(No Model.)

2 Sheets—Sheet 1.

H. S. PARK.

AIR BRAKE.

No. 561,811. Patented June 9, 1896.

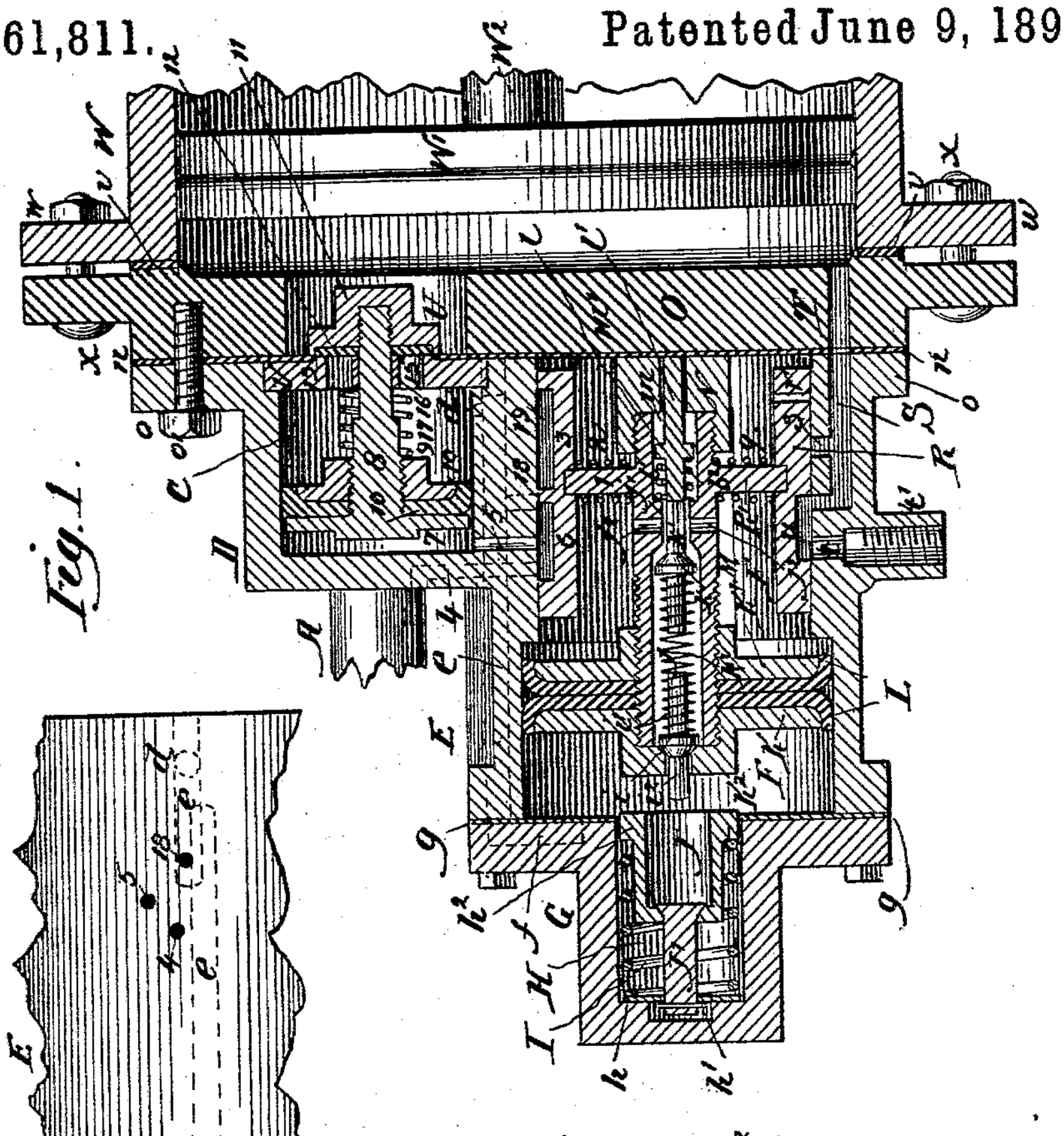

Fig. 1.

Fig. 9.

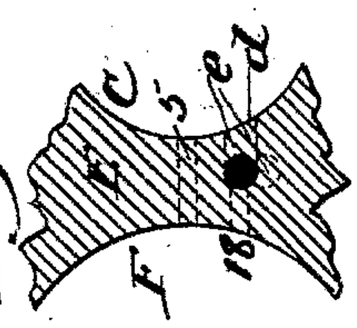

Fig. 8

Fig. 7.

Fig. 6.

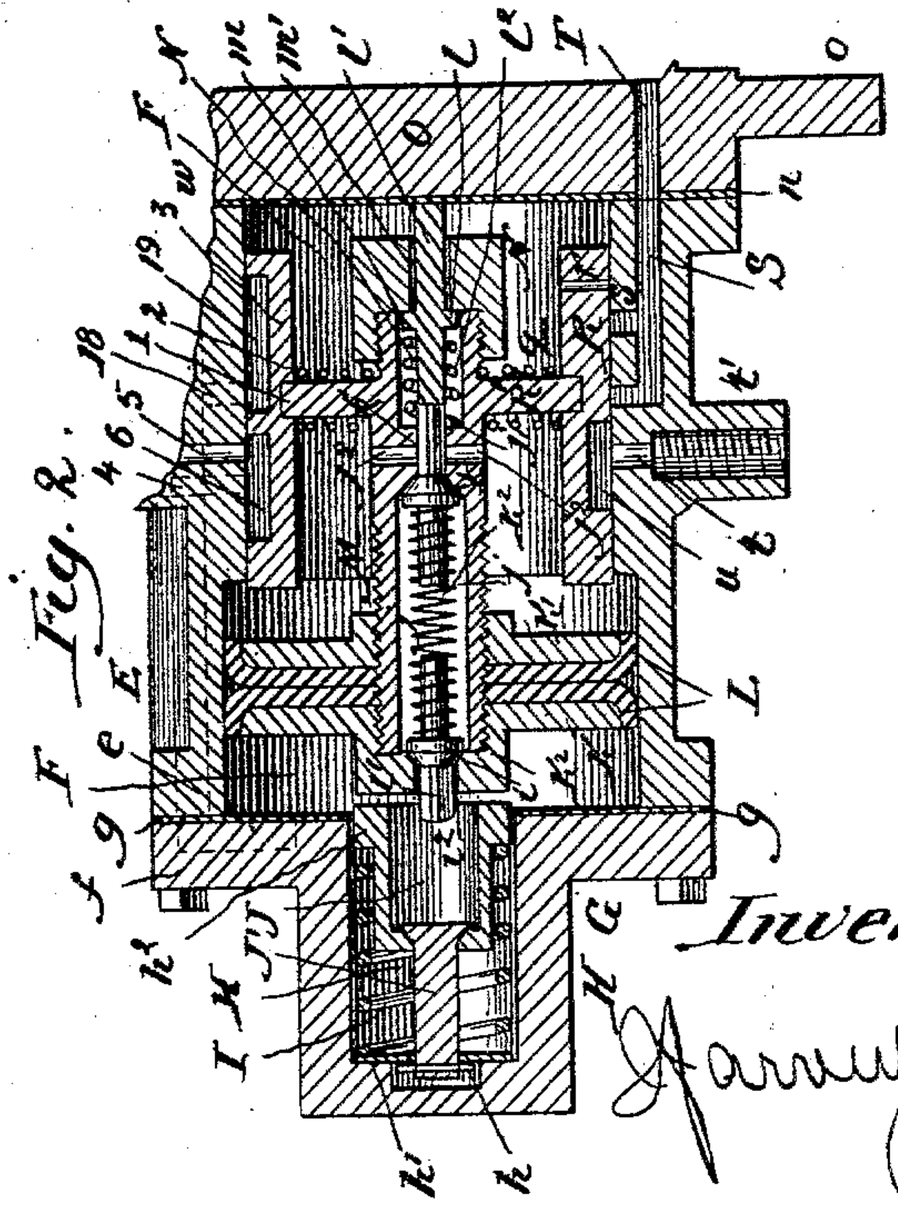

Fig. 2.

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(No Model.)

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Fig. 5.

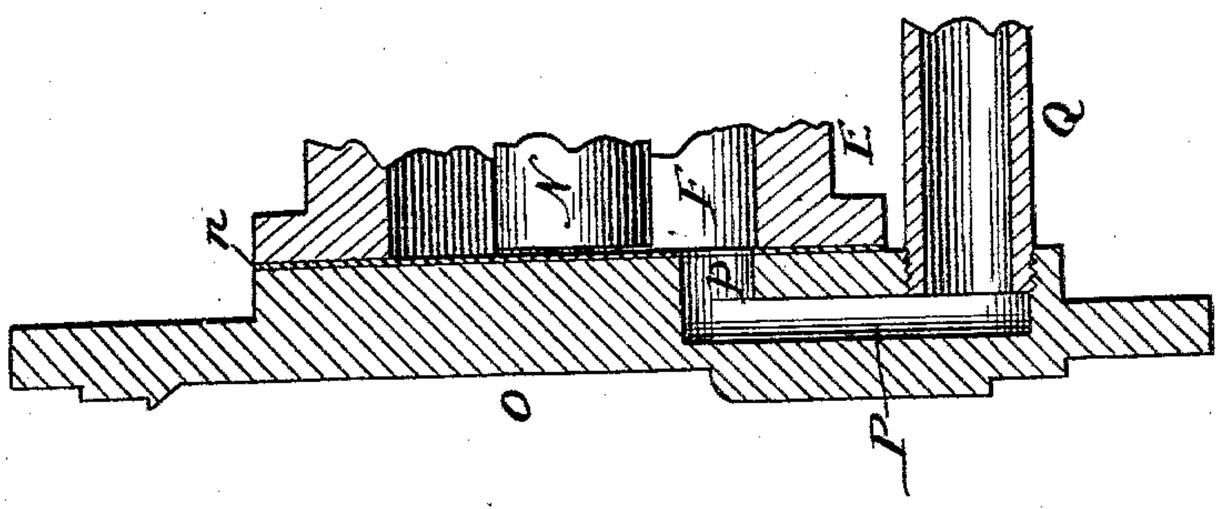


Fig. 4.

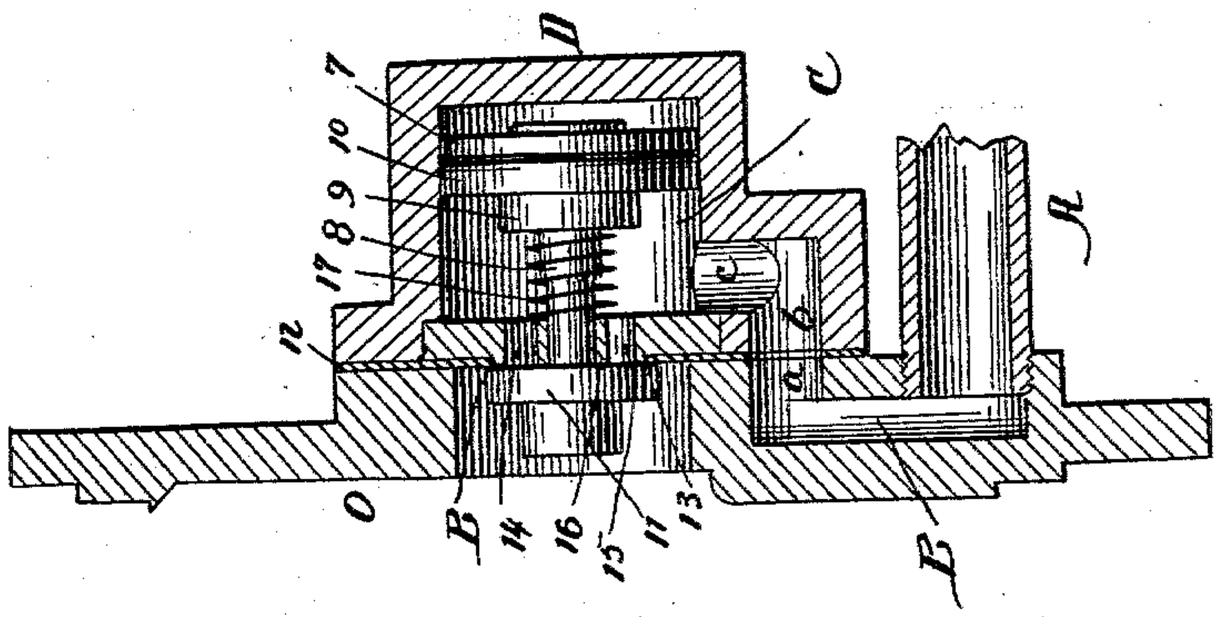
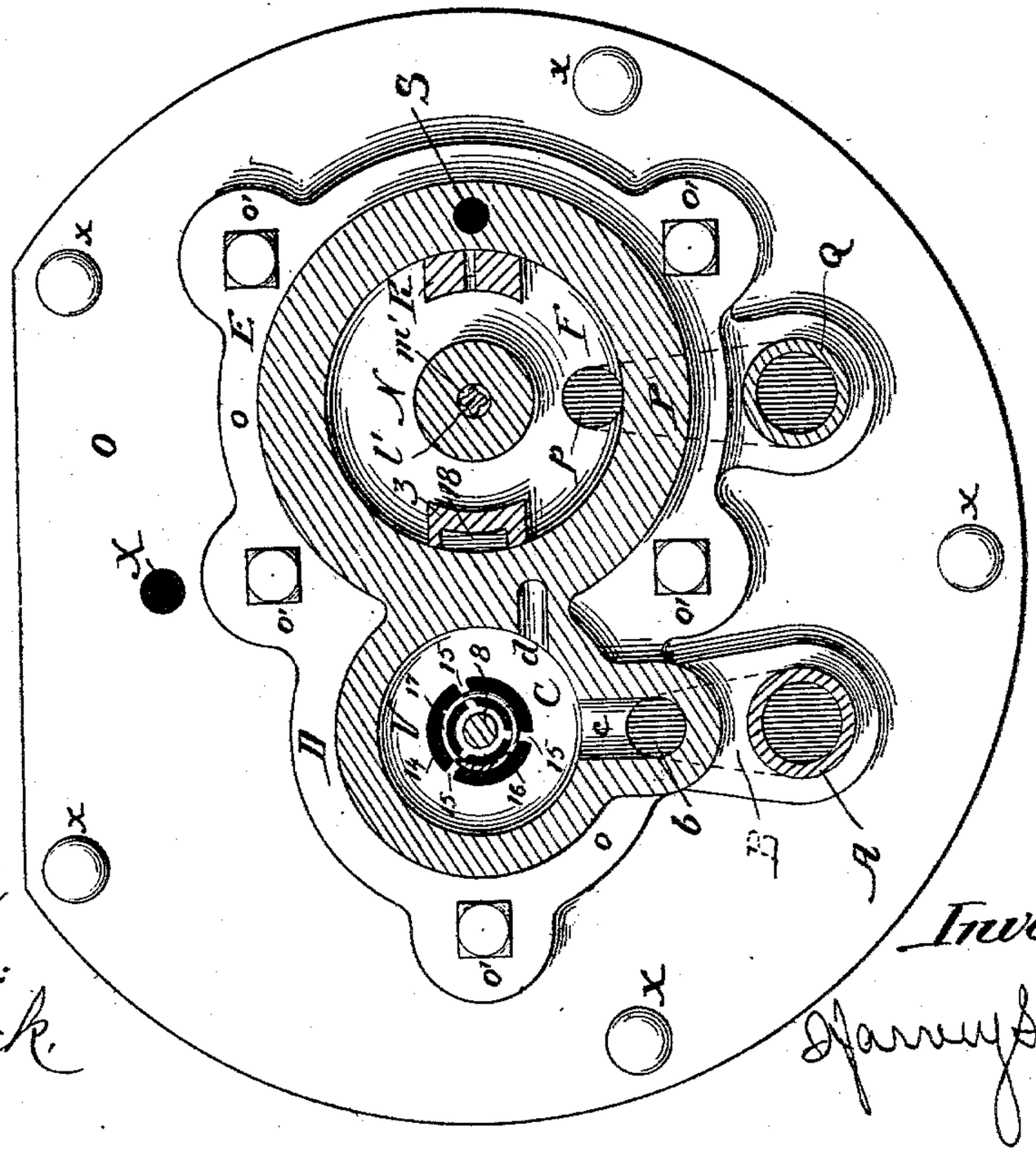


Fig. 3.



Witnesses
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UNITED STATES PATENT OFFICE.

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AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 561,811, dated June 9, 1896.

Application filed November 11, 1889. Serial No. 329,948. (No model.)

To all whom it may concern:

Be it known that I, HARVEY S. PARK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Brakes; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, forming a part hereof, in which—

Figure 1 is a longitudinal section of the valve, showing the brake-cylinder broken off and showing the valve in its normal position; Fig. 2, a longitudinal section of the main valve, showing the position after a grading pressure has been applied and the valve returned to retain such pressure; Fig. 3, a cross-section showing the passage for admitting the train-pipe air to the main-valve chamber and the passage for admitting air from the main-valve chamber to the auxiliary reservoir; Fig. 4, a detail in section, showing the passage for admitting train-pipe air; Fig. 5, a detail in section, showing the passage for the air to the auxiliary reservoir; Fig. 6, a face view of the valve for admitting auxiliary-reservoir air to the brake-cylinder and releasing it therefrom; Fig. 7, a face view of the valve for controlling the piston of the valve which admits train-pipe pressure direct to the brake-cylinder; Fig. 8, a detail in section, showing the arrangement of passages and ports for the train-pipe air; Fig. 9, a face view of the main-valve chamber, showing the ports and passages for the train-pipe air.

This invention relates to air-brakes in which a valve operated by a piston controlled by train-pipe pressure is employed for admitting air from an auxiliary reservoir to a brake-cylinder for applying the brakes and for venting the brake-cylinder to release the brakes and in which a second slide-valve is employed to operate a valve controlling direct communication between the train-pipe and the brake-cylinder for setting the brakes by the direct action of train-pipe pressure.

The object of the invention is to improve the construction and operation of the devices employed for admitting auxiliary-reservoir pressure to the brake-cylinder to set the brakes to a grading pressure and then partially restoring the valve to its normal position to hold the pressure on the brakes without venting the brake-cylinder to the atmosphere, to improve the communication on opposite sides of the piston by which the valve controlling the admission of direct train-pipe pressure is actuated by train-pipe pressure in being opened, and to improve generally the construction and operation of the mechanism which enters into the construction of the valve as a whole; and its nature consists in the several parts and combinations of parts hereinafter described, and pointed out in the claims as new.

In the drawings, A represents a pipe connecting the valve with the train-pipe, which is not shown, but is located as usual.

B is a passage which communicates with the pipe A.

C is an interposed chamber which communicates with the passage B by the openings *a b c*, as shown in Fig. 4.

D is a casing surrounding the chamber C and having on one side a projecting portion, in which is located the passages *b* and *c*.

E is the casing for the main valve, formed with which is the casing D.

F is the main-valve chamber inclosed by the casing E and in which is located the main valve and its piston, and, as shown, the casing is of two different diameters, that portion for the main-valve piston being the largest diameter. The chamber F is in communication with the chamber C by a port *d*, leading from the chamber C, a passage *e*, communicating with the port *d* and formed in the casing E, and a passage *f*, communicating with the passage *e* and with the chamber F. The communication with the train-pipe and the chamber F is thus had by the pipe A, passage B, openings *a b c*, chamber C, port *d*, passage *e*, and opening or passage *f*.

G is a cap or cover for closing the piston end of the chamber F, and in order to have an air-tight joint a packing *g* is placed between the casing E and the cap G, as shown in Figs. 1 and 2.

H is an opening in an extension of the cap G.

I is a resisting-spring located in the opening or chamber H and against which the main valve abuts when the limit of its initial movement for a grading pressure is reached, and the further lowering of the piston contracts the spring I for its reaction to assist in returning the piston to its normal position on restoring the train-pipe pressure.

J is a tube in the chamber or opening H and encircled by the spring I and having a stem J′, on which the tube J can slide. The spring I is located between a plate *h* on the stem J′, held in place by a pin *h′* and a shoulder h^2 on the tube J, and this tube J furnishes a guide and support by which the spring is held in a straight line, and at the same time is free to perform its work.

K is a disk having a center or hub K^2, and K′ is another disk corresponding to the disk K.

L are cup-leathers forming a packing and secured between the disks or plates K K′, and these parts K, K′, and L form the piston for the main valve.

M is the piston-stem, onto which are screwed the disks or plates K K′, with the cup-leathers L between them, as shown in Figs. 1 and 2.

N is a head screwed or otherwise secured to the outer end of the stem M. A valve *i* on a stem *i′* closes a hole i^2 through the hub or center K^2, which hole leads into a chamber *j*, in which chamber is located the valve *i*, and the valve *i* seats in the direction of the cap G. A passage *j′* leads from the chamber *j*, and with this passage *j′* side passages j^2 communicate, which passages j^2 lead to the outside of the stem, and the passage *j′* is controlled by a valve *k* on a stem *k′*, which valve seats in the opposite direction from the valve *i*, and between the valves *k* and *i* and around the stems *k′* and *i′* is a coiled spring k^2, by which the valves are held to their seats, respectively. The passage *j′* leads into a chamber *m* in the stem M, from which chamber a passage *m′* leads through the cap N, and in the chamber *m* is located a disk *l* on a stem *l′*, and around the stem *l′*, between the disk *l* and the end wall of the chamber *m*, is a coiled spring l^2. The stems *i′*, *k′*, and *l′* project on both sides of the valves *i k* and the disk *l*, so that when the piston is in its normal position the stems *k′* and *l′* will abut to hold the valve *k* open by the striking of the stem *l′* against the cap at the valve end of the chamber F, as shown in Fig. 1, at which time the head N is in contact with the head or cap of the chamber, and when the head N is not in contact with the cap or chamber and the stem *l′* is in contact therewith the valve *k* will be seated, as shown in Fig. 2.

O is the head of the brake-cylinder, forming also the cap for the valve-chamber F and the chamber C, and in which cap is formed the passage B, as shown in Fig. 4. The joint between the head O and the casing D E is made air-tight by a packing *n*, and the casing D E is secured to the head O by a flange *o* and bolts *o′*, as shown in Fig. 1.

P is a passage in the head O, communicating with the chamber F by a hole *p* for allowing air to escape from the chamber F into the passage P.

Q is a pipe communicating with the passage P and leading to the auxiliary reservoir (not shown) for admitting air to the auxiliary reservoir from the chamber F to charge such reservoir.

R is a slide-valve controlling the admission of air from the auxiliary reservoir through the pipe Q, passage P, and chamber F to the brake-cylinder, and also controlling the venting of the air from the brake-cylinder to the atmosphere. This valve R is connected to the piston-stem M by an arm R′, the end of which enters an opening in the face of the valve, and around the arm R′ is a spring *q*, by which the acting face of the valve R is held to its seat against the face of the shell or case E.

S is a passage in the wall or casing E, with which communicates a port *s*, which port *s* is controlled by the valve R, and the valve R has a port *r*, which as the valve is lowered comes in communication with the port *s* and admits air from the chamber F into the passage S. The valve R has a passage *u*, by which communication is had when the valve is in its normal position with the passage S, and a port *t*, leading to the atmosphere through a nipple *t′*.

T is a passage in the head O, in line with the passage S and leading into the brake-cylinder, for admitting air to the brake-cylinder from the passage S.

U is an opening in the head O, furnishing a communication between the brake-cylinder and the chamber C.

V is a plate located in the casing D between the opening U and the chamber C.

W is the brake-cylinder, having therein a piston W′, attached to a stem W^2, as usual. This cylinder W has a flange *w*, by means of which and bolts *x* the cylinder is attached to the head O, and the joint between the cylinder W and the head O is made air-tight by a packing *v*.

X is a hole in the head O for supplying oil or grease to the cylinder W, which hole is closed by an air-tight plug.

1 is an arm projecting out from the stem M on the opposite side to the stem R′, and around this arm is a coil-spring 2, and this arm 1 carries a slide-valve 3, which is held to its seat on the face of the chamber F by the spring 2. A port 4 leads from the chamber F to the atmosphere, and a port 5 leads from the chamber C to the chamber F, and these ports 4 and 5 are brought into communication when the piston in the main-valve chamber is in its normal position by a passage 6 in the valve 3, as shown in Fig. 1. A disk 7, having a stem 8, is located in the chamber C, and on the stem 8 is screwed a disk 9, with a cup-leather packing 10 between it and the disk 7, so that the disks 7 and 9 and the cup-

leather packing 10 form a piston located in the chamber C, back of which piston the port or passage 5 enters the chamber C. The stem 8 has attached to its outer end a valve 11, in the face of which is a packing 12, which seats on a rim 13 on the face of the disk V, which rim 13 is around a hole 14, and spanning the hole 14 are arms 15, having a ring 16, which furnishes a guide and support for the stem 8, and between the bars 15 and the disk 9, around the stem 8, is a coiled spring 17.

A port 18 leads from the passage *e* to the chamber F, and in the valve 3 is a passage 19, by means of which, when the valve is lowered, communication is formed between the port 18 and the port 5 for admitting the pressure in the chamber C in front of the piston to the chamber C back of the piston to counterbalance the pressure on opposite sides of the piston and allow the train-pipe pressure in the chamber C to act on the face of the valve 11 and open such valve for communication between the chamber C and the opening U, by which train-pipe pressure direct is admitted to the brake-cylinder W.

The connecting-pipe A communicates with the passage B in the cover or head O of the brake-cylinder, which passage communicates with the chamber C through the openings *a b c*, admitting train-pipe pressure to the chamber C, and from this chamber C the train-pipe pressure passes to the port *d*, passage *e*, and opening *f* to the chamber F back of the piston in such chamber, and when the piston is in its normal position, as shown in Fig. 1, the pressure in the chamber F back of the piston will raise the valve *i*, allowing the pressure to enter the chamber *j* through the port or passage i^2, and as the valve *k* is held unseated by the contact of the stems *k'* and *l'* the train-pipe pressure flows through the chamber *j*, passage *j'*, and passage *j''* into the chamber F in front of the piston, and from such chamber the air passes into the passage P through the opening *p* and enters the pipe Q and flows into the auxiliary reservoir, and when the pressure in the auxiliary reservoir and the pressure in the train-pipe are equal the valve *i* will be closed by the action of the spring k^2, in connection with the pressure in the chamber *j* on the valve *i*, closing the opening i^2 and stopping further flow of the air through the stem M into the chamber F in front of the piston. The passage P is in the cover or head O, and it will thus be seen that this cover or head has therein the passages for the admission of train-pipe pressure back of the piston in the chamber F and for the admission of pressure to the auxiliary reservoir from the chamber F in front of the piston. The cover or head O furnishes the means for closing one end of the brake-cylinder and for closing one end of the chambers C and F, and furnishes also a connection for the attachment of the valve as a whole to the brake-cylinder; and by this attachment it will be seen that the valve can be disconnected from the cylinder without removing the pipes A and Q, as all that is required to disconnect the valve is to remove the bolts *o'*, when the valve as a whole can be taken off, leaving the pipes still in position, and to attach the valve all that is required is to place it in position and insert the bolts *o'*, thereby enabling the valve to be taken down for repairs without taking off the connecting-pipes.

The valve is shown in Fig. 1 in its normal condition, with the train-pipe and auxiliary reservoir at the same pressure, and to apply the brakes with a grading pressure the pressure in the train-pipe is lowered slightly, which causes a lowering of the pressure in the chamber F back of the piston, so that the excess of pressure in the chamber F in front of the piston will push the piston back, carrying with it the valve R for the port *r* to come in line with the port *s* for the pressure in the auxiliary reservoir to flow into the chamber F in front of the piston, through the pipe Q, passage P, and opening *p*, and from the passage S the pressure flows through the passage T into the brake-cylinder W back of the piston W', advancing such piston and setting the brakes. The flow of air through the passage S lowers the pressure in the chamber F in front of the piston, and when the pressure back of the piston is in excess of the pressure in front the piston will be partly returned, carrying with it the valve R, and such return will be limited by the engagement of the stem *l'* with the face of the cover O, which arrests the return or advance of the piston, bringing the parts into the position shown in Fig. 2, in which position the brakes will be held at the grading pressure, as the port *r* has passed the port *s* and the passage *u* has not connected the port *t* with the passage S, thereby maintaining the pressure in the brake-cylinder, and if the pressure in the brake-cylinder is not sufficient to apply the brakes with the required force the train-pipe pressure is again lowered, operating the piston in the chamber F, as just described, and bringing the valve R back for the ports *r* and *s* to again come in line and admit pressure from the auxiliary reservoir into the brake-cylinder through the passages S and T until the pressure in the chamber F is lowered sufficient for the excess of pressure in the chamber F, back of the piston, to again return the piston and valve R to the position shown in Fig. 2, and this operation can be repeated until the required force has been applied to the brakes.

The brakes are released by restoring the train-pipe pressure sufficient to return the piston and the valve R to their normal position, carrying the port *r* past the port *s*, as shown in Fig. 1, and bringing the passage S into communication with the port *t* by the passage *u* for the pressure in the brake-cyl-

inder to pass back through the passages T and S and vent to the atmosphere through the passage *u* and port *t*, thereby venting the brake-cylinder and releasing the brakes.

The operation of applying the brakes with a grading pressure does not affect the emergency or quick-action valve 11, by which train-pipe pressure is admitted into the brake-cylinder, which admission of train-pipe pressure is required only in case of an emergency stop, and to operate the emergency-valve 11 the train-pipe pressure is reduced sufficiently to lower the valve 3 for the passage 19 to furnish a communication between the port 18 and the port 5, which allows the pressure in the chamber C in front of the piston in such chamber to pass back of the piston, equalizing the pressure in the chamber C on both sides of the piston, when the train-pipe pressure on the face of the valve 11 raises such valve and allows the train-pipe pressure to pass from the chamber C, through the opening U, directly into the brake-cylinder W, and this action of the valve 3 to open the valve 11 will occur as the piston in the chamber F is near the limit of its backward movement and before the end of the valve R has passed the port *s*, and when the valve R in the further backward movement of the piston in the chamber F passes the port *s* the auxiliary-reservoir pressure will flow into the passage S and passage T into the brake-cylinder, thereby adding auxiliary-reservoir pressure to the train-pipe pressure, and such excess of pressure in the brake-cylinder will enter the opening U and, acting on the outer face of the valve 11, will close such valve as the piston in the chamber F is at the limit of its backward movement, closing the opening 14 against the flow of pressure from the chamber C into the opening U and restoring the parts, so far as the valve 11 is concerned, to the position shown in Fig. 1. The restoring of the train-pipe pressure causes a flow of air through the pipe A and passage B into the chamber C, and from such chamber the air passes through the port *d*, passage *e*, and opening *f* into the chamber F, back of the piston in such chamber, returning the parts to the position shown in Fig. 1, for the valve *i* to open and permit the escape of air from the chamber F back of the piston into the chamber F in front of the piston, and thence to the auxiliary reservoir through the passage P and pipe Q.

It will be seen that the port 18, when the valve 3 is up, is closed against the flow of air through such port from the passage *e*, thereby permitting the air to pass unobstructed into the chamber F, and at the same time shutting off air from passing through the port 18 in front of the piston in the chamber C, back of such piston, and at the same time the ports 4 and 5 are in communication through the passage 6, venting any excess of pressure in the chamber C, back of the piston therein, to the atmosphere, and maintaining the pressure back of the piston in the chamber C at a normal pressure only, so that the train-pipe pressure in front of the piston in the chamber C will effectually hold the valve 11 to its seat, and when the valve 3 is lowered for the passage 19 to bring the ports 18 and 5 into communication the pressure in the chamber C in front of the piston enters the port *d* and passage *e* and flows through the port 18, passage 19, and port 5 to the chamber C back of the piston, and it will thus be seen that the passage *e* furnishes a communication for equalizing the pressure on both sides of the piston in the chamber C.

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

1. In an automatic fluid-pressure brake system, the combination, with a train-pipe, a brake-cylinder, and a valve-casing, of a head for the brake-cylinder, and a passage in the brake-cylinder head which communicates with the train-pipe and with a chamber in the valve-casing, substantially as set forth.

2. In an automatic fluid-pressure brake system, the combination, with a train-pipe and a brake-cylinder, of a head for the brake-cylinder, a triple-valve casing connected to the head of the brake-cylinder, and a passage in the head of the brake-cylinder, which is in communication with the train-pipe and with a chamber in the triple-valve casing, substantially as set forth.

3. In an automatic fluid-pressure brake system, the combination, with a brake-cylinder head and a triple-valve casing, of a passage in the brake-cylinder head which communicates at one end with a passage leading to the main-valve chamber of the triple valve and at the other end is connected with the train-pipe, and a second passage in the brake-cylinder head which communicates at one end with the main-valve chamber of the triple valve and at the other end with the auxiliary-reservoir connection, substantially as set forth.

4. In an automatic fluid-pressure brake system, the combination, with a train-pipe and an auxiliary reservoir, of a brake-cylinder, a head on the brake-cylinder, a passage in the head for connection to the train-pipe, a passage in the head for connection with the auxiliary reservoir, and a triple-valve casing removably connected to the brake-cylinder head and having openings, ports, or passages adapted to connect with the passages in the brake-cylinder head, whereby the triple-valve casing may be detached without breaking the connections from the auxiliary reservoir and train-pipe to the passages in the head, substantially as set forth.

5. In an automatic fluid-pressure brake system, the combination, with a triple valve and an emergency-valve device for releasing fluid under pressure from the train-pipe, of a main-

valve chamber in the casing of the triple valve, a chamber in which is fitted a piston for operating the emergency-valve, a passage in the casing through which fluid is admitted from the train-pipe to one side of the triple-valve piston, and a slide-valve in the main-valve chamber which controls the admission of train-pipe fluid from the passage in the casing to one side of the emergency-piston, substantially as set forth.

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