(No Model.)

4 Sheets—Sheet 1.

A. R. BOLUSS.

STRAIGHT AIR AUTOMATIC BRAKE.

No. 435,791. Patented Sept. 2, 1890.

Fig. 1.

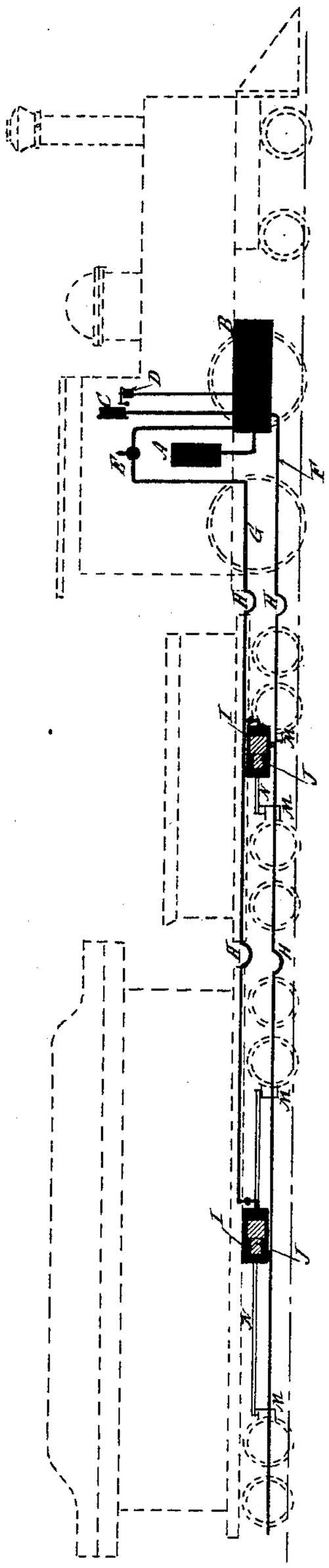

Fig. 2.

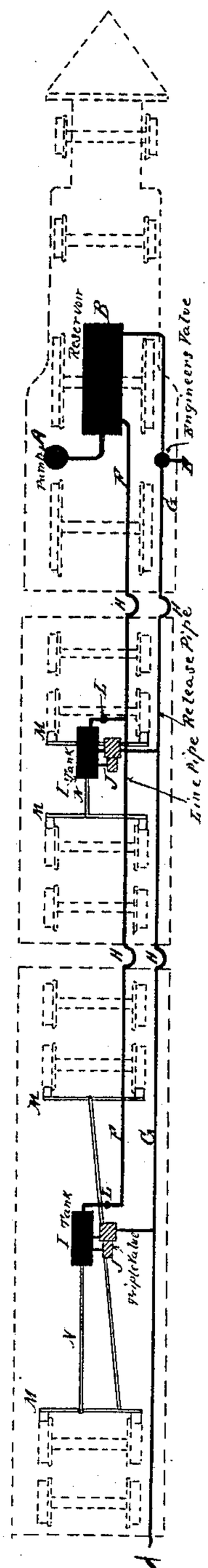

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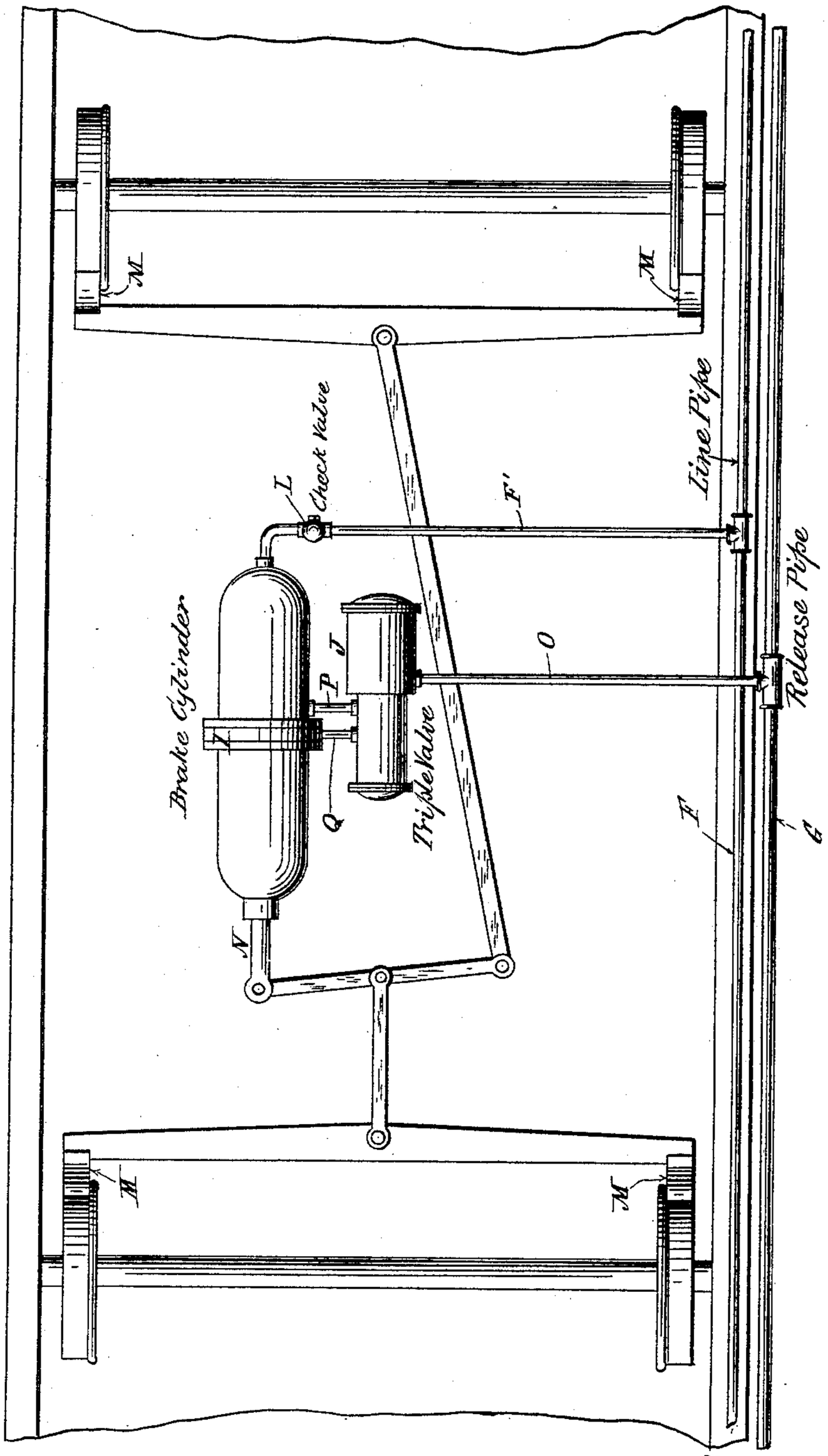
Fig. 3.



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STRAIGHT AIR AUTOMATIC BRAKE.

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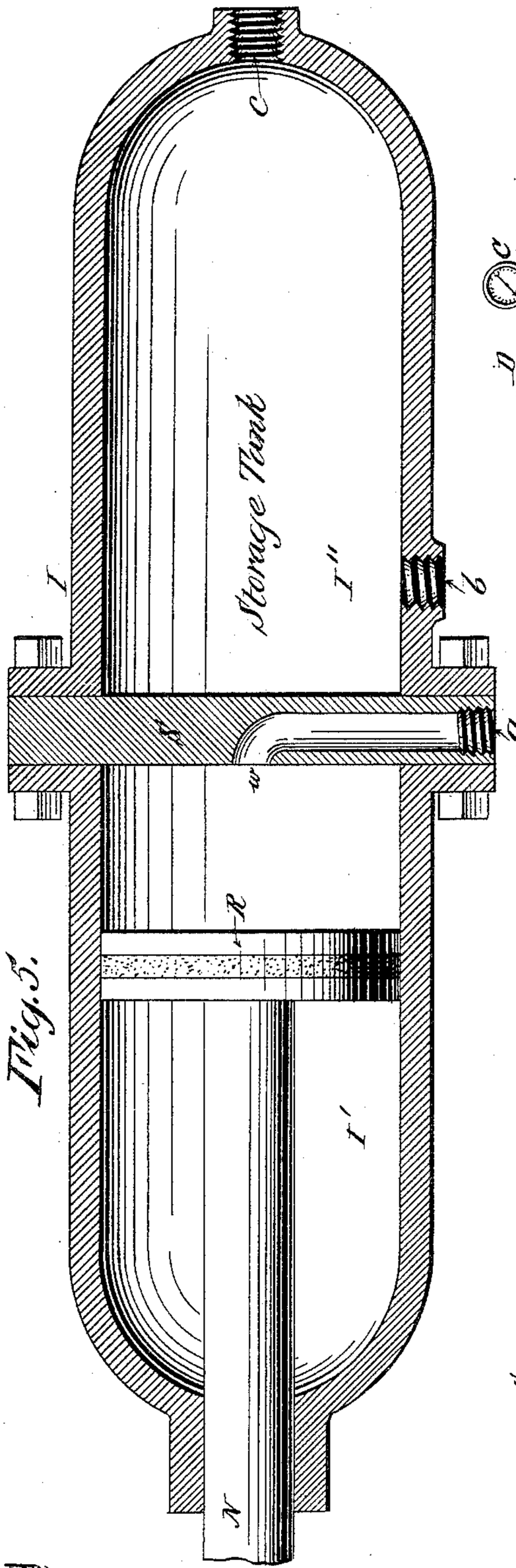

Fig. 5.

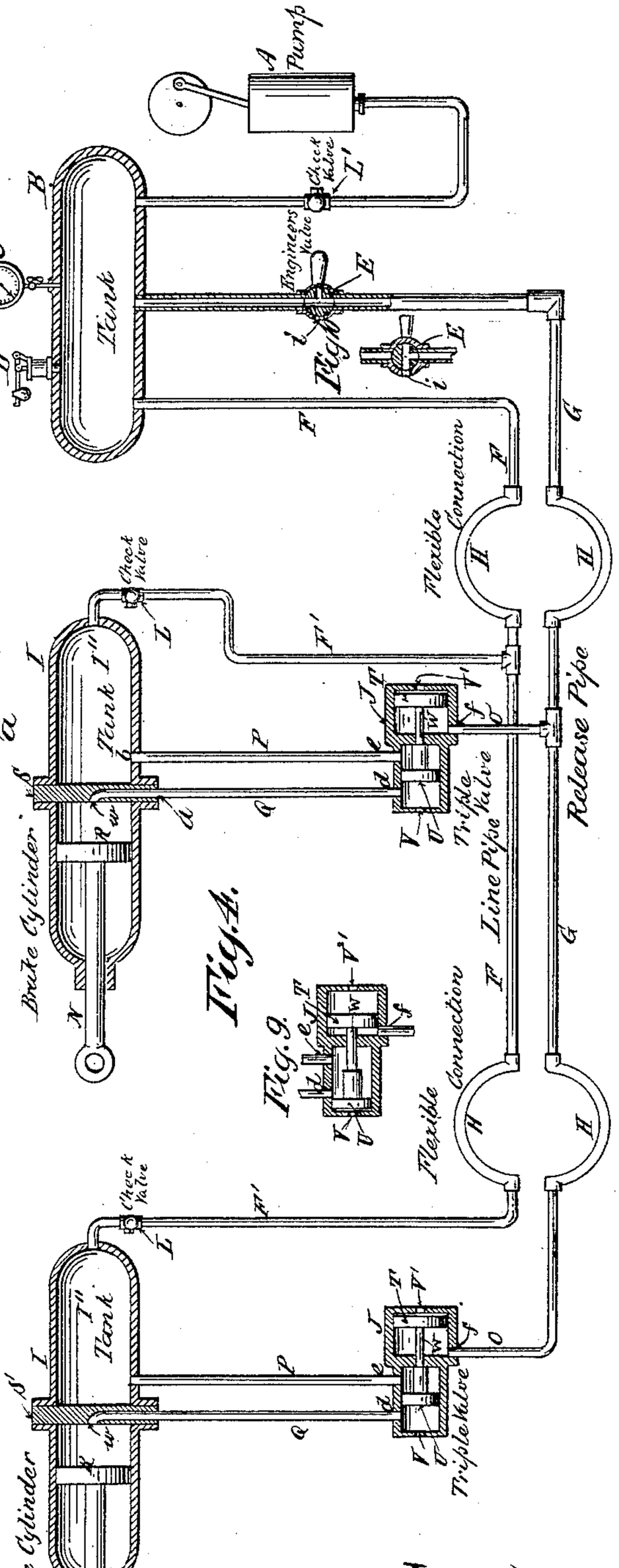

Fig. 4.

Fig. 9.

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(No Model.) 4 Sheets—Sheet 4.

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STRAIGHT AIR AUTOMATIC BRAKE.

No. 435,791. Patented Sept. 2, 1890.

Fig. 6.

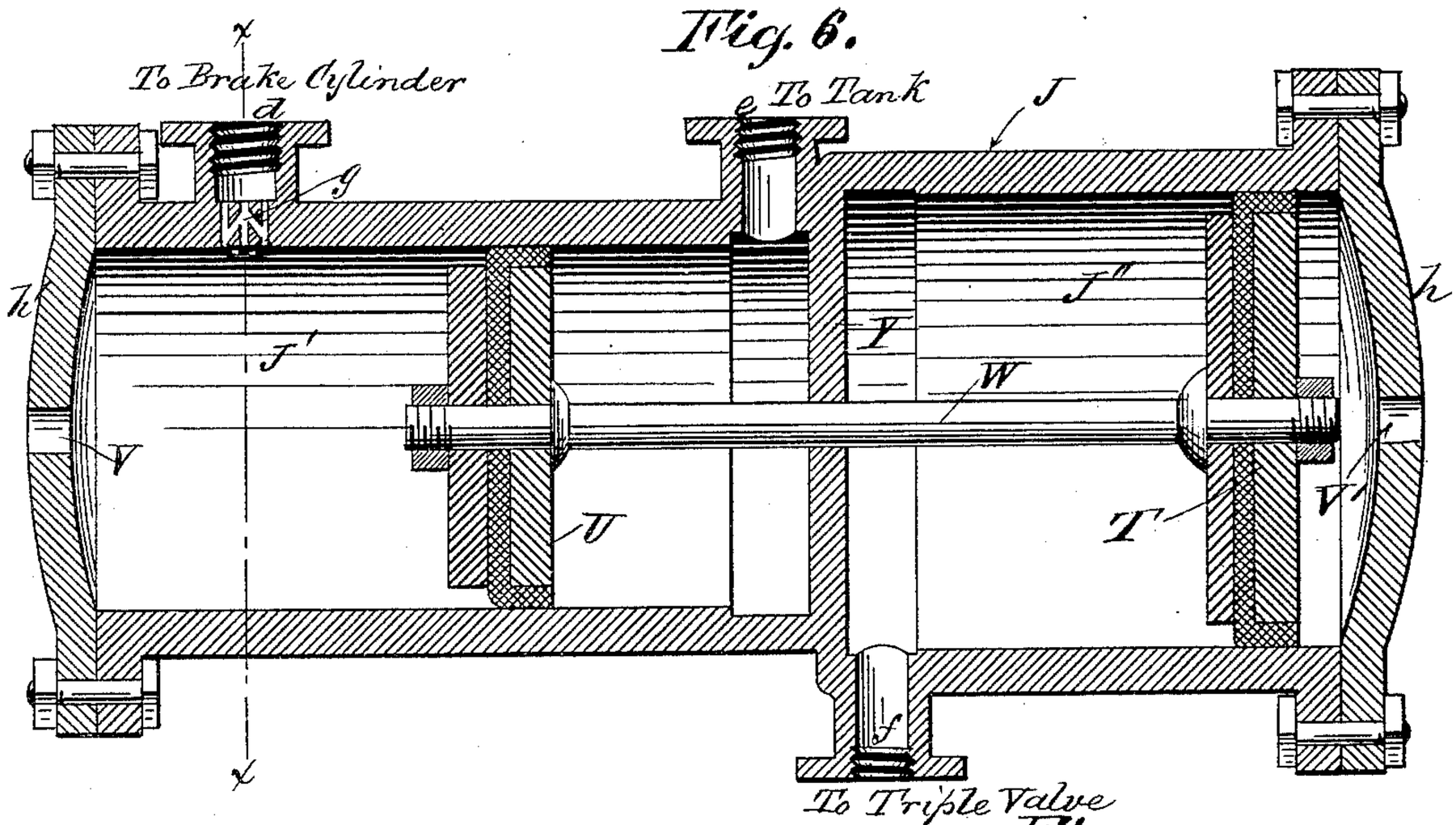


Fig. 7.

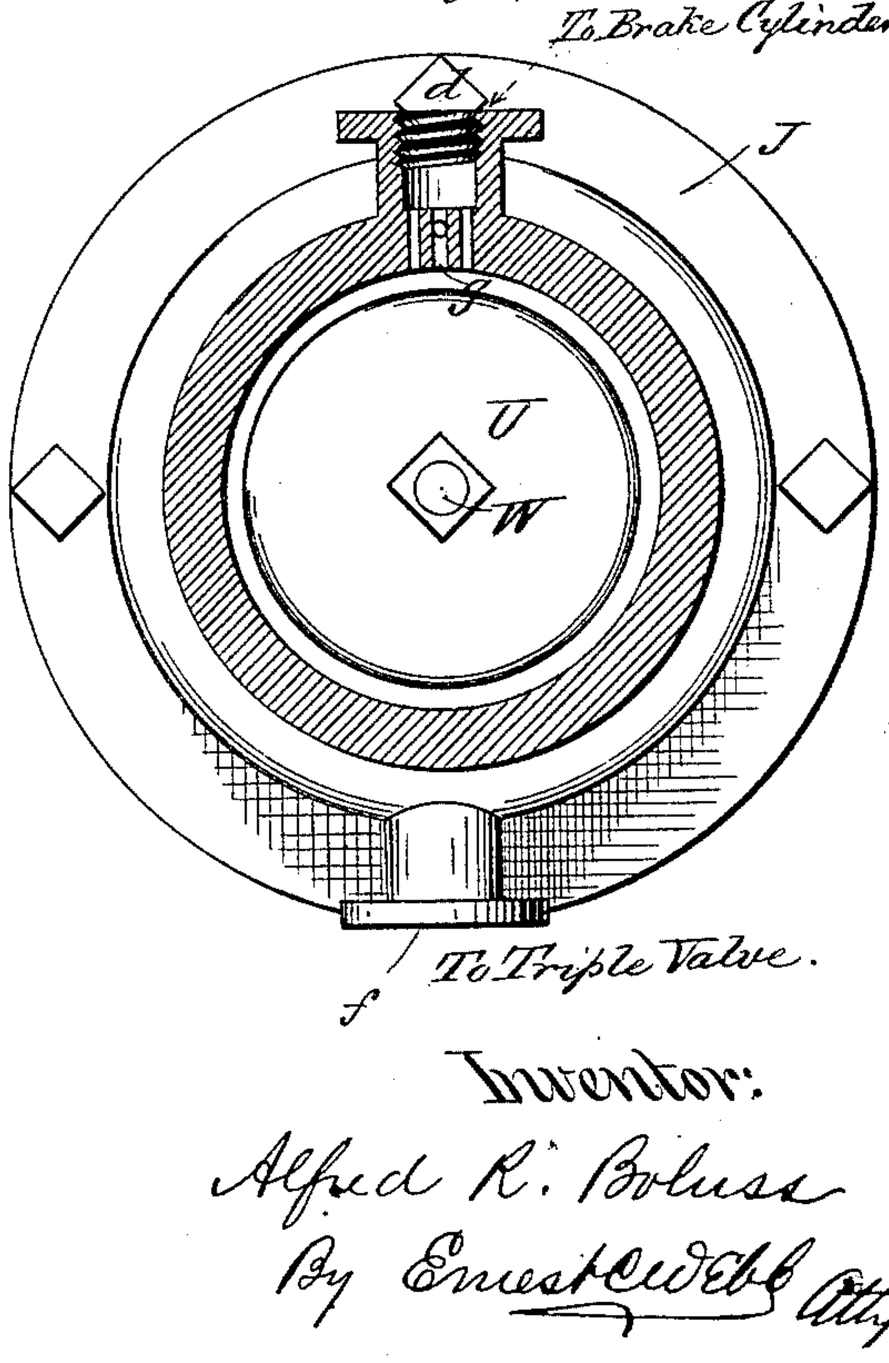
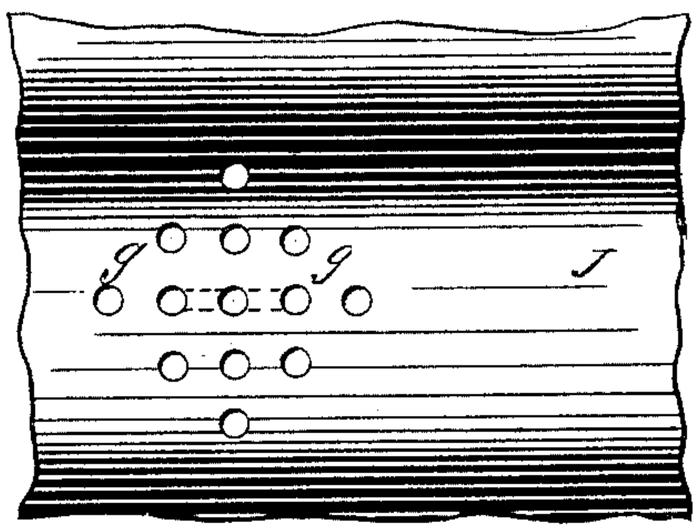


Fig. 8.



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UNITED STATES PATENT OFFICE.

ALFRED R. BOLUSS, OF NORWOOD, OHIO.

STRAIGHT AIR AUTOMATIC BRAKE.

SPECIFICATION forming part of Letters Patent No. 435,791, dated September 2, 1890.

Application filed October 29, 1889. Serial No. 328,589. (No model.)

To all whom it may concern:

Be it known that I, ALFRED R. BOLUSS, a citizen of the United States, residing at Norwood, in the county of Hamilton, in the State of Ohio, have invented certain new and useful Improvements in Straight Air Automatic Brakes, of which the following is a description.

My invention relates to improvements in a system of straight air automatic brakes, and has for its object the simplification of such a system and the more direct action of the brakes and to obviate any chance for a misapplication of the brakes and the danger of any portion of the system not operating perfectly and freely, and also the rendering of such a system automatic in its action, either when the engineer or person handling the brakes shall through carelessness or inattention not manipulate the apparatus properly or in case of accident the train should become broken or one car parted from another.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are designated by similar letters of reference, Figures 1 and 2 are diagrams (side and bottom) showing the complete system as applied to a train of cars. Fig. 3 is a detail view of the apparatus as applied to the brakes of a single car. Fig. 4 represents more in detail the general outline of the various parts of my improved brake system and shows the position the engineer's valve and triple valve occupy when the brakes are off. Fig. 5 is a longitudinal sectional view of the storage-tank and brake-cylinder. Fig. 6 is a detail view of my improved triple valve. Fig. 7 is a section on the line *x x* of Fig. 6, showing my improved inlet and outlet port. Fig. 8 is a plan view of this port. Fig. 9 is a sectional view of the triple valve in the position it occupies when the brakes are thrown on, and Fig. 10 shows the position of the engineer's valve when the brakes are thrown on.

A is the air-pump for compressing the air into the reservoir B.

C is a pressure-gage.

D is a safety-valve.

E is the engineer's operating-valve.

F is the line of pipe through which the compressed air is supplied to the brakes.

G is a releasing-pipe.

H H are flexible couplings between the cars.

I I are the main storage-tanks and brake-cylinders, one of which is located under each car.

J J are the triple valves.

L L are check-valves in the pipes F′ F′, connecting the main-line pipe with the storage-chambers.

M M are the brakes, and N N are the main connecting-rods between the brakes and the brake-cylinders I I.

O O are pipes connecting the triple valves J J with the main release-pipe G, P P pipes connecting the brake storage-tanks I I with the triple valves J J, and Q Q pipes connecting the triple valves J J with the brake-cylinders I I.

Fig. 5 shows in detail the main brake-cylinder and storage-tank I. It is divided into two air-tight portions I′ and I″ by the diaphragm S, through which passes the inlet-port *w*, which is connected with the pipe Q at *a*.

b is a nipple connecting the pipe P to the brake storage-tank I″, and *c* is a nipple in the storage-tank, to which is connected the pipe F′.

The triple valve is shown is detail in Figs. 6, 7, and 8. This triple valve has an outer casing provided with heads *h h′*, in which are openings V V′.

Y is a diaphragm separating the valve-cylinder into two chambers J′ J″, through whose center passes the air-tight connecting-rod W, at the extremities of which are located the piston-heads T U. The piston-head T has a larger area than the piston-head U, the reason for which will be explained farther on.

f is a port leading from the chamber J″ into pipe O and thence to the release-pipe G.

e is a port leading from chamber J′ through pipe P to the storage-tank.

d is a port leading from the other end of the chamber J′ through pipe Q and the diaphragm S into the brake-cylinder. The port *d* communicates with chamber J′ through the holes *g*, so arranged that as the piston-head U passes over them the area of inlet through said holes will be gradually enlarged or reduced, as may be determined by the direction in which the piston-head U is moving.

The operation is as follows: When the apparatus is in the position shown in Fig. 4, with the engineer's valve set in the position shown, the air-pressure from the main tank B is transmitted to the braking apparatus through both of the pipes F G. That portion of it passing through the pipe F passes through the pipes F′, through check-valves L, into the storage-cylinders I″, and from these tanks through the pipes P to the chambers J′ of the triple valves J, exerting its pressure against the piston-heads U. The air-pressure also passes through the pipe G and connecting-pipes O into the other chambers J″ of the triple valves J, exerting its pressure against the piston-heads T. As the area of the heads T is greater than the area of the heads U, the difference of pressure exerted against the piston-heads T over that exerted against the piston-heads U maintains these pistons in a position shown in Fig. 4. In this position the pipe Q will connect the brake-cylinder I′ through the port *w*, pipe Q, port *d*, and outlet V with the outer air, so that no pressure is exerted against the brake piston-heads R, and therefore the brakes are released and the car-wheels free to revolve. If it be desired to set the brakes, the engineer turns the valve E into the position shown in Fig. 10. When the valve E is in this position, the air-supply from the storage-tank B is cut off from the pipe G and the pipe G connected with the outer air through the port I. This relieves the pressure which existed upon the face of the piston-heads T of the triple valves and allows the pressure which exists against the face of the piston-heads U to force the pistons forward into the position shown in Fig. 9. When this takes place, the port *d* is uncovered by the piston-head U passing it, and the air stored in the tank I″ passes through pipe P, chambers J′ of the triple valves J, thence through port *d*, pipes Q, and ports *w*, and is exerted against the face of the brake piston-heads R, forcing them forward and setting the brakes.

Fig. 4 represents the normal position of the brakes while the cars are running. If through accident the train should be parted, a break would occur in the pipes connecting the cars together—in all probability at the flexible connections H. When this takes place, the brakes will be automatically applied to the cars by the following operation: The brake storage-tanks I″ always contain air under pressure, which cannot escape from them on account of the check-valves L, except through the pipes P into the chambers J′ of the triple valves J. The main release-pipe G being broken, a communication is thereby established with the open air at the point of rupture, and the same action takes place as when the engineer turns his valve to the position shown in Fig. 10. The pressure will be removed from the face of the piston-heads T, and the pressure of the air from the tanks I″ through the pipe P, will act upon the piston-heads U and throw the pistons forward as before, and the air pressure from the tanks I″ will pass through pipes P, triple-valve chambers J′, ports *d*, pipes Q, and ports *w*, and be applied to the face of the brake piston-heads R. When the engineer desires to apply the brakes gradually, either to slack the speed of the train or to bring it to a standstill, by turning the valve E slowly the release-pipe G is gradually opened through port *i* to the outer air. The pressure existing against the piston-heads T is thereby gradually removed, and the pressure existing against the piston-heads U takes effect by degrees and slowly forces the pistons forward, thereby gradually uncovering the graduated holes *g* of ports *d*, allowing the air-pressure from the storage-tanks I″ to be gradually applied to the brake piston-heads R, causing the brakes M to be slowly and easily set. The motion of the compound piston can be arrested at any point by simply turning the valve E back to its original position, as shown in Fig. 4. A certain amount of pressure by this means can be applied to the brakes, varying from almost nothing up to the full amount, so that the motion of the train can be very gradually arrested until brought to a full stop, or the speed can be slowed up to a given amount and then held at that. In this way all sudden or jerking action is relieved and all danger of parting the train from this cause or damaging the contents of the cars by such action is obviated. It will be seen from the drawings that there are no cocks upon any of the pipes running under the cars which may be turned maliciously or by accident, thereby preventing the brakes from acting properly. The whole operation of setting and releasing the brakes is under the control of the engineer at the locomotive by means of one and the only valve E.

In an application filed by me October 29, 1889, Serial No. 328,587, I have described a form of valve E to be used in this connection, by means of which it is impossible for the engineer to throw the valve in the wrong direction when it is desired to brake the train, the valve operating equally well whichever way it is turned, so that in case of accident and the engineer becoming confused under excitement he cannot turn the valve the wrong way.

In another application filed by me October 29, 1889, Serial No. 328,588, I have shown another form of this valve E, so arranged that if the engineer, through carelessness or accident, releases his hold upon the controlling-lever the valve will automatically shift itself and set the brakes. It will be seen from this description that it is next to impossible for an accident to occur without the brakes being automatically set or for the engineer to neglect his duty in attending to the controlling-valve without the same action taking

place, and that the whole apparatus is so simple in its construction and so free from all unnecessary parts that it will be entirely positive and certain in its action at all times and under all circumstances.

Some of the advantages resulting from the construction hereinbefore described are the following: The main-line pipe is open at all times from the main reservoir or tank to the auxiliary reservoirs or tanks, and therefore these auxiliary tanks are constantly supplied with pressure, whether the brakes are set or released. Thus there is obviated the necessity of stopping on grades in order to refill the auxiliary reservoirs. Again, there are no cocks on the line-pipe to be tampered with by malicious or careless persons. Again, pressure being in the storage-tanks, a long train of cars may be operated without serious shocks to the cars. Again, in my improved system, as pressure of the air is always constant, an engineer has nothing to do with the storage of it in the auxiliary tanks, and therefore in setting the brakes cannot have a varying pressure to apply at times more than is required to satisfactorily operate the brakes.

What I claim is—

1. An air-brake system comprising a main tank or reservoir, a main pipe extending directly from the main tank to the storage-tank under each car, a triple valve comprising a shell opening into the atmosphere at each end and containing pistons of unequal area arranged in isolated chambers, the smaller of which communicates with the brake-cylinder and auxiliary reservoir and the larger of which communicates with the release-pipe, a release-pipe extending from said main tank to the triple valve, an engineer's valve interposed in said release-pipe, and supply-passages connecting the storage or auxiliary tank and the triple valve and the triple valve and brake-cylinder, the supply-passage between the triple valve and brake-cylinder serving also as a return-passage from the brake-cylinder to the triple valve, all combined and arranged to operate substantially as described.

2. An air-brake system comprising a main tank or reservoir, a main pipe extending directly from the main tank to the auxiliary storage-tank under each car of a train and in constant open communication therewith and provided with check-valves to prevent the backflow of pressure from the auxiliary storage-tanks, a triple valve for each car, a release-pipe extending from said main tank to the triple valves only, an engineer's valve interposed in said release-pipe and communicating with it only, supply-pipes which connect the storage or auxiliary tanks and the triple valves, and supply-pipes which connect the triple valves and brake-cylinders, the supply-pipes between the triple valves and brake-cylinders serving also as return-passages from the brake-cylinders to the triple valves, all combined and arranged to operate substantially as described.

In testimony whereof I have hereunto set my hand this 12th day of October, A. D. 1889.

ALFRED R. BOLUSS.

Witnesses:

JAC. C. LOWY,

ERNEST C. WEBB.