increase or excess of train-line pressure the tighter the valve will seat itself on the seat

L′ and the feed-valve will not open until the train-line pressure is again reduced to a normal pressure, as the spring L^4 will then again move the piston L^2 up to establish communication between the port F′ and the auxiliary reservoir I. From the port *a* leads a branch port *b* to the face or seat of the slide-valve B to register with a recess *c*, formed in the under face of the said valve B. The recess *c* is adapted to connect the port *b* with a port *d*, likewise formed in the body A and opening into the branch pipe J^2, forming part of the pipe J, for supplying the brake-cylinder with fluid-pressure. The recess *c* has a transverse extension *c*′, adapted to register with a port c^2, formed in the valve-body A and leading to the atmosphere, the recess *c*′ registering with the port c^2 at the time the slide-valve B and piston D have moved into the position shown in Fig. 2 on an emergency application, so that air from the train-pipe can pass by the ports *a b*, recesses *c c*′, and port c^2 to the atmosphere to insure a local reduction of the train-pipe pressure at the time an emergency application is made. The port *d* is also adapted to be connected by an L-shaped port *e* with a port *f*, connected with the other branch pipe J′, and with an exhaust-port *g*, formed in the body A and leading to the outside. (See Fig. 6.)

In the valve B is formed a port *h*, which opens at one end into the recess *c* and contains near its other end a spring-pressed valve N for normally closing this end of the port *h*, as shown in Fig. 1, the said port being adapted to connect with the port *d* when the valve B is moved into an emergency position—that is, to the extreme left—as shown in Fig. 2.

In order to move the main slide-valve into a lap position, as shown in Fig. 8, and to insure a more uniform application of the brakes in the whole train, I employ an auxiliary piston device consisting principally of two cylinders O O′ and pistons P and P^2, operating therein as follows: From the port *f* leads a branch port *f*′ to one end of the cylinder O, secured to the valve-body A and extending within the auxiliary reservoir I. In the cylinder O is mounted to travel the piston P, having a valve-stem P′, extending through the smaller cylinder O′, containing the piston P^2, secured on the valve-stem P′. The latter is formed with an extension P^3, adapted to engage the slide-valve B, so as to push the latter, with the piston D, into lap position at whatever pressure the auxiliary reservoir I and brake-cylinder would be if the auxiliary-reservoir pressure were allowed to expand into the brake-cylinder on an emergency stop. A port *j*, arranged in the cylinder-wall, connects the interior of the auxiliary reservoir I with the interior of the valve-body A, as will be readily understood by reference to the drawings. A port *i* leads from the cylinder O′ between the pistons P P^2 to the atmosphere to insure the setting out of the cup leather packings of the pistons. A spring P^4 presses on the piston P^2 and is adjusted to equalize with the auxiliary-reservoir pressure that is constantly against the left end of the said piston. Now it is evident that the constant pressure of the auxiliary reservoir is against the piston P^2, while the cylinder O fills with air through port *d*, Fig. 1, from the brake-cylinder, and consequently the brake-cylinder pressure is against the large piston P, so that the two pistons P P^2 are pushed to the left only at fifty-five-pounds pressure to move the slide-valve B and the piston D into lap position, as shown in Fig. 8.

From the foregoing it will be seen that the auxiliary piston device P P′ P^2 P^3 P^4 has two functions. When the train-line pressure is increased for gradual or service application, then the triple pistons, which yield most readily to this increase, receive air-pressure in their brake-cylinder first; but when this takes place the same brake-cylinder pressure will be against the right end of piston P and will create a resistance to the too free movement of the valve. Each weak triple valve in the train will therefore be strengthened, requiring a greater increase of train-line pressure to move it and insuring a more uniform application of the brakes throughout the train. The second function of the auxiliary piston device is to push the main triple piston D and slide-valve B into lap position, as shown in Fig. 8, when the brake-cylinder pressure has reached the highest point desired and to hold the piston and valve in this position against any further increase of train-line pressure. It is understood that as soon as any air enters the brake-cylinder it will move the supplementary piston device to the left, but stops and cannot move farther as soon as the main slide-valve has been pushed on lap. A small feed-groove K is formed in the cylinder E, so that when the piston D is in a release position, as shown in Fig. 1, and if a car charged with air is now cut off and the train-pipe should leak, then the piston D will pass to the left until it is over the feed-groove K, when the auxiliary-reservoir pressure and train-line pressure will equalize and prevent the brakes from creeping on.

The operation is as follows: When the several parts are in the position shown in Fig. 1, then the air-pressure in the train-pipe can pass through the cup F into the cylinder E at the left-hand end of the piston D, and air can also pass through the port *a* past the valve K and through the feed-valve L into the auxiliary reservoir I and through the valve-chamber to the cylinder E at the right-hand end of the piston D, so that the pressure on both sides of the piston is equal. Now when the engineer's valve is adjusted to maintain, say, seventy pounds pressure in the train-pipe and it is desired to apply the brakes, then excess pressure from the main reservoir above the train-pipe pressure is allowed to enter the train-pipe and pass from

the latter to the port *a*, the feed-valve L being set to close when the pressure on the piston L^2 exceeds that normally maintained in the train-pipe, and the auxiliary reservoir is closed to the excess of pressure, which passes through the drain-cup F into the left-hand end of the cylinder E to press against the piston D, so as to force it to the right against the axiliary-reservoir pressure, which is only seventy pounds. The piston D thus comes in contact with the rubber ring or gasket H; but at this time the recess *c* is not yet in register with the port *d;* but upon further pressure and compression of the gasket H (see Fig. 7) the recess *c* is brought in register with the port *d* to allow the train-pipe pressure to pass directly from the port *a*, port *b*, recess *c*, and port *d* into the branch pipe J^2 and by the pipe J to the brake-cylinder to apply the brakes. If it takes five pounds of excess pressure to the square inch to move the piston D against the gasket H and one additional pound of pressure to compress the said gasket H, then it is clear that when one pound of pressure has passed into the brake-cylinder, as above described, then the piston D moves to the left to pull the valve B in a like direction, aided by the expansion of the rubber gasket H and spring device, to move the piston D sufficiently far to the left to bring the recess *c* out of register with the port *d*. Thus the pressure remains in the brake-cylinder to keep the brakes applied until the piston D is moved either again to the right or to the left by an increase or reduction of pressure in the train-pipe. The rubber gasket H makes a perfect joint at the piston D, so that air is not liable to leak from the train-line through the valve-chamber into the auxiliary reservoir, or vice versa, thereby preventing equalization. In order to release the brakes, the train-pipe pressure is reduced down to seventy pounds, (to normal pressure,) so that the spring device G moves the piston D back to its normal position (shown in Fig. 1) to bring the slide-valve B, with its recess *e*, over the port *d* to allow the air to escape from the brake-cylinder by way of the pipe J, branch pipes J' J^2, port *d*, recess *e*, and exhaust *g*. In order to make an emergency application, the train-pipe pressure is reduced so that the pressure in the auxiliary reservoir I forces the piston D to the left against the tension of the device G, the piston moving the slide-valve B sufficiently to the left to uncover the port *f* and allow the auxiliary-reservoir pressure to pass through the port *f* and branch pipe J' into the pipe J and to the brake-cylinder to instantly apply the brakes. The valved end of the port *h* will also be moved in register with the port *d*, and as the valve N remains closed by the excess of pressure from the auxiliary reservoir I it is evident that some of the train-pipe pressure before it gets away passes through the port *b* and recess *c* into the port *h* to open the valve N and to pass into the port *a*, thus allowing the train-pipe pressure to rush into the brake-cylinder until said pressure meets the stronger pressure from the auxiliary reservoir, after which the valve N will again close. By the arrangement described the action of the brakes in a whole train is almost instantaneous, as the brake-cylinders are filled very rapidly with pressure for applying the brakes. It is further evident that by the arrangement described no release of the brakes for recharging the auxiliary reservoir is necessary while graduating, and the reservoir-air is always ready in case of breaking of the hose or train-pipe and also up to the required amount for an emergency. Furthermore, a gradual braking can be accomplished from one pound or a fraction, as required. By having the additional exhaust-ports *c e* an additional local reduction of pressure can be made in the train-pipe on emergency applications, as previously described, and by the arrangement of the pistons P P^2 the main slide-valve B is shifted to the left for the purpose previously mentioned.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A triple valve provided with a feed-valve in the port connecting the train-pipe with the auxiliary reservoir, the said feed-valve comprising a cylinder, a hollow piston-valve mounted to slide therein, a graduated spring pressing the said piston, and a fixed valve-seat extending into the hollow piston-valve, and adapted to be engaged by the latter to close the port to the auxiliary reservoir on an increase of pressure in the train-pipe, substantially as shown and described.

2. In a triple valve, a main piston and slide-valve, the said slide-valve being adapted when moved by an increase of train-pipe pressure to open communication between the train-pipe and the brake-cylinder, and an auxiliary piston device under auxiliary-reservoir pressure at one end and connected at its opposite end by a port with the brake-cylinder and adapted to receive the brake-cylinder pressure, the said auxiliary piston device being adapted to shift the slide-valve to close communication between the train-pipe and brake-cylinder when the brake-cylinder pressure has reached the highest point desired and to hold the main piston and valve in this position against further increase of train-pipe pressure, substantially as described.

3. In a triple valve, a valve-body, a main slide-valve and piston, the said slide-valve being provided with a recess in communication with the train-pipe and adapted to be brought into register with a port communicating with the brake-cylinder to connect the train-pipe with the brake-cylinder to apply the brakes, and an auxiliary piston device arranged for engagement with the said slide-valve to move the same to carry its recess out

of register with the port leading to the brake-cylinder to maintain the pressure in the brake-cylinder, substantially as set forth.

4. A triple valve provided with a valve-body having two ports independently connected with the brake-cylinder, an exhaust-port leading to the atmosphere, a slide-valve arranged to uncover one of the said ports to make connection with the auxiliary reservoir on an emergency application, the said slide-valve being provided in its face with a recess at all times in communication with the train-pipe pressure, the recess having a lateral extension adapted to register with the said exhaust-port on an emergency application, to form a local reduction for train-pipe pressure, and a port leading from the said recess, and adapted to connect the other port in the valve-body with the train-pressure, substantially as shown and described.

5. In a triple valve, a valve-body, a main slide-valve in said valve-body, a piston connected with said slide-valve, a cylinder in which said piston is mounted to travel, the said slide-valve being adapted when moved by an increase of train-pipe pressure to establish communication between the train-pipe and brake-cylinder, a compressible gasket held in said cylinder and adapted to be compressed by the said piston, and an auxiliary piston device for engagement with the slide-valve and adapted to receive brake-cylinder pressure, as and for the purpose set forth.

6. In a triple valve, a valve-body having an inlet-port connecting the train-pipe with the auxiliary reservoir, a feed-valve in said port adapted to close the port to the auxiliary reservoir on an increase of pressure in the train-pipe, the said valve-body being provided with a branch port leading from the inlet-port, a slide-valve connected with a piston and provided with a recess registering with the said branch port and adapted when the piston and slide-valve are moved by an increase of train-pipe pressure to connect the said branch port with a port in said valve-body communicating with the brake-cylinder whereby communication is opened between the train-pipe and the brake-cylinder, and an auxiliary piston device for moving the said slide-valve and piston into lap position, the said auxiliary piston device communicating at one end with the auxiliary reservoir and at the other end with the brake-cylinder, as and for the purpose set forth.

7. In a triple valve, an auxiliary piston device comprising two connected pistons of different area and operating in corresponding cylinders, of which the larger one is connected by a port with the brake-cylinder and arranged to receive brake-cylinder pressure, and the other with the interior of the valve-body to be under constant auxiliary-reservoir pressure, and a spring adjusted to equalize with the auxiliary-reservoir pressure against the smaller piston, the said pistons being adapted to shift the main slide-valve and piston to a lap position, substantially as described.

8. In a triple valve, the combination with the valve-body and the main slide-valve and piston, of the auxiliary piston device comprising two connected pistons of different area and operating in corresponding cylinders, of which the larger one is connected by a port with the brake-cylinder and the other with the interior of the valve-body to be under auxiliary-reservoir pressure, and a spring pressing on one end of the smaller piston and adjusted to equalize with the auxiliary-reservoir pressure against the other end, the said pistons being adapted to shift the main valve and main piston to a lap position, the cylinders being connected with the atmosphere by a port between the said pistons, substantially as shown and described.

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