(No Model.) 3 Sheets—Sheet 1.

W. H. HALL.

AUTOMATIC AIR BRAKE FOR RAILWAY TRAINS.

No. 574,062. Patented Dec. 29, 1896.

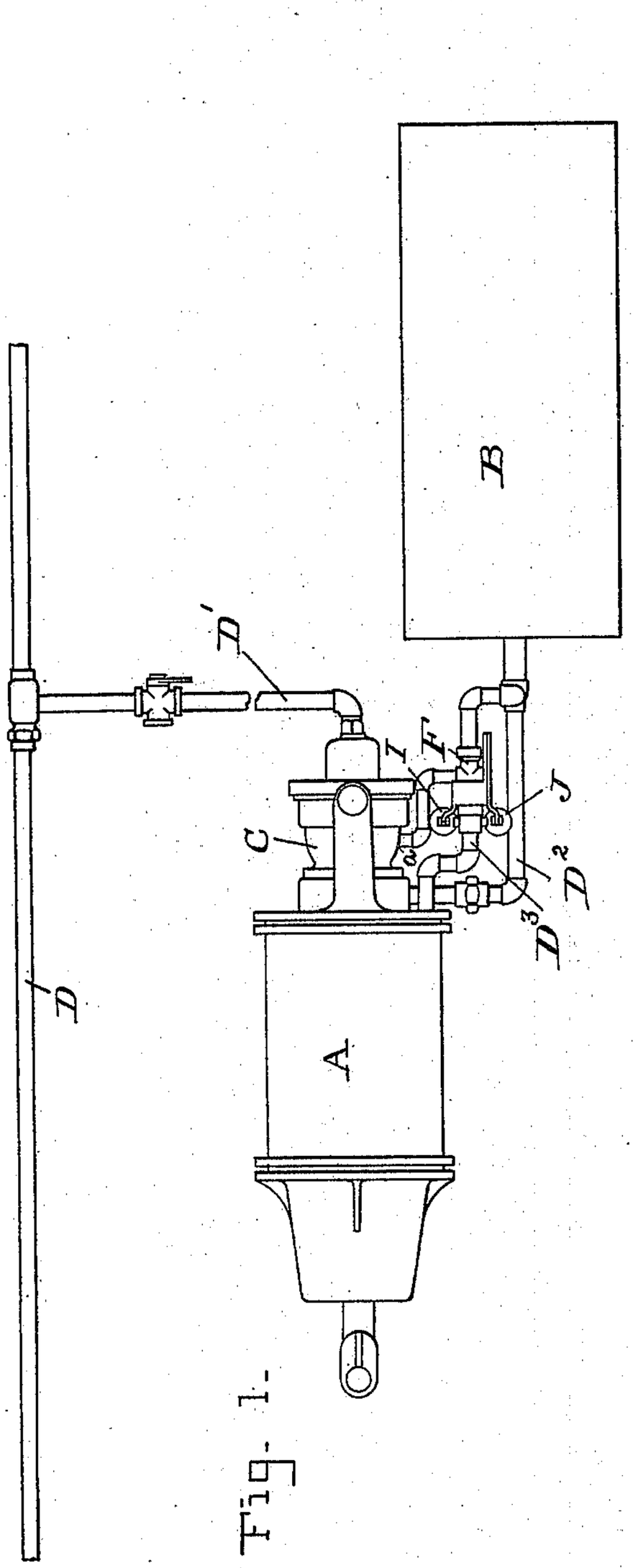

Fig. 1.

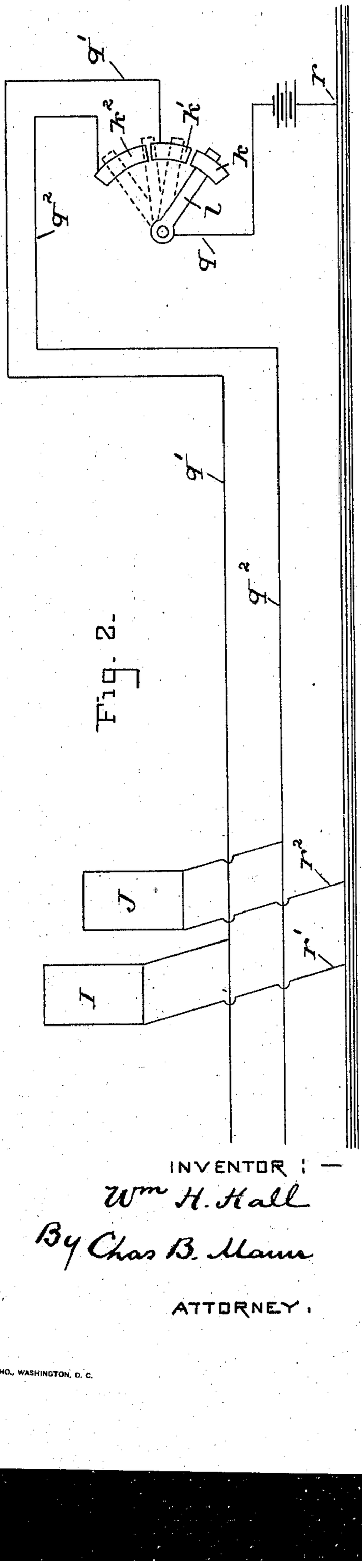

Fig. 2.

WITNESSES:—

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C. P. Heinemann

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Wm H. Hall

By Chas B. Mann

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(No Model.) 3 Sheets—Sheet 2.

W. H. HALL.

AUTOMATIC AIR BRAKE FOR RAILWAY TRAINS.

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Fig. 7.

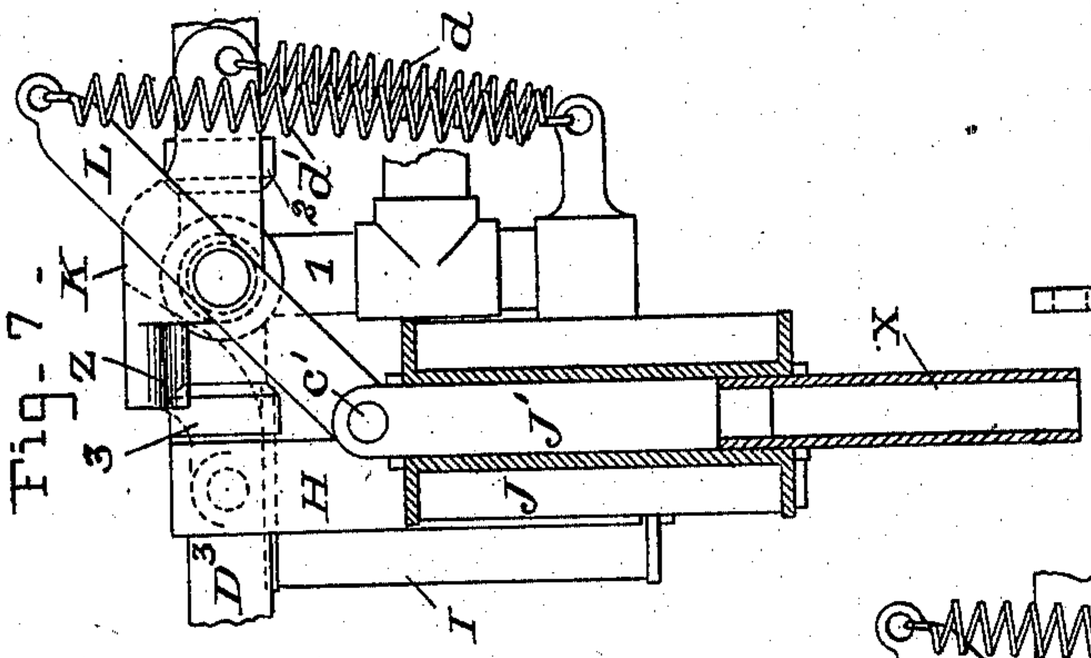

Fig. 4.

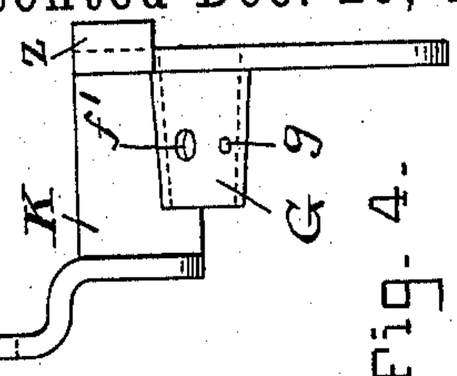

Fig. 8.

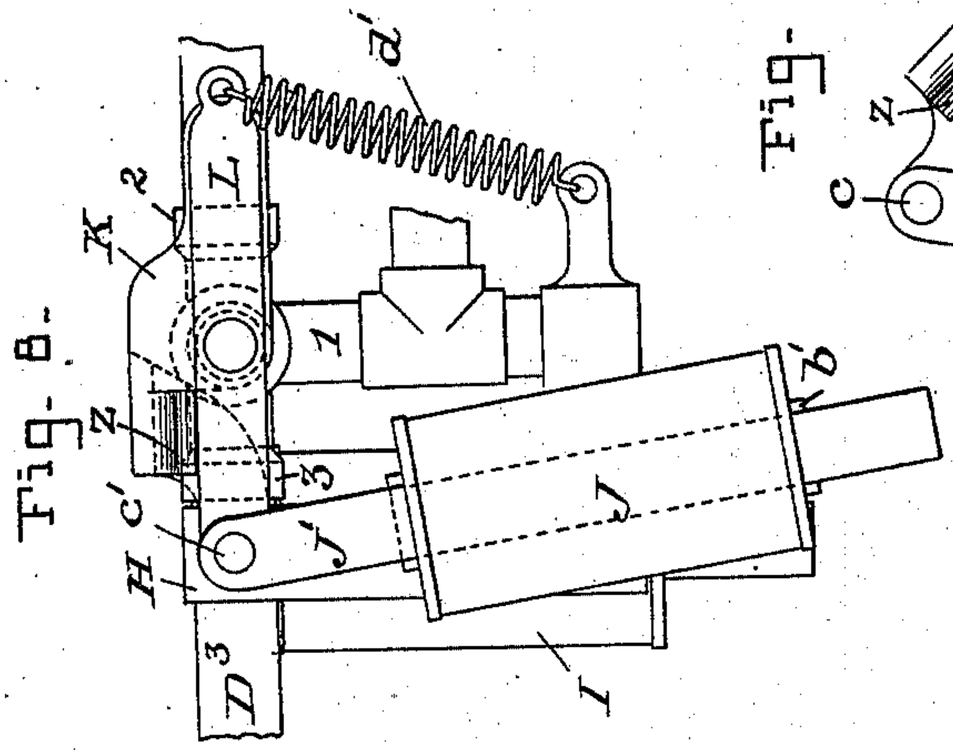

Fig. 9.

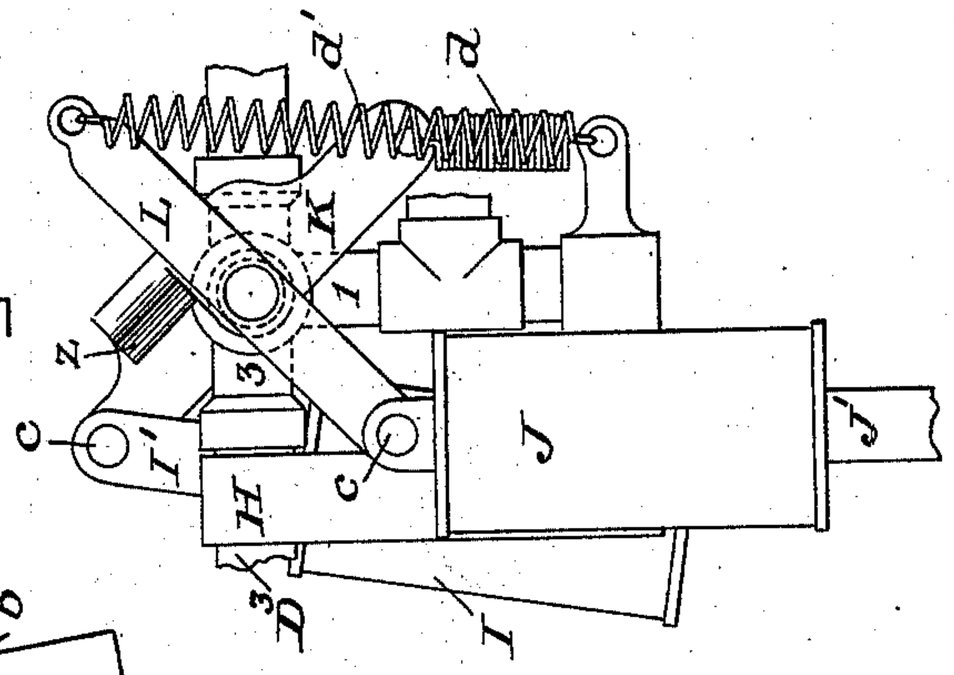

Fig. 5.

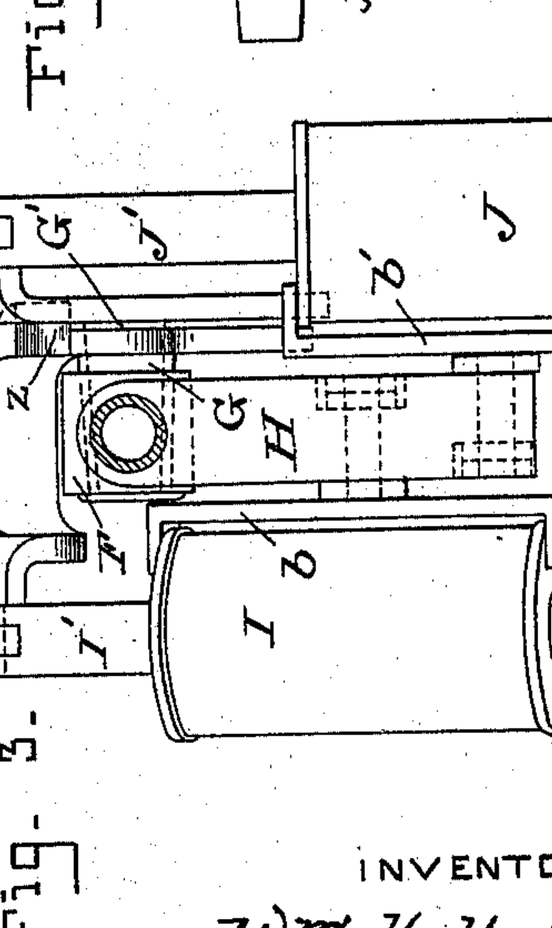

Fig. 6.

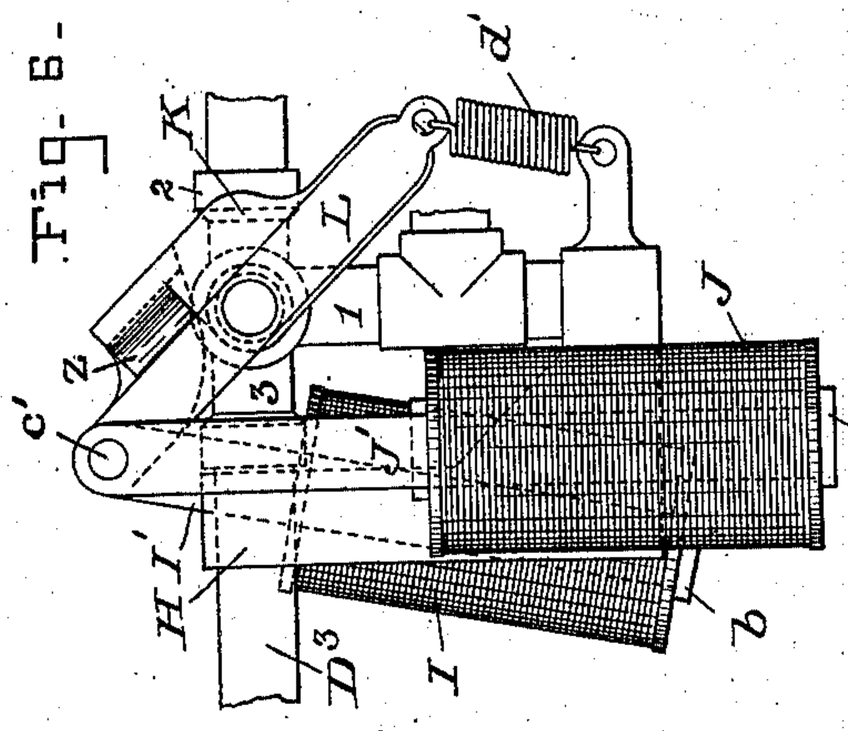

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

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AUTOMATIC AIR BRAKE FOR RAILWAY TRAINS.

No. 574,062. Patented Dec. 29, 1896.

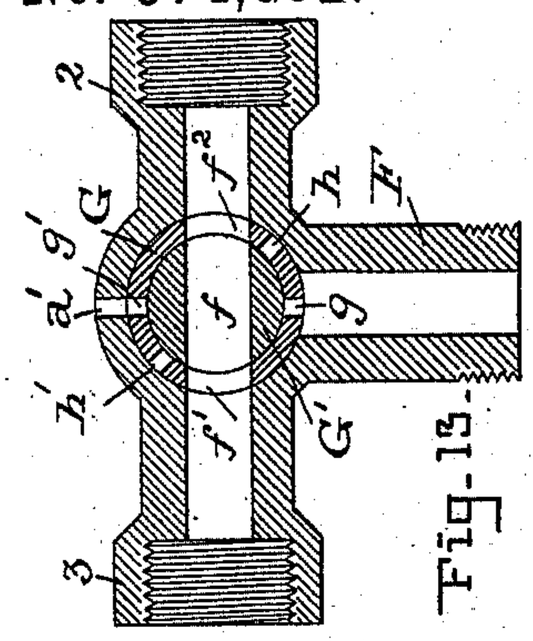

Fig. 9.

Fig. 11.

Fig. 12.

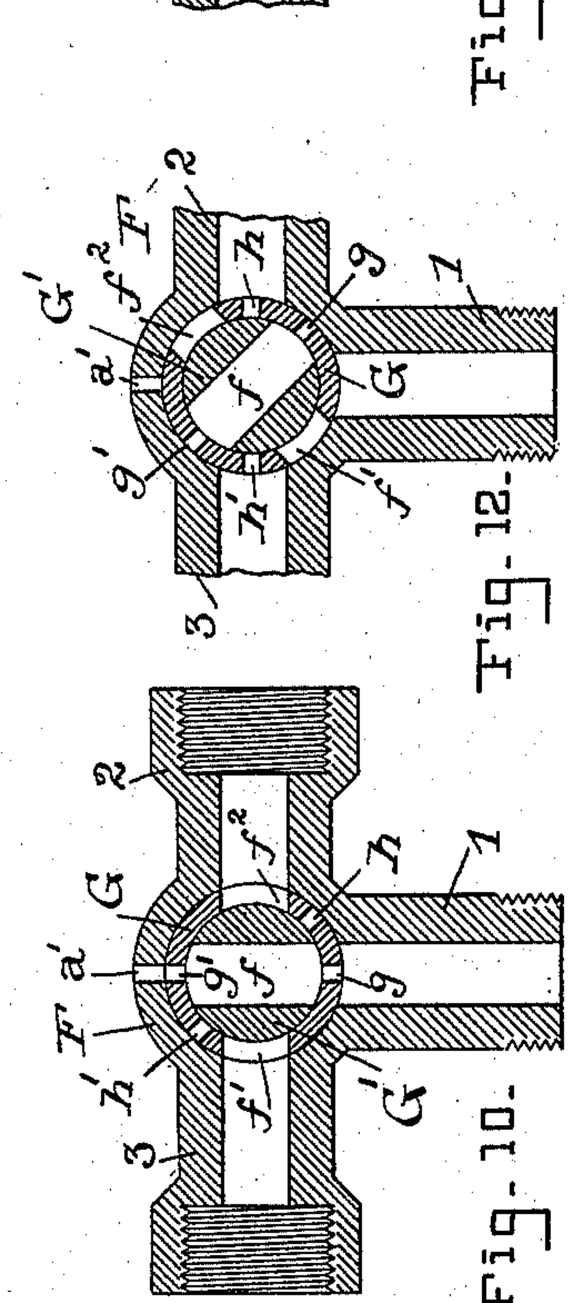

Fig. 10.

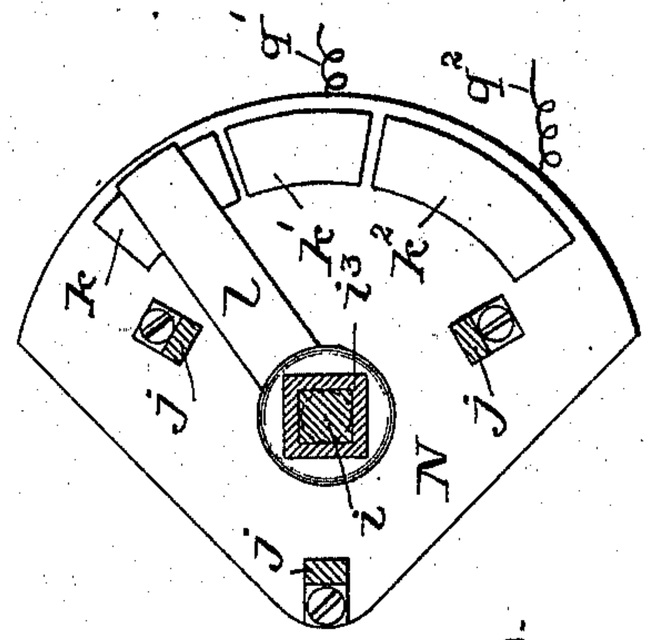

Fig. 15.

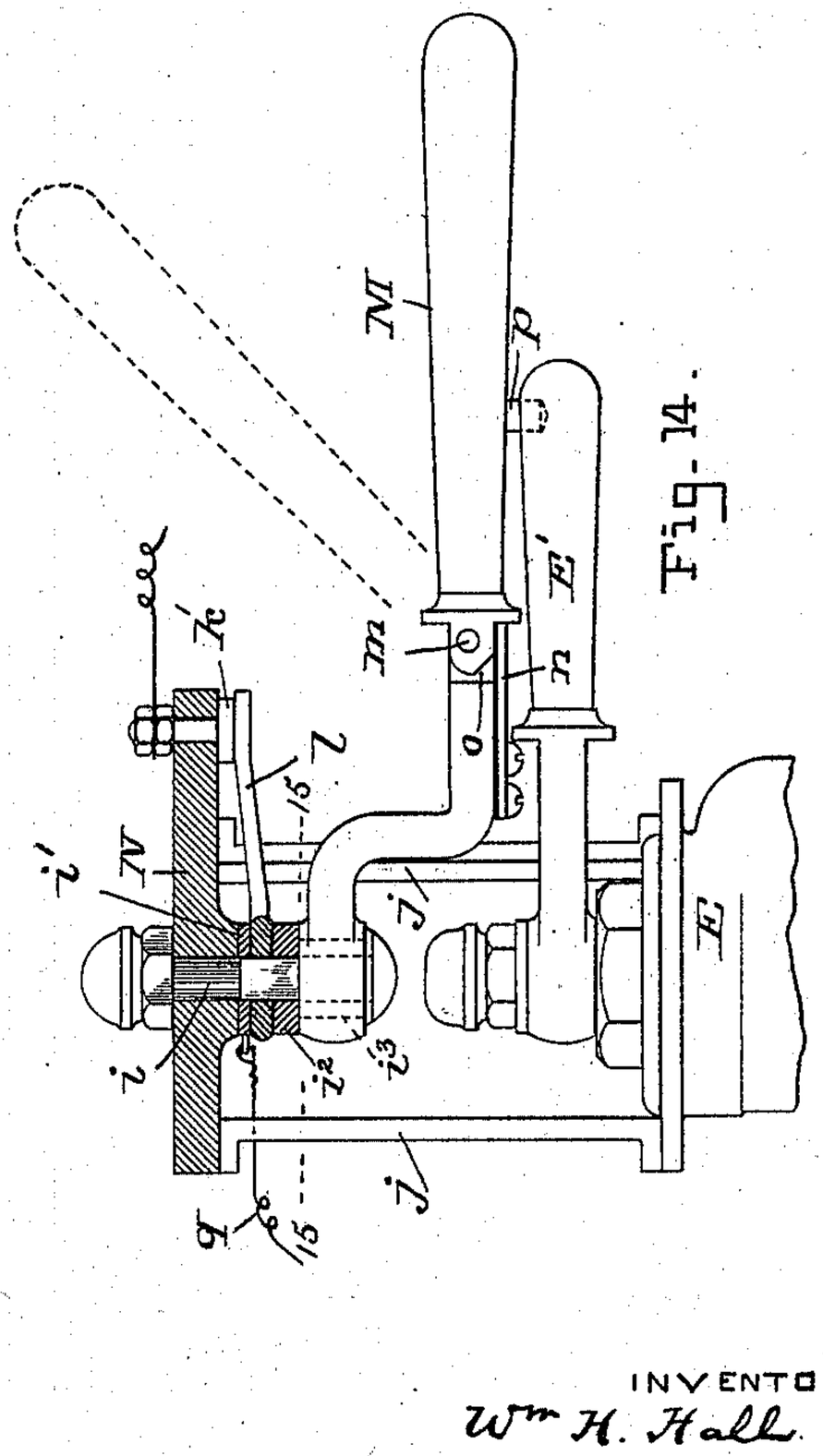

Fig. 14.

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UNITED STATES PATENT OFFICE.

WILLIAM HARRY HALL, OF BALTIMORE, MARYLAND, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO THOMAS M. DUKEHART AND JOHN T. MASON, R, OF SAME PLACE.

AUTOMATIC AIR-BRAKE FOR RAILWAY-TRAINS.

SPECIFICATION forming part of Letters Patent No. 574,062, dated December 29, 1896.

Application filed April 14, 1896. Serial No. 587,476. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HARRY HALL, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Automatic Air-Brakes for Railway-Trains, of which the following is a specification.

This invention relates to improvements in automatic air-brakes for railway-trains. The air-brakes referred to are the automatic brakes of the Westinghouse type now generally used.

The objects of my improvements are, first, to provide means whereby the automatic air-brake on all the cars on trains of any length may be simultaneously applied; second, to provide means whereby the auxiliary reservoir on each car of a train may be recharged while the brakes are applied; third, to provide means which will enable all the brakes of a long train to be partially released and then before they are fully released to hold them in the partially-applied position.

The parts comprised in my invention are added to the usual automatic air-brake parts and are so combined therewith as to allow the automatic air-brake their customary action without hindrance whenever it may be preferred to use said old parts alone. At the same time in the performance of certain brake functions my improvements and said automatic air-brake parts may act together in unison; and, again, my improvements alone may be employed to produce certain brake functions without calling into action the triple valve of the automatic air-brake.

In order to make my invention more clearly understood, I have shown in the accompanying drawings certain means for carrying the same into practical effect, without, however, intending to limit my invention to the particular construction which for the sake of illustration I have there shown.

Figure 1 is a plan view of the parts of an automatic air-brake as arranged on the bottom of a car and shows the position of my improvements. Fig. 2 is a diagram showing the battery, two magnets, the controller, and the circuits. Fig. 3 is a front view showing the two electromagnets and connections with my duplex valve. Figs. 4 and 5 are views, respectively, of the bushing-valve and its lever and the plug-valve and its lever. Figs. 6, 7, 8, and 9 are side views of the electromagnets, levers, and duplex valves, the several views indicating the different positions the magnets and levers take in operating the brakes, to wit: the release position, the service-stop position, the lap or blank position, and the emergency-stop position. Figs. 10, 11, 12, and 13 are section views of the duplex valve and T-piece containing them and show the various ports. These four views indicate the different positions of the ports of the two valves when operating the brakes, the several positions being indicated in the same order as stated above for Figs. 6, 7, 8, and 9. Fig. 14 is a view showing the controller and the engineer's brake-valve and the relation of the two. Fig. 15 is an inverted view of the terminals of the wiring and the contact-plates and shows the brush-arm.

The letter A designates the brake-cylinder on a car; B, the auxiliary reservoir; C, the triple valve; D, the train-pipe, and D′ a branch of the train-pipe, connected, as usual, with the triple valve. D^2 is a branch leading from the triple valve to the auxiliary reservoir. These parts are comprised in the old automatic air-brake equipment for cars.

The letter E designates the ordinary engineer's brake-valve mounted in the cab of a locomotive and connected, as usual, with other parts comprising the automatic air-brake.

Commencing now to describe the parts comprising my invention, it is proper to state that I provide an electrically-operated valve which has pipe connections that enable it to be interposed between the auxiliary reservoir and the brake-cylinder. This valve is contained in a T-piece F, having one branch 1, which is in connection with the exhaust-port *a* of the triple valve, a second branch 2, which is in connection with a branch of the train-pipe leading into or out of the auxiliary reservoir, and a third branch 3, which is in connection with the brake-cylinder. This T-piece has an exhaust-port *a′* to the atmosphere, the location of this port being diametrically opposite the said first branch 1. The

new valve contained in this T-piece is a duplex valve and comprises two parts—a bushing G, which partly rotates, and a plug G′, which partly rotates in the bushing. Each of these two parts has a partial rotation independent of the other. In certain positions or under certain circumstances either of these duplex parts by a movement performs a valve function without any movement of the other part, and under different circumstances both parts must move to perform a valve function. For convenience in this specification one of these parts will be termed the "bushing-valve" and the other the "plug-valve." Each of these parts of the duplex valve is controlled by an electromagnet, two magnets thus being used. A hanger H is pendent from the branch pipe D^3, which enters the third branch 3 of the T-piece. The two magnets I J are supported by holders b b', swiveled to the said hanger, one holder being at a side of the hanger opposite the other. Each magnet has an endwise-movable core I′ J′, and the end of each core is jointed at c and c' to a lever, and two levers are used. Each core has a lower end x of brass (non-magnetic) and an upper end of iron. One lever K is connected with the bushing-valve G and causes it to partly rotate, and the other lever L is connected with the plug-valve G′ and causes it to partly rotate. Thus the magnet I moves the bushing-valve and the magnet J moves the plug-valve. When either magnet is energized, the effect is to move its core endwise, and this movement causes one of the levers K or L to tilt and thus shift the valve G or G′. Thus the magnets when energized are capable of moving the valves one way only. In order to move each valve the opposite way, a spring is employed. The end of the lever K has an attached spirals pring d, which is connected with a fixed stud. When the magnet I is not energized, this spring will draw the lever and thereby move the bushing-valve G. In like manner the end of the lever L has a spring d', which operates in the same way. This spring moves the plug-valve G′.

The ordinary engineer's brake-valve is continued in use for the automatic air-brake, and I provide an engineer's switch or controller for operating by an electric circuit the duplex valve of my invention. These two parts—the engineer's brake-valve and the controller—are arranged (see Figs. 14 and 15) so that the engineer can with one hand work either one or the other, or both together, as hereinafter explained.

The several ports of the duplex valve and the different positions they assume in operating the brake will first be explained, and then the wiring and electric circuit and engineer's brake-valve action will be described.

The plug-valve G′ has but one large port or passage f, extending diametrically through it. The bushing-valve G has two emergency ports f' f^2 diametrically opposite each other and as large as the port f in the plug-valve. It also has two ports g g' diametrically opposite, which are the release-ports, and also has two ports h h', which are the graduation or service-application ports The first position of the duplex valve and its operating parts is shown in Figs. 6 and 10. This is the release position, as when the train is running. In this position the circuit is broken and neither magnet is energized, and the position the cores, levers, and ports of the two valves have is indicated.

The passage f of the plug-valve and the release-ports g g' of the bushing-valve are all in alinement or coincidence with the branch 1 and exhaust-port a', so that air may pass from the brake-cylinder in the usual manner through the release-valve of the triple and out of the triple exhaust-port a, then through branch 1 and ports g f g' and a' to the atmosphere.

The second position is shown in Figs. 7 and 11 and is termed the "service-application" position, and is used for checking up the speed of the train or for stopping at some regular stopping-place, such as a station. In this position the electric circuit is closed and both magnets are energized, which moves the bushing-valve G forty-five degrees and the plug-valve G′ ninety degrees. In this position the release-ports are closed and communication is established, through the ports h, f, and h', between the auxiliary reservoir and brake-cylinder. If it is desired after thus applying the brakes partially to hold them applied, the valves G G′ should be put in the third position, which is the lap or blank position.

The third position is shown in Figs. 8 and 12. In this all the ports are blanked, or placed on the lap. The magnet I only is energized, and the bushing-valve G stands the same as in the second position. The lever K is the one pulled down by the core of the magnet I. This lever has a lateral lug z, which overlaps the lever L, so that if lever L is all the way up when lever K is pulled down this lug will bear on top of lever L and press it part way down, as in this third position.

The fourth position is shown in Figs. 9 and 13, and is the emergency position for the quickest possible application of the brakes. In this position the magnet J only is energized, which causes the plug-valve to be turned with its large passage f in line with the branches 2 3. The spring d, acting on the lever K, draws the bushing-valve, and its ports are placed the same as in the first position, the large ports f' f^2 now being coincident with the large passage f in the plug-valve. In this "emergency" or fourth position the auxiliary reservoir is in communication with the brake-cylinder.

The usual engineer's brake-valve E employed with the automatic air-brake is used or may be used as heretofore, and when used has its customary action on the triple valve.

In applying the brakes the duplex valve of my invention may be used alone or in conjunction with the triple valve. I provide a controller (shown in Figs. 14 and 15) for the engineer, by means of which he is able to govern the duplex valves G G′ at the same time that by use of the engineer's valve he governs the triple valves. The controller has a handle M, pivoted by a bolt *i*, whose axis is exactly in a vertical line with the axis of the pivot of the handle E′ of the engineer's valve. This bolt *i* turns in a plate N of insulating material, which is supported on suitable standards *j* above the case of the engineer's valve E. On the under side of the plate N are contact-pieces *k k′ k²*, separated from each other, and the said pivot-bolt *i* carries a brush-arm *l*, which projects and when turned makes contact with said pieces *k*. Between the arm *l* and the plate N is a washer *i′*, to which a wire *q* of the battery is attached and leads to the ground at *r*. The controller-handle is insulated from the brush-arm *l* and from the bolt *i* by insulation (denoted *i²* and by broken lines *i³* in Fig. 14.)

The controller-handle M is immediately over and projects parallel with the handle E′ of the engineer's brake-valve. This handle M is in two sections, jointed together at *m*, so as to permit the grasp part to be tilted upward, as indicated in broken lines. One section has a plate-spring *n* and the other a beveled end *o* adjacent the joint *m*. When the handle M is tilted up, the beveled end *o* comes in contact with the said plate-spring, and thereby the handle is kept up. When thus up, the engineer's brake-valve handle E′ is accessible to be grasped alone. When the controller-handle M is down, the plate-spring *n* so acts as to hold it down. This handle also has a pin or lug *p*, which, when the handle is down, engages a socket made in the top side of the brake-valve handle E. This lug or pin serves to keep the two handles connected in operative position, and both may be moved by grasping only the one M.

The wiring and diagrams illustrating the circuits are indicated in Fig. 2. The several positions—first, second, third, and fourth—of the controller-handle are indicated, and these correspond with the same positions already described of the duplex valve G G′.

Referring to the wiring, (see Fig. 2,) when the brush-arm *l* is on contact *k* all the valves will be at the release position. A wire *q′* leads from the second contact-piece *k′* to the magnet I and then to the ground at *r′*, and a wire *q²* leads from the third contact-piece *k²* to the magnet J and then to the ground at *r²*. When the controller M is turned so as to place the brush-arm *l* on both contacts *k² k²*, (second position,) both magnets I J are energized, and the brakes are thereby applied for service. When the brush-arm *l* is on the second contact *k′* only, (third position,) the magnet I is energized and the ports in valves G G′ are blanked. When the brush-arm *l* is on the third contact *k²*, (fourth position,) the magnet J will be energized for the emergency application.

The source of electric energy may be storage batteries or otherwise.

The triple valve may be kept at the release position by maintaining the train-pipe pressure at the maximum, and then by disconnecting the handle of the controller from the handle of the engineer's brake-valve all the duplex valves of my improvement in a train may simultaneously or instantly be placed in the emergency position, and thus apply the brakes quickly with auxiliary-reservoir pressure alone. At the same time air from the main reservoir on the locomotive and train-pipe may pass through the feeding-in valve of the triple, (the triple-valve parts, as above stated, being at the release position,) and thereby recharge all the auxiliary reservoirs in the train. Thus the pressure applied in the brake-cylinders may be increased to the maximum.

With my invention either the old plain triple valve, like that, for instance, in United States Patent No. 220,556, may be used, or the more modern quick-action triple valve, like that, for instance, in United States Patent No. 376,837, may be used.

Having thus described my invention, I claim—

1. An automatic air-brake comprising a brake-cylinder, an auxiliary reservoir, a triple valve and a train-pipe, in combination with an electrically-operated valve whose case has three connections two of which are made in the pipe between the auxiliary reservoir and brake-cylinder while the third connection is made with the exhaust-port of the triple valve.

2. An automatic air-brake comprising a brake-cylinder, an auxiliary reservoir, a triple valve and a train-pipe, in combination with an electrically-operated valve having a movable bushing and a movable plug in said bushing—said two parts having different ports for the passage of air-pressure to effect the release of the brakes, the gradual or service application of the brakes, and the emergency application of the brakes.

3. An automatic air-brake comprising a brake-cylinder, an auxiliary reservoir, a triple valve and a train-pipe, in combination with an electrically-operated valve controlling the passage of air-pressure when releasing, when gradually applying for service, and when applying for emergency stops; a spring to move said valve one way; and an electromagnet to move the valve the opposite way.

4. An automatic air-brake comprising a brake-cylinder, an auxiliary reservoir, a triple valve and a train-pipe, in combination with an electrically-operated valve having two separately-movable parts; an electromagnet connected with and capable of moving one of said parts; another electromagnet connected with and capable of moving the other part; and electric-circuit connections with said two

magnets, whereby either one or both may be operated at the same time.

5. An automatic air-brake comprising a brake-cylinder, an auxiliary reservoir, a triple valve and a train-pipe, in combination with an electrically-operated valve having two separately-movable parts; an electromagnet in connection with said valve; a controller for the engineer to operate manually; and an electric circuit including the electromagnet and controller.

6. The combination of an air-brake pipe; a duplex valve having a bushing which partly rotates and a plug which partly rotates in the bushing; an electromagnet arranged to move the bushing; another electromagnet arranged to move the plug; a controller for the engineer to operate manually; and an electric circuit including the electromagnet and controller.

7. The combination of an air-brake pipe; a duplex valve having a bushing which partly rotates and a plug which partly rotates in the bushing; a lever to each of said valve parts; two holders each separately swiveled; an electromagnet mounted in each of said holders and each magnet connected with one of said levers; a controller for the engineer to operate manually; and an electric circuit including the electromagnet and controller.

8. An automatic air-brake comprising a brake-cylinder, an auxiliary reservoir, a triple valve and a train-pipe, in combination with an electrically-operated valve whose case has a port connected with the ordinary exhaust-port of the triple valve and provided with an exhaust-port to the atmosphere, whereby air discharged from the brake-cylinder by the triple valve must pass through the case of said electrically-operated valve; an electromagnet connected with and capable of moving said valve; a controller for the engineer to operate manually; and an electric circuit including the electromagnet and controller.

9. The combination of an air-brake pipe; a duplex valve having a bushing which partly rotates and a plug which partly rotates in the bushing—said bushing and plug having ports for the passage of air when releasing, ports for the passage of air when making service or gradual applications, and ports for the passage of air when making emergency applications; and an electromagnet and a spring to operate the said valve.

In testimony whereof I affix my signature in the presence of two witnesses.

WILLIAM HARRY HALL.

Witnesses:

THOS. C. BAILEY,

CHARLES B. MANN, Jr.