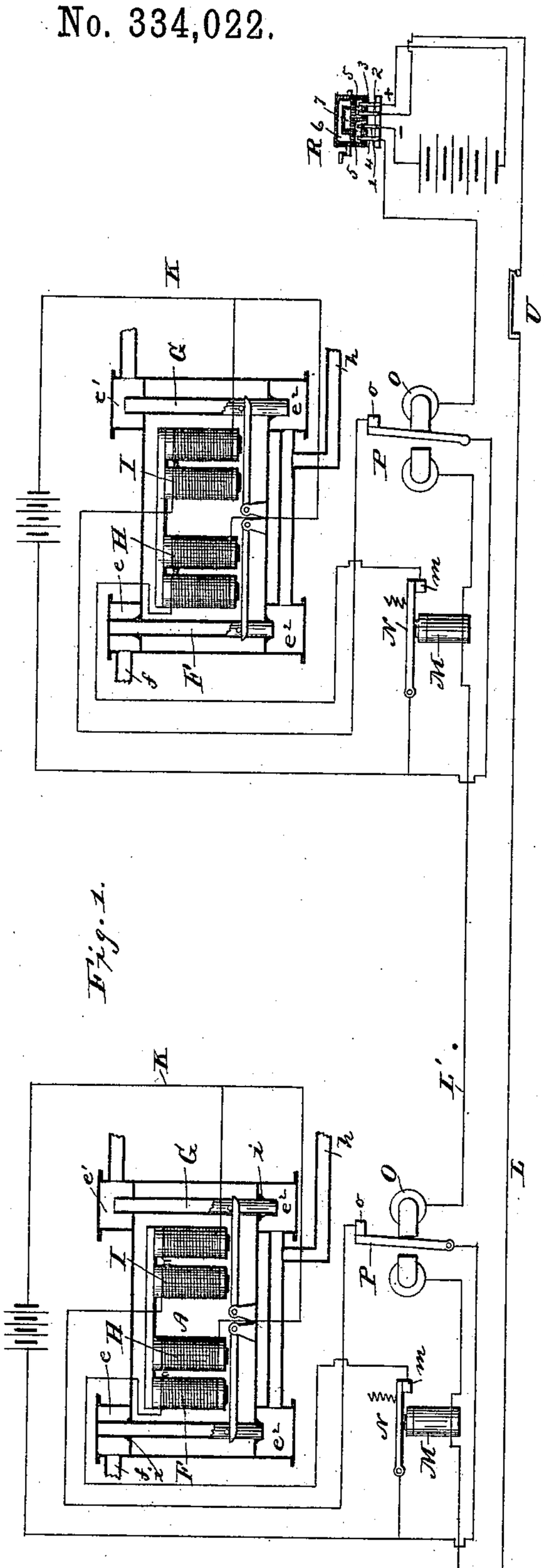
(No Model.)

H. HOLLERITH.

ELECTRO MAGNETICALLY OPERATED AIR BRAKE FOR RAILWAY CARS.

No. 334,022. Patented Jan. 12, 1886.



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ELECTRO-MAGNETICALLY-OPERATED AIR-BRAKE FOR RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 334,022, dated January 12, 1886.

Application filed April 30, 1885. Serial No. 164,010. (No model.)

To all whom it may concern:

Be it known that I, HERMAN HOLLERITH, of St. Louis, in the county of St. Louis and State of Missouri, have invented certain new and useful Improvements in Air-Brakes for Railway-Trains; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

My invention relates to that class of air-brakes for railway-trains in which the valves which control the admission of compressed air from the air-supply or power chambers to the brake-cylinders and the exhaustion of air from said brake-cylinders into the atmosphere are operated by means of electro-magnetism; and it relates particularly to that species in which the inlet and exhaust valves are controlled independently of each other, so as to enable the brakes to be put fully on, or partially on, or taken off by the manipulation of one or more electric circuits.

I will first describe my invention with reference to the accompanying drawings, and will then point out what I deem to be its features of novelty in the claims at the end of this specification.

In said drawings, Figure 1 is a diagram showing the application of my invention to a train of two cars. Fig. 2 represents a modification of the arrangement shown in Fig. 1.

A represents a valve-casing containing a tubular inlet-valve, F, and a tubular exhaust-valve, G. The upper end of the inlet-valve F operates within a small chamber, *e*, which is in communication, through a pipe, *f*, with the auxiliary compressed-air reservoir, and the upper end of the exhaust-valve G operates within another small chamber, *e'*, which is in communication with the atmosphere, while the lower ends of both said valves operate within small chambers e^2 e^3 in communication with each other and with the brake-cylinders through a pipe, *h*. The inlet-valve F seats upward, while the exhaust-valve G seats downward, and each is provided with suitable packings, *i*, to prevent leakage of air. The inlet-valve F is controlled by an electro-magnet, H, and the exhaust-valve G is controlled by an independent electro-magnet, I, the said two electro-magnets being arranged in a local circuit, K, charged either by a primary or a secondary battery or batteries, or in any other suitable manner. Each car is provided with an equipment such as just described. A main electric circuit, L L', extends throughout the train. This main circuit has interposed in it on each car an ordinary relay or electro-magnet, M, having a neutral armature, N, which is adapted to form part of that portion of the local circuit in which the electro-magnet H, controlling the inlet-valve, is included, and it has also interposed in it on each car a polarized relay, O, whose polarized armature P is adapted to form part of that part of the local circuit which includes the electro-magnet I, which controls the exhaust-valve G. Upon the engine is mounted a suitable current-generator for charging the main circuit, and which is preferably an ordinary battery. The wires from the generator extend to a suitable current-reverser—such, for instance, as shown in Fig. 1, wherein one of said wires (designated as —) is connected to a contact-finger, 1, and the other wire (designated +) is connected to a contact-finger, 2, while the outgoing circuit-wire is connected to a contact-finger, 3, and the return-wire to a contact-finger, 4. The ends of all these contact-fingers are adapted to bear upon a cylinder, R, the body of which is of insulating material, but which has metallic conducting portions 5 5, 6, and 7 upon it. When the cylinder is turned so as to bring the fingers 2 3 upon one metal surface 5 and the fingers 1 and 4 upon the other metal surface 5, a direct current will be sent through the circuit, which will cause the armatures of both the relay M and the polarized relay O to engage with their respective contacts *m* and *o*, and thus close the local circuit through both the valve-magnets and cause the inlet-valve to be closed and the exhaust-valve to be opened, thereby releasing the brakes; but when the cylinder is turned so as to bring all the contact-fingers to bear upon its insulated surface the main circuit will be broken and the armatures of both the relays will be released, thus cutting out both valve-magnets and allowing

both valves to drop—the inlet-valve to open and the exhaust-valve to closed position—and the brakes to be applied. While the valves are in this position—that is to say, the inlet-valve open and the exhaust-valve closed—and the brakes on, and it is desired to cut off and hold the pressure in the brake-cylinders, the current-reverser is turned so as to cause the contact-fingers to be brought upon the metal portions 6 and 7, which will throw a reversed current on the main circuit, thereby cutting in the magnet of the inlet-valve and closing the said valve and cutting out the magnet of the exhaust-valve and keeping said last-mentioned valve closed. With the switch or current-reverser under his control, the engineer is enabled to apply or release the brakes or keep them under partial pressure at will. The equipment of each car is the same, and consequently the manipulation of the main circuit affects the brake mechanism of each car alike. The conductors forming the main circuit may consist of insulated wires laid in the main air-pipes through which the air is supplied, or partly of wires so arranged and partly of the body of the pipe or the rails in the usual manner. Whenever the main circuit is broken from any cause, the brakes will be applied. Upon each car a circuit-breaker—such as shown at U—is arranged so as to enable the conductor to apply the brakes from any car at will.

In the modification shown in Fig. 2 the valve-magnets are arranged in a local circuit with a switching device which is operated by an electro-magnet in the main circuit in a manner to cause either or both of the valve-magnets to be cut in or out of the local circuit. The said switching device consists of a drum, A^2, adapted to be given a step-by-step motion in one direction by means of an anchor-movement, B^2, actuated by an electro-magnet, C^2, in the main circuit. This drum is of metal, but has insulation upon it, as shown by the dark cross-lined portions in the drawings. Co-operating with this drum are a series of fingers, D^2 E^2 F^2. The finger D^2 bears at all times upon a metallic portion of the drum, while E^2 F^2 bear, respectively, upon a metallic portion and an insulated portion, or both upon insulation or both upon metallic portions, according to the position of the drum. By making and breaking the main circuit by a circuit-breaker—such as, G^2, for instance—the drum is advanced step by step. When both contacts E^2 and F^2 are on metal portions of the drum, the inlet-valves are closed and the exhaust-valves opened, which releases the brakes, and when they are both upon insulation no current passes in the local circuit, the inlet-valve is open, and the exhaust-valve closed, thus putting on brakes. When the contact E^2 passes from insulation to metal and the contact F^2 at the same time continues upon metal, the inlet-valve will be closed without disturbing the exhaust-valve, which remains closed, and the pressure in the brake-cylinders will be retained, thus keeping the brakes partially on.

While I have herein shown and described my invention as applied to a brake system in which compressed air is used for applying the brakes, it is evident that it is equally applicable to the various known vacuum-brake systems.

In another application filed by me on the 30th of April, 1885, Serial No. 164,008, and designated by me as "Application A," I have shown and described an air-brake system in which are employed a series of valves for controlling the inlet of compressed air from the air-supply to the brake-cylinders, and another series of valves independent of the first-named series for separately controlling the exhaustion of air from the brake-cylinders into the open air, each of said two series of valves being operated by means of a separate series of electro-magnets arranged in electric circuits extending throughout the train, and adapted, when open, to cause the brakes to be applied, and when closed to release the brakes.

In still another application filed by me on the same day, Serial No. 164,009, and designated by me as "Application B," I have shown an electro-magnetic switching device operated by a reversal of the current to cut out the electro-magnets which control the valves in the line of communication from the brake-cylinder to the external air.

Neither of the subjects-matter of these other applications do I make any claim to herein, as they are fully covered in my other cases.

I claim as my invention—

1. In an air-brake system for railway-trains, the combination, with separate inlet and exhaust valves for controlling the admission of pressure to the brake-cylinder and the exhaustion of pressure therefrom, of a local circuit on each car, including an electro-magnet for controlling the inlet-valve and an independent electro-magnet for controlling the exhaust-valve, a main circuit extending throughout the train, and switch devices operated by the manipulation of the current in the main circuit for cutting in or out either or both of the valve-magnets, substantially as described.

2. In an air-brake system such as described, the combination, with the inlet-valves for controlling the admission of compressed air from the air-supply or power chamber to the brake-cylinders, and with independent exhaust-valves for controlling the exhaustion of air from the brake-cylinders into the atmosphere, of separate electro-magnets for operating said inlet and exhaust valves, switching devices for cutting out or putting in said valve-magnets, or either of them, from or into local circuits, a main circuit extending throughout the train, electro-magnets in

said main circuit for actuating the switching devices, and means for opening and closing the main circuit, substantially as described.

3. In an air-brake system substantially such as described, the combination, with the separate inlet and exhaust valves, of the local circuits including in separate branches electro-magnets for controlling the said inlet and exhaust valves, the main circuit extending through the train and containing the relays for controlling the inlet-valve magnets, and the polarized relays for controlling the exhaust-valve magnets, and switching devices for making or breaking or reversing the current on the main circuit, as set forth.

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