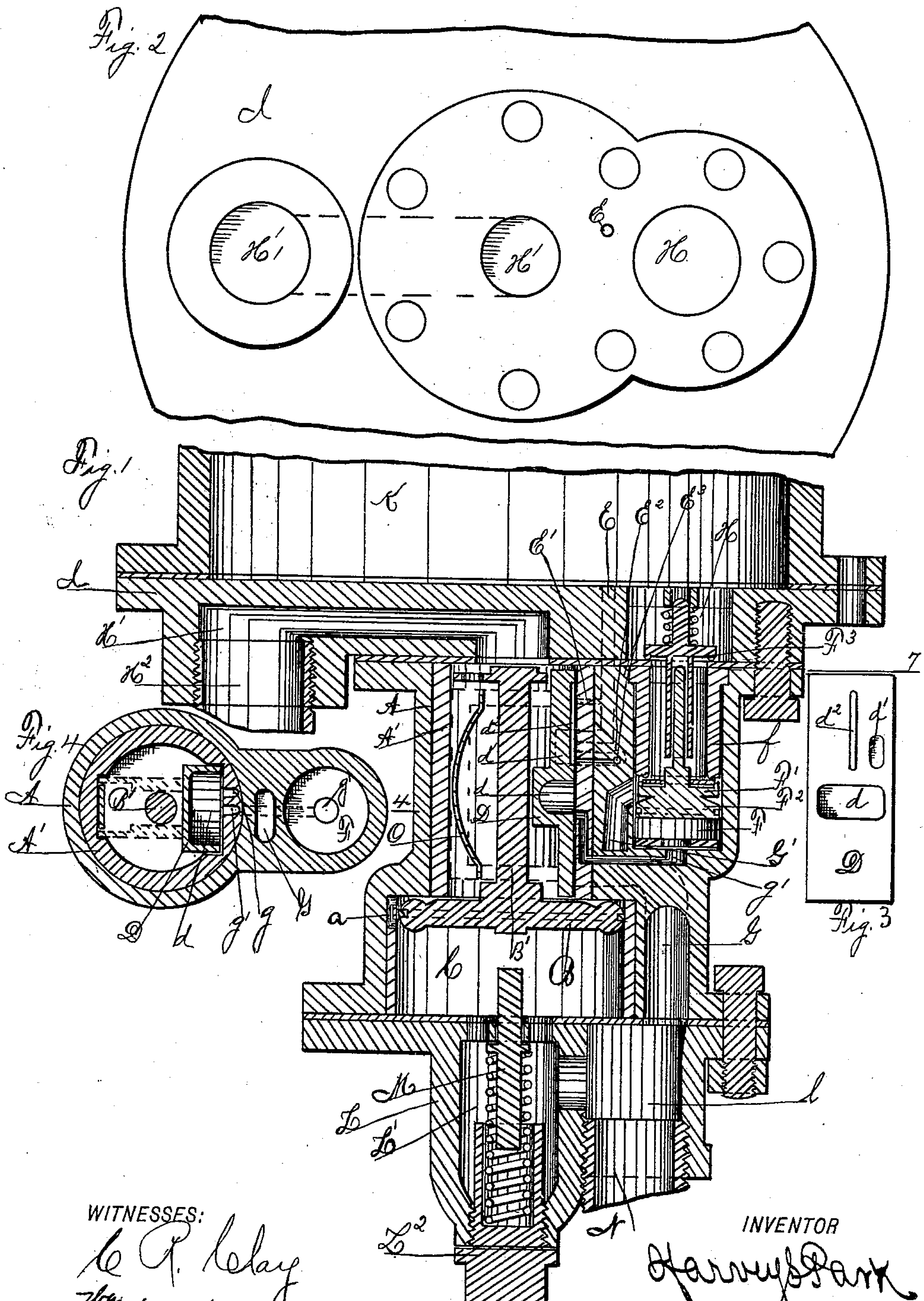
(No Model.) 3 Sheets—Sheet 1.

H. S. PARK.

FLUID PRESSURE BRAKE.

No. 543,102. Patented July 23, 1895.




WITNESSES:

C. R. Clay

Wm. Hardy

INVENTOR

Harvey S. Park

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# H. S. PARK.

## FLUID PRESSURE BRAKE.

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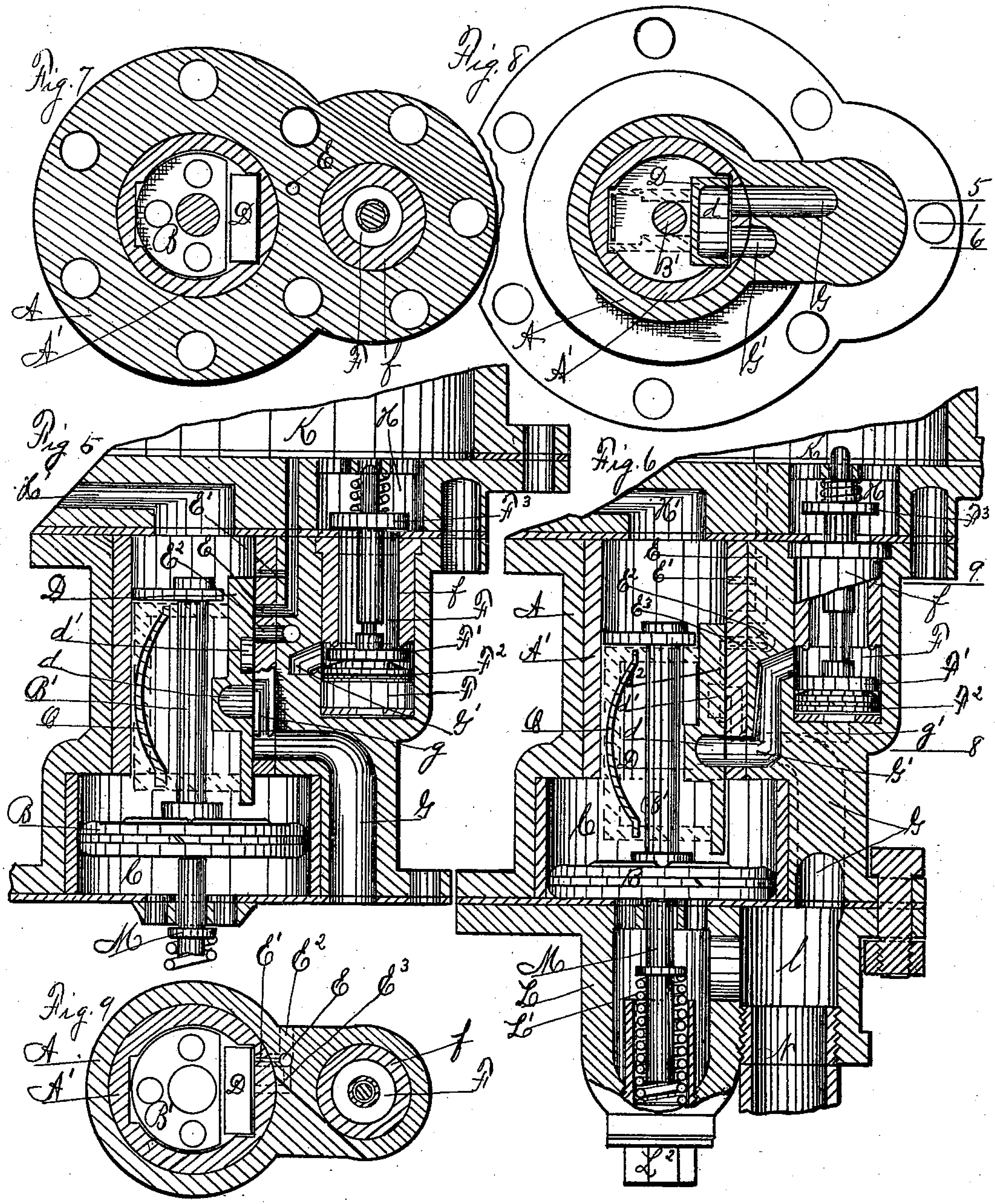


WITNESSES:

C. A. Clay

Wm. Hardy.

INVENTOR

Harvey S. Park

(No Model.) 3 Sheets—Sheet 3.

H. S. PARK.

FLUID PRESSURE BRAKE.

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Fig. 12

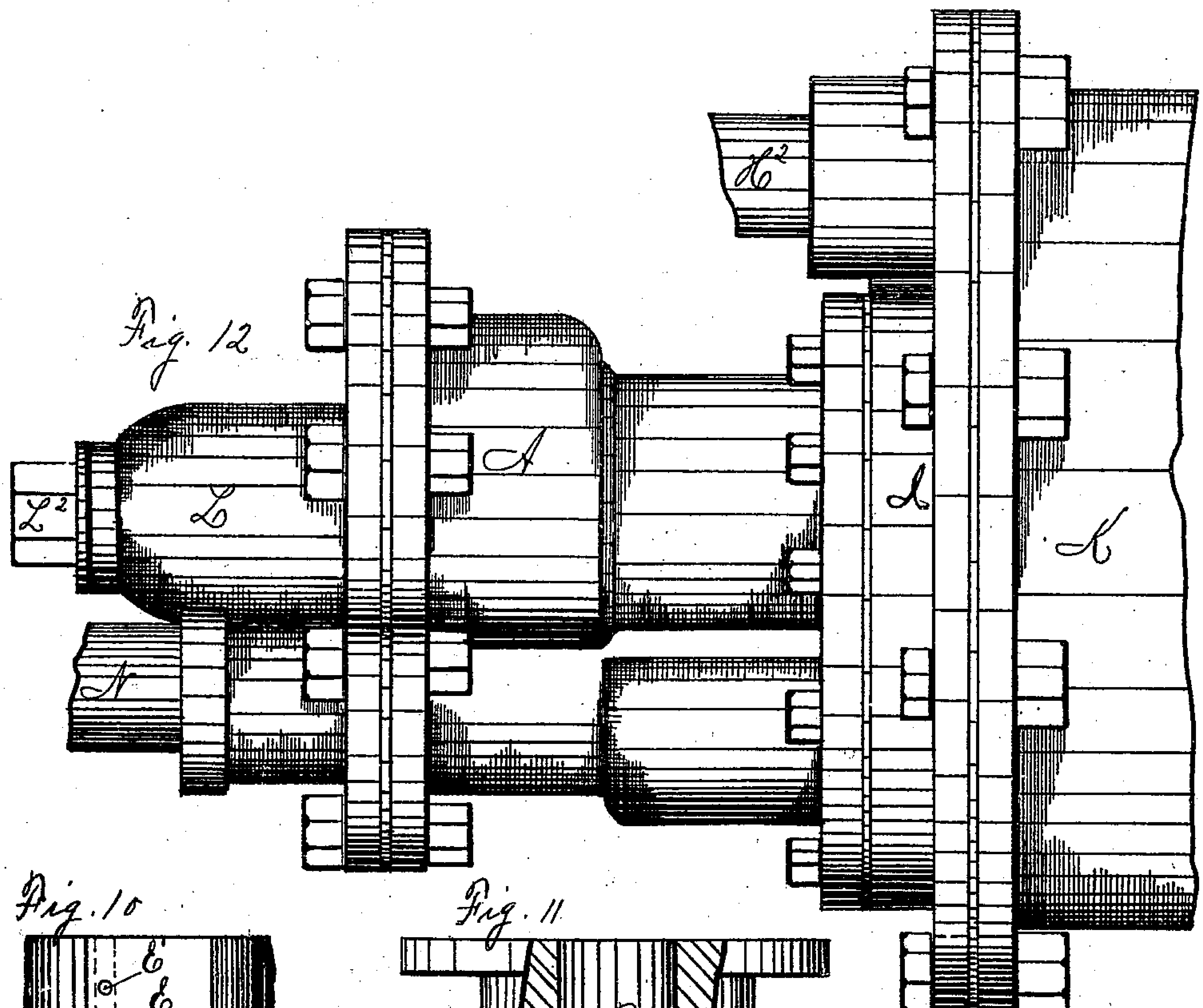


Fig. 10

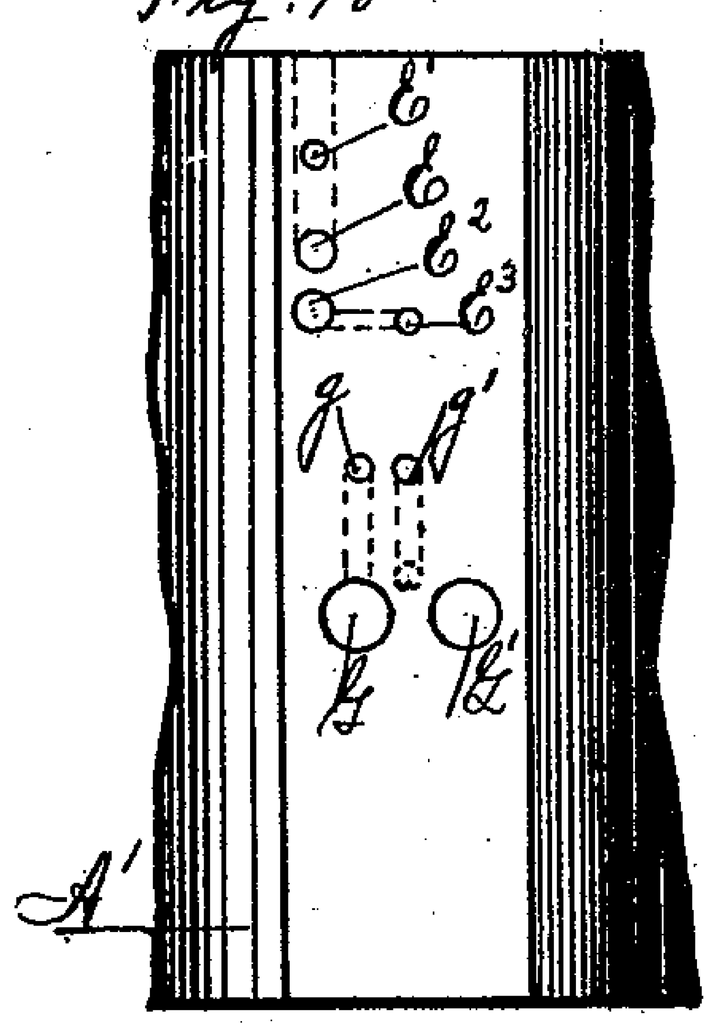
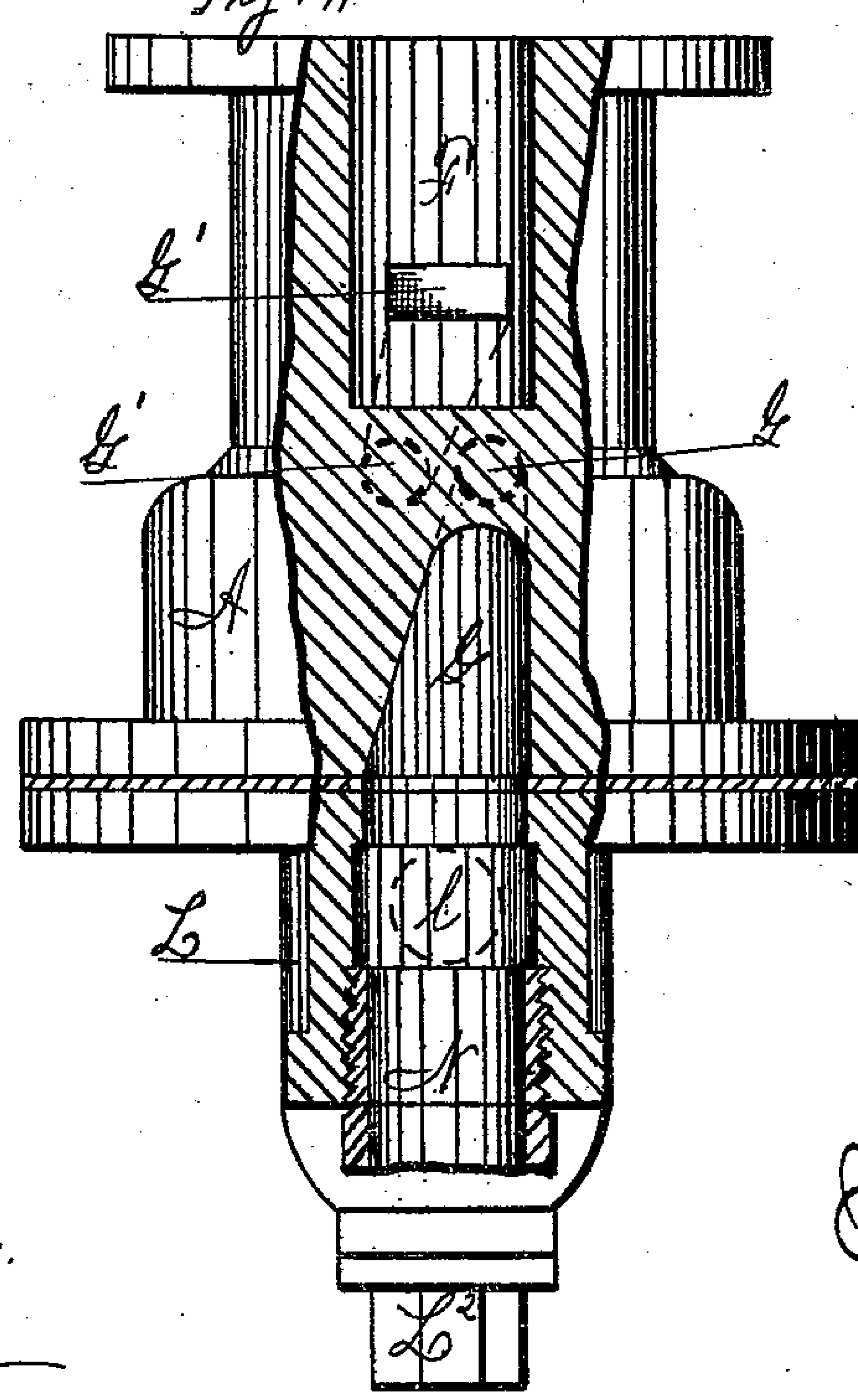


Fig. 11



WITNESSES:

C. R. Clay.

Wm Hardy

INVENTOR

Harvey S. Park

# UNITED STATES PATENT OFFICE.

HARVEY S. PARK, OF CHICAGO, ILLINOIS.

## FLUID-PRESSURE BRAKE.

SPECIFICATION forming part of Letters Patent No. 543,102, dated July 23, 1895.

Application filed April 17, 1895. Serial No. 546,145. (No model.)

*To all whom it may concern:*

Be it known that I, HARVEY S. PARK, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fluid-Pressure Brakes, of which the following is a specification.

The object of my invention is to provide a quick-acting brake which shall be simple in construction and positive and reliable in operation; and my invention consists in the features and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a cross-section of the valve apparatus on line 1 of Fig. 8; Fig. 2, a view in elevation of the head of the brake-cylinder, showing the ports and passages from the valve apparatus to the car-reservoir and brake-cylinder. Fig. 3 is a face view of the valve governing the ports and passages between the car-reservoir and brake-cylinder and between the train-pipe and brake-cylinder; Fig. 4, a cross-section on line 4 of Fig. 1, showing ports and passage for venting the train-pipe air to the brake-cylinder; Fig. 5, a sectional view of the apparatus on line 5 of Fig. 8, showing the position of valve apparatus when making ordinary service-stops; Fig. 6, a sectional view of the valve apparatus on line 6 of Fig. 8, showing the position of the valve apparatus in making emergency-stops and setting the brakes with air from both the train-pipe and car-reservoir; Fig. 7, a cross-section on line 7 of Fig. 1, showing passages from the train-pipe and car-reservoir to the brake-cylinder and from the train-pipe through the main chamber to the car-reservoir. Fig. 8 is a cross-section on line 8 of Fig. 6, showing passages and ports and valve governing the same from the train-pipe to the brake-cylinder; Fig. 9, a cross-section on line 9 of Fig. 6, showing ports and passages for venting air to the atmosphere from the lower portion of a chamber in the air-passage from the train-pipe to the brake-cylinder and the passage from the brake-cylinder to the atmosphere, also the passage from the car-reservoir to the brake-cylinder; Fig. 10, a view in elevation of a part of the valve-chamber of the apparatus, showing the seat of the valve and the position of the ports from the train-pipe and car-reservoir to the brake-cylinder and from the brake-cylinder to the atmosphere; Fig. 11, a view of the wall or casing of the apparatus in elevation and partly cut away, showing the route for venting the air from the train-pipe to the brake-cylinder; and Fig. 12, a view in elevation showing the apparatus fixed to a brake-cylinder.

The operation of a valve apparatus for venting air from a car-reservoir to a brake-cylinder by means of a slide-valve located in a chamber and operated by a piston is well known and need not be dwelt upon further than to describe the working of the same.

In the drawings, A is a wall or casing forming the chamber in which the apparatus actuates.

A′ is a bushing firmly fixed in the casing, being fitted so close as to be air-tight.

C is a chamber formed by the case and is in the form of a cylinder, having its upper part smaller in diameter than its lower part. In the upper part of chamber C is located and operated the slide-valve D, actuated by the piston B working and operating in the lower part of the chamber C, where the diameter is the greater. The valve is actuated by means of the stem B′ extending into and to the upper part of chamber C and provided with a shoulder on its lower end and a head on its upper end. This stem actuates the slide-valve D in its upward movement by its shoulder abutting against the arms that extend from the back of the slide-valve and across the chamber C, forming a guide for the valve. The stem also actuates the valve on its downward movement by its head abutting the arms extending from the rear and upper part of the valve. These arms cross chamber C and form a guide for the valve, whereby the latter may move downward and upward in a channel or guideway cut in the bushing A′.

In the casing is the passage E leading to the brake-cylinder K downward and into chamber C. From the chamber C is passage E′ leading to the passage E, and from chamber C is a passage $E^2$ through the wall or casing to the atmosphere, and from chamber C a passage $E^3$ in the wall A connects with passage $E^2$ and through it to the atmosphere.

The slide-valve is provided with a large recess *d* to connect the ports for venting the train-pipe air to the brake-cylinder. The slide-valve is also provided with a small recess $d'$ to connect lower end of passage E and passage $E^2$, and forming an open way to the atmosphere from the brake-cylinder. Also in slide-valve D is a recess $d^2$ formed to connect a passage from chamber F with passage $E^3$, making an open way from chamber F to the atmosphere.

Casing L is fixed to the lower end of casing A, closing its lower end and forming chamber L', provided with a communicating side chamber $l$, into which is fixed the train-pipe N. Chamber L' has a passage or passages communicating with chamber C, while the chamber $l$ has a passage communicating with the passage G in the wall or casing A. The passage G extends upward and inward, and its upper and inner end connects with chamber C, but is covered by the slide-valve. A chamber F is formed in the wall or casing A, and has a connection with chamber C through a passage G' which is formed in casing A, one end terminating in chamber F and its other end in chamber C, but covered by the slide-valve. The upper end of chamber F is connected with the brake-cylinder by the passage H formed in the head I of the brake-cylinder.

The recess $d$ in the slide-valve is so formed that when the valve has made its full travel downward the recess connects passages G and G' in such manner that by means of chamber $l$, passage G, passage G', chamber F, and passage H a direct communication is formed from the train-pipe to the brake-cylinder. In chamber F is located valve F', connected to a piston $F^2$, and held to its seat by air-pressure from the train-pipe entering from the train-pipe through passages G and $g$ and recess $d$ and passage $g'$ to the under side of the piston $F^2$. The valve F' is seated on a valve-seat formed on the lower end of tubular flange $f$, located in the chamber F, through which flange a passage is formed connecting chamber F with passage H in the head of the brake-cylinder. In passage H is located valve $F^3$, seated on a gasket pressing against flange $f$ and having its upper stem working in a guide formed in the head of the brake-cylinder. This stem is surrounded by a spiral spring pressing against the valve and the guide. The lower stem of the valve passes downward into chamber F and is of a tubular form, the tube forming a guide for the stem of valve F'. The valve $F^3$ lifts when the air flows from the train-pipe to the brake-cylinder, but is held to its seat when the brake is set for service-stops by air from the car-reservoir.

In chamber L' is located a stem M, whose upper end passes through the wall L and terminates in chamber C. This stem has a shoulder that abuts against the wall L to prevent its further upward travel and is surrounded by a spring abutting against the under side of the shoulder, the lower end of the spring pressing a nut $L^2$, screwed into the casing L. A passage H' is formed in the head of the brake-cylinder, one end of this passage connecting with the upper end of chamber C and communicating at its other end with a pipe $H^2$, which connects with the car-reservoir.

The operation is as follows: All the parts of the device being in their normal positions, as shown in Fig. 1, air being pumped into the train-pipe N enters the chamber $l$, passes into chamber L' and into chamber C below the piston, and passes, by means of a by-port $a$ in the wall A, around the piston B and into the upper part of the chamber C and through the passage H' in the brake-cylinder head to pipe $H^2$ and to the car-reservoir. The air from the train-pipe will pass from chamber $l$ to passage G and to the under side of the slide-valve, also from passage G into passage $g$ and into recess $d$ and from recess $d$ into passage $g'$ and into chamber F under the piston $F^2$, and hold the valve F' seated. The piston $F^2$ is not fitted to the chamber F to be perfectly air-tight, and the air will slowly pass the piston into the chamber F above the piston and hold the valve firmly seated, and the air will also pass into passage G' and to the under side of the slide-valve at the lower end of the passage G'. The air from the train-pipe being in the passage G pressing against the slide-valve, and also in passage G' pressing against the slide-valve, the same pressure per square inch being on the opposite side of the valve in chamber C, will perfectly balance the valve. This balanced slide-valve will, consequently, be easily moved by a small reduction of the pressure in the train-pipe, and to hold it perfectly to its seat the curved spring O is fixed in the chamber C, pressing against the bushing A', and also against the arms or guides for the slide-valve, thus giving the valve a perfect seating.

In operation, the pressure being slightly reduced in the train-pipe, the piston will travel downward by reason of the excess of pressure on its upper side and carry the slide-valve with it. The piston will continue to move downward until the lower end of its stem abuts the stem M, when its travel will be arrested by the resistance of the spiral spring around the stem. The downward movement of the slide-valve will close port $E^2$ to the atmosphere, and when the piston abuts stem M the slide-valve will uncover passage E', when the air from the car-reservoir will pass through passages E' and E to the brake-cylinder and set the brakes. When the pressure in the car-reservoir has been reduced to a pressure slightly lower than that in the train-pipe, by reason of air flowing into the brake-cylinder, the piston will move the valve upward and close passage E', but sufficient to open passage $E^2$, and the brakes will remain set. During this operation the valve $F^3$ in passage H will prevent the air from entering chamber F. When the pressure is restored in the train-pipe the piston B will return the slide-valve to its normal position, as shown in Fig. 1, connecting ports E and $E^2$ and release the brakes. In the foregoing operation the slide-valve did not travel sufficiently far to have recess $d$ connect passages G and G′ nor to close the passages $g$ and $g'$ from recess $d$. The position of the slide-valve as described in the foregoing is shown in Fig. 5.

When it is necessary to set the brakes quickly for an emergency a reduction in the train-pipe pressure is made sufficient to have the pressure above piston B overcome the resistance of the spring around the stem M, and the piston will travel to its fullest extent to the position shown in Fig. 6 and carry with it slide-valve. The recess $d$ will connect passages G and G′ as the slide-valve travels downward. Before connecting G and G′ it will close passages $g$ and $g'$ from recess $d$, and as the connection from passage G to passage G′ is made the recess $d^2$ will connect passages $g'$ and $E^3$, forming an open way from chamber F below piston $F^2$ to the atmosphere, when the air-pressure above the piston in chamber F will move it downward and seat it on a gasket located in the bottom part of chamber F and make an air-tight seating. This will form a large direct passage from the train-pipe to the brake-cylinder that will quickly admit the train-pipe air to the brake-cylinder. In this position the slide-valve will uncover ports or passages E and E′ and the car-reservoir air will flow to the brake-cylinder and all the brakes will be set quickly. When the car-reservoir air is added to the train-pipe air in the brake-cylinder the pressure in the brake-cylinder will be greater than that in the train-pipe and the valve $F^3$ will close. The position of the piston B, piston $F^2$, stem M, slide-valve D, valve M′, valve $F^3$, and the connection between the ports and passages in this operation are shown in Fig. 6.

To release the brakes the pressure in the train-pipe is restored. The piston B will travel upward, moving the slide-valve closing the connection between passages G and G′, and closing the passage from chamber F to the atmosphere, and connect passage $g$ and passage $g'$ with recess $d$, when the air from the train-pipe will flow to the lower part of chamber F and under piston $F^2$ and the piston will seat valve F′. Further travel of the piston and slide-valve will connect recess $d'$ with ports E and $E^2$ and release the brakes, at which time all the parts will be in their normal positions, as shown in Fig. 1.

In actuating brakes for an emergency, seconds of time are extremely valuable, and it is essential that a simultaneous action of the brakes be had throughout the entire train, so that the brakes can be set to their best retarding force without detriment to the train or load at any speed. Heretofore a nearly-simultaneous action has been attempted by venting car-reservoir and train-pipe air into the brake-cylinder by electrically-actuated valves and by what is known as a "triple valve," in combination with an auxiliary valve device.

I have in this invention constructed a slide-valve that is balanced as to the ports, passages, and recess between the train-pipe and brake-cylinder and that will move quickly with a slight reduction of train-pipe pressure and open a large and direct passage from the train-pipe to the brake-cylinder, whereby the train-pipe can be emptied into the brake-cylinder throughout the entire length of the longest train in a very short period of time, producing a practically-simultaneous setting of the brakes on the entire train. Furthermore, the slide-valve is moved at all applications of the brakes, actuates the brake mechanism in service-stops, and also forms the operating device of the emergency part of the construction, so that it is always in working condition for emergency purpose. In those constructions where the emergency device is called into action only when required, which is rare, the valve mechanism is liable to stick and fail to respond on account of rust or accumulated dust and dirt. My slide-valve is used for both service and emergency stops, so that its free, quick, and positive operation for the latter purpose is always assured.

Although I have described more or less precise forms and details of construction, I do not intend to be understood as limiting myself thereto, as I contemplate changes in form, proportion of parts, and substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit of my invention; and, furthermore, where I have designated certain parts and passages by their reference-letters in the specification or claims it is obvious that I do so for clearness and certainty and not as intending to limit myself to their particular form and location shown in the drawings.

I claim—

1. The combination of a train pipe, a car reservoir, a brake cylinder, and a single balanced slide-valve arranged to set the brakes by air pressure from the train pipe and the car reservoir.

2. The combination of a train pipe, a car reservoir, a brake cylinder and a balanced slide-valve to admit air from the car reservoir and train pipe to the brake cylinder.

3. In a valve mechanism for actuating railway brakes, a balanced slide-valve controlling direct ports and passages between a train pipe and a brake cylinder.

4. The combination of a train pipe, a car reservoir, a brake cylinder and a balanced slide-valve actuated by a piston, the preliminary travel of the valve admitting air from the car reservoir to the brake cylinder, and its further travel admitting air from the train pipe direct to the brake cylinder.

5. In a railway brake mechanism, the passage G, balanced slide-valve D, recess $d$, passage G′, chamber F, valve F′, piston $F^2$, pas-

sage H, passage $g$, passage $g'$, recess $d^2$, and passage $E^3$, substantially as described.

6. In a brake mechanism, the combination of a chamber or casing communicating respectively with the car reservoir, brake cylinder and train pipe, a piston adapted to travel within the chamber, a passage leading from the train pipe directly to the brake cylinder, and a balanced slide-valve, actuated by the piston and adapted to govern the ports and passages leading to the brake cylinder from the chamber and train pipe respectively.

7. In a brake mechanism, the combination of a chamber or casing communicating with the auxiliary reservoir and brake cylinder, a passage leading from the train pipe and communicating directly with the brake cylinder, a piston adapted to travel in the chamber, and a slide-valve actuated by the piston and balanced by the train pipe pressure and reservoir pressure respectively, the valve being adapted to govern the ports and passages to the brake cylinder respectively, from the chamber and train pipe.

8. In a brake mechanism, the combination of a chamber or casing communicating with the auxiliary reservoir and brake cylinder, a passage leading from the train pipe and communicating directly with the brake cylinder, a piston adapted to travel within the chamber and provided with a stem, and a slide-valve arranged within the piston chamber, and connection to the piston stem, such valve being balanced by reservoir and train pipe pressure respectively upon its opposing faces, and adapted to govern ports and passages to the brake cylinder respectively from the chamber and train pipe.

9. In a railway brake mechanism, a balanced slide-valve in combination with a train pipe and a brake cylinder, arranged to have air pressure in the port from the train pipe to the slide-valve, and in the port from the slide-valve to the brake cylinder to be always of such pressure that the valve will at all times be in a balanced condition, with means for actuating the valve for venting the air direct from the train pipe to the brake cylinder.

10. In a fluid brake mechanism, a slide-valve arranged to vent fluid under pressure from a train pipe to a brake cylinder through a direct passage from the train pipe, and a valve located in the passage and adapted to maintain an equal pressure in the ports governed by the slide-valve in such direct passage, with means for actuating the slide-valve.

11. In a railway brake mechanism, a slide-valve arranged to vent air from a train pipe to a brake cylinder, through a passage from the train pipe to the brake cylinder, a valve located in the passage and adapted to maintain a balanced pressure on the slide-valve; a passage to the atmosphere governed by the slide-valve and suitably fixed to move the valve in the passage from the train pipe to the brake cylinder, with means for actuating the slide-valve.

12. In a railway brake mechanism, for actuating railway brakes a slide-valve arranged for venting train pipe air into the brake cylinder, in combination with a balancing valve.

13. In a brake mechanism, the combination of a chamber communicating with the auxiliary reservoir and brake cylinder, a passage leading from the train pipe and communicating with the brake cylinder, a slide-valve adapted to travel within the chamber and govern the ports to the brake cylinder from the auxiliary reservoir and from the train pipe respectively, and means for balancing the slide-valve against the pressure in the chamber.

14. In a brake mechanism, the combination of a chamber communicating with the auxiliary reservoir and brake cylinder, a passage leading from the train pipe and communicating with the brake cylinder, a slide-valve adapted to travel within the chamber and govern the ports to the brake cylinder from the auxiliary reservoir and from the train pipe respectively, and ports opening against the slide-valve and communicating with the train pipe whereby the pressure on both sides of the valve will be the same per square inch area.

15. In a brake mechanism, the combination of a chamber communicating with the auxiliary reservoir and brake cylinder, a passage leading from the train pipe and communicating with the brake cylinder, a slide-valve adapted to travel within the chamber and govern the ports to the brake cylinder from the auxiliary reservoir and from the train pipe respectively, passages opening against the slide-valve and communicating with the train pipe, such passages forming a local circuit fed with train pipe air, and a balancing valve located in such circuit.

HARVEY S. PARK.

Witnesses:
H. SCARBOROUGH,
M. M. COAKLEY.