(No Model.) 3 Sheets—Sheet 1.

H. W. HARRIS, Dec'd.

R. J. HARRIS, Administrator.

AUTOMATIC BLOCK SIGNAL AND ANTICOLLISION APPLIANCE FOR RAILWAYS.

No. 563,374. Patented July 7, 1896.

Fig. 1.

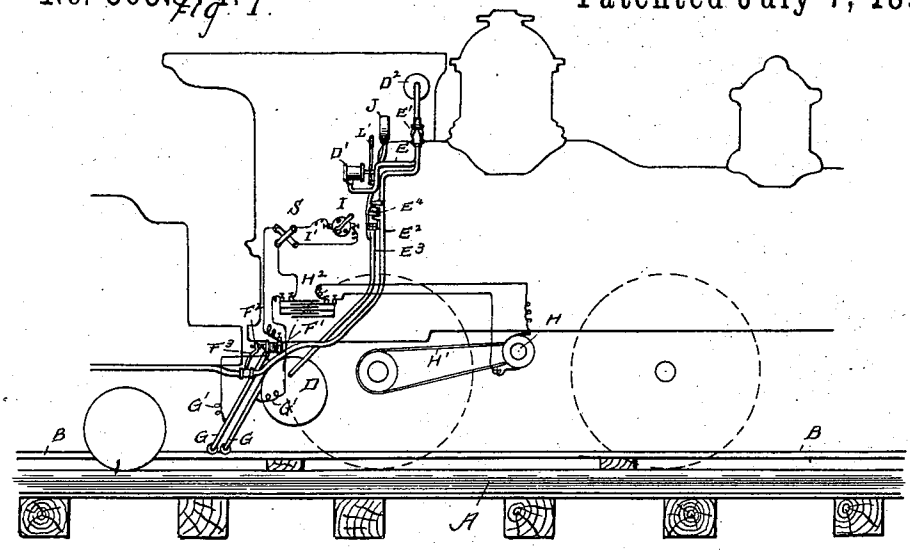
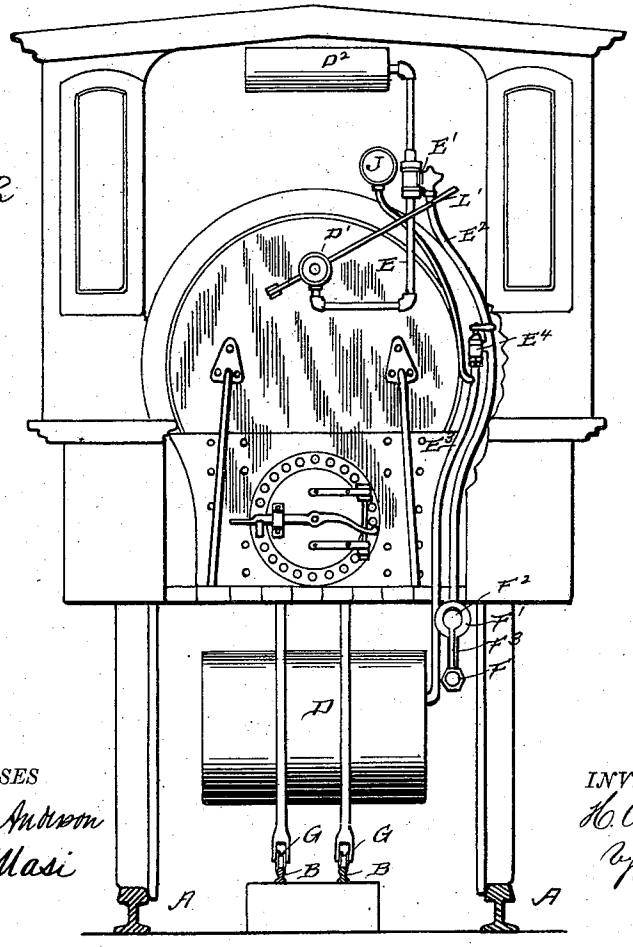


Fig. 2.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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AUTOMATIC BLOCK SIGNAL AND ANTICOLLISION APPLIANCE FOR RAILWAYS.

No. 563,374. Patented July 7, 1896.

Fig. 3.

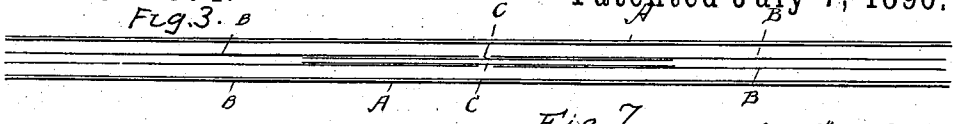


Fig. 7.

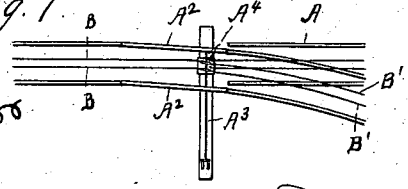


Fig. 4.

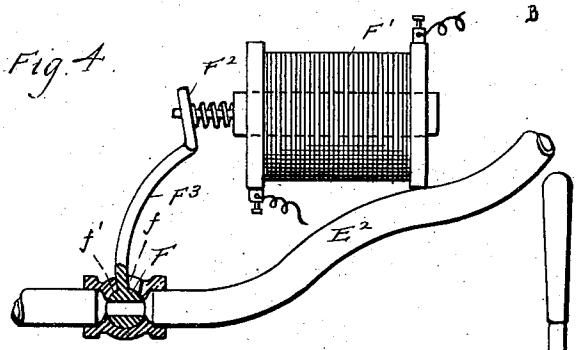


Fig. 8.

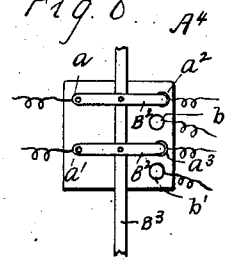


Fig. 9.

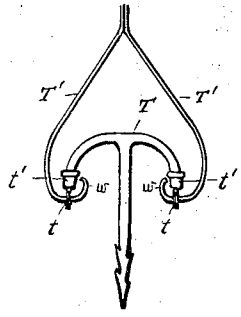


Fig. 5.

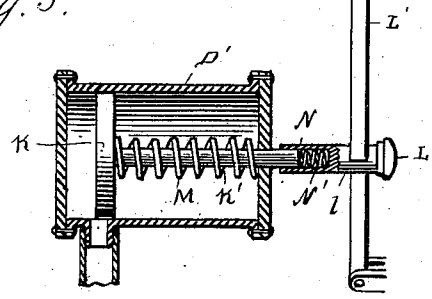
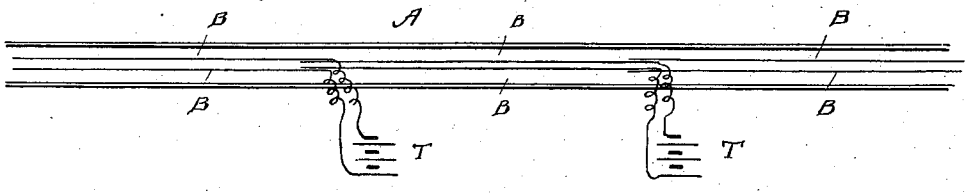


Fig. 6.



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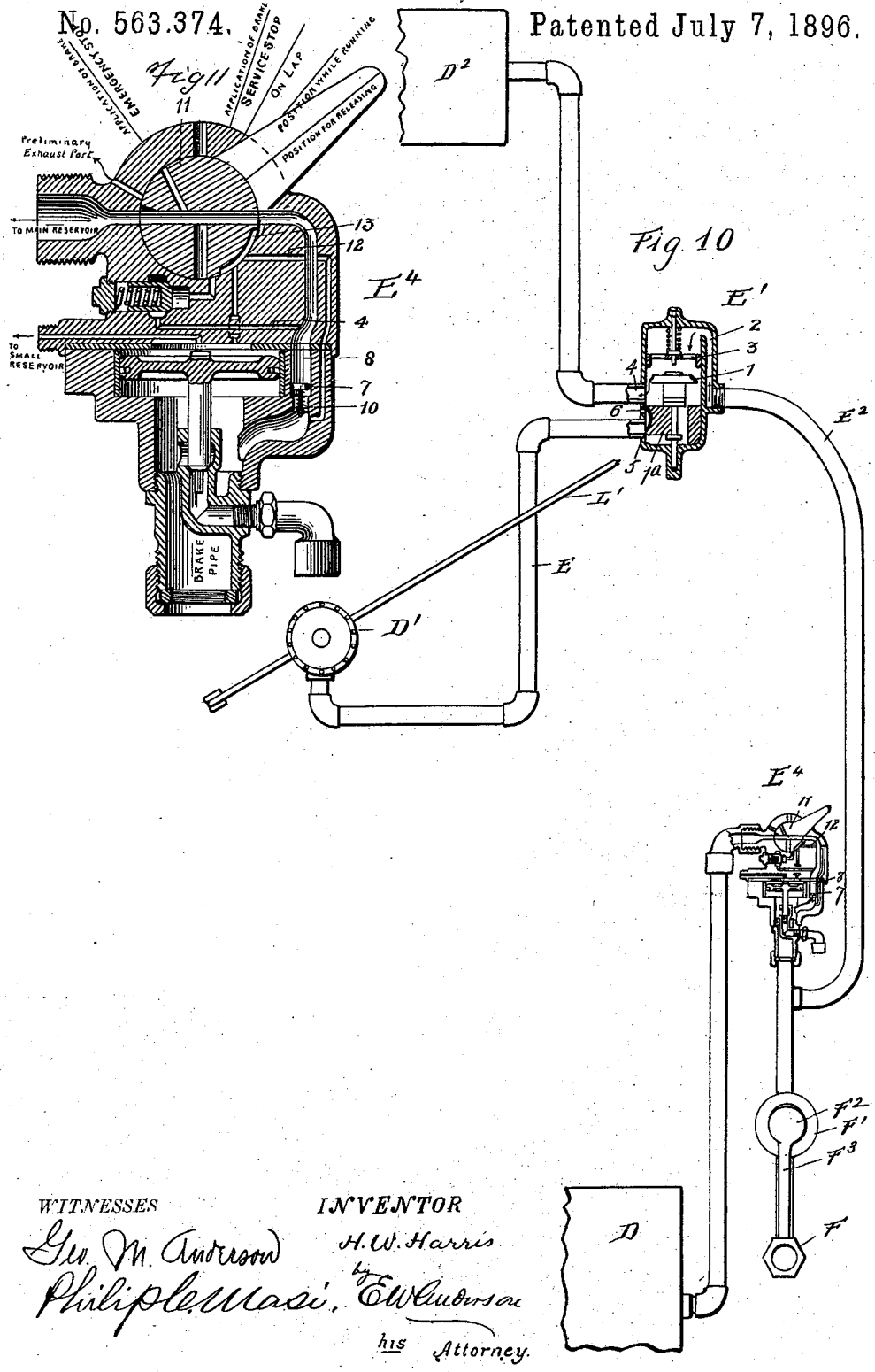

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UNITED STATES PATENT OFFICE.

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AUTOMATIC BLOCK-SIGNAL AND ANTICOLLISION APPLIANCE FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 563,374, dated July 7, 1896.

Application filed May 14, 1895. Serial No. 549,305. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. HARRIS, a citizen of the United States, and a resident of Raleigh, in the county of Wake and State of North Carolina, have invented certain new and useful Improvements in Automatic Block-Signal and Anticollision Appliances for Railways; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and numerals of reference marked thereon, which form a part of this specification.

Figure 1 is a side elevation, partly diagrammatic, showing the application of the invention. Fig. 2 is a rear view of locomotive, showing invention applied thereto. Fig. 3 shows the arrangement of conductors on a single-track system. Fig. 4 is an enlarged view of valve or magnet mechanism. Fig. 5 is a sectional view of air-cylinder, throttle-valve, &c. Fig. 6 shows the arrangement of conductors on a double-track system. Fig. 7 shows arrangement of conductors at a siding. Fig. 8 is an enlarged view of device for changing connections at a siding. Fig. 9 shows a good way of supporting wires and making connection therewith from the engine. Fig. 10 is a view, partially diagrammatic and partly in section, illustrating an arrangement of the valves governing the setting of the brakes and the closing of the throttle. Fig. 11 is an enlarged sectional view of the engineer's valve.

This invention relates to an automatic block-signal and anticollision appliance for railway-trains, and is designed to provide means which will absolutely prevent collision between two or more trains, either from front or rear.

With this object in view, the invention consists in the novel construction and combination of parts, all as hereinafter described, and pointed out in the appended claims.

In the practice of my invention the railway-track is divided into blocks or sections of three miles in length, more or less, as the conditions may require. Along each section I place a conductor or conductors, consisting of wires either overhead or ground, or of rails disposed upon or adjacent to the trackway, which conductors are supplied with an electric current by means of a dynamo or battery, or a combination of dynamo and storage battery carried upon the locomotives or trains, or by a stationary dynamo and battery or other generator located at any suitable point or points along the road. At the end of each block or section there is employed an auxiliary conductor or conductors extending a distance of five hundred yards, more or less, each way beyond the joint; or the main conductors may be made to lap each other to the proper distance and the auxiliary conductor or conductors be dispensed with.

The locomotive of each train is provided, in connection with the air-brake system appliances commonly employed, with an electro-magnet device which is connected directly or indirectly with a valve of the brake system, and which is in electrical connection with the conductor or conductors along the trackway. This device is arranged, upon the completion of the electric circuit of which it forms a part, to operate the said valve to set the brakes throughout the train. The locomotives are also provided with means whereby the throttle-valves are automatically closed by the setting of the brakes, as above described.

The entire system is so arranged that whenever two or more trains enter upon the same block or section from the same or from opposite directions, or approach within a given distance of the termini of two adjacent sections, a complete electric circuit is established through the electromagnets, resulting in the immediate application of the brakes and the closing of the throttle-valve upon the locomotive of each, whereby the trains are brought to a full stop.

It will be obvious that the system above described is susceptible of various modifications in the character and arrangement of the conductors and electrical connections and in the character and location of the generators, as well as in the details of the operative parts, and I do not desire to limit myself in these respects.

The construction and arrangement shown in the accompanying drawings and now to be

described constitute, however, a practical application of the invention and may be adapted with good results.

Referring to the drawings, the letter A designates the trackway; B B, the sectional conductors, which in the present case are light rails or wires disposed between the track-rails.

C designates the auxiliary conductors, which lap the joints of the main conductors.

D designates the usual air-reservoir upon a locomotive Z; D′, an air-cylinder, and D^2 an auxiliary air-reservoir, which is connected to the cylinder D′ by means of a pipe E through the triple valve E′, to which is also connected the train-pipe E^2.

E^3 is the pipe from the main reservoir D to the train-pipe E^2, through the engineer's brake-valve E^4.

F is a brake-valve in the train-pipe, and F′ is the electromagnet, having an armature F^2 and an armature-lever F^3, which is connected to the stem of said valve.

G are brushes or trolleys which make contact with the sectional conductors, and G′ G′ are electric connections from the said brushes or trolleys to the magnet and to the generator, which is shown as consisting of a dynamo H, supported and journaled underneath the cab and driven by a gear connection H′ with one of the axles.

H^2 is a storage battery which receives the current from the dynamo.

I is a switch which is interposed in the connection I′ between one terminal of the battery and the magnet, and by means of which the circuit may be broken at will.

J is an air-pressure gage.

Within the air-cylinder D′ is a piston K, having a rod K′, whose outer end portion is telescoped by the sleeve or socket portion N of a throttle-valve stem or rod *l* L. Interposed between the end of said rod K′ and the inner end wall of the socket is a spring N′, the purpose of which is to prevent the jar or concussion which would result from a direct impingement of the rod. When the piston is thrown into operation, this spring is compressed by the rod K′ and the stem or rod *l* L is moved sufficiently to close the throttle-valve.

M is a spring which is coiled around the rod K′ between the piston and the outer cylinder-head, being for the purpose of recovering or returning said piston.

L′ indicates the throttle-valve lever, which is shown as extending through an opening in the valve stem or rod, being thereby rigidly connected thereto. It will be apparent that the engineer can operate this lever in the usual manner, independently of the piston-rod and piston, the sleeve or socket portion N sliding freely upon the said rod.

It will be observed that there is no positive connection between the piston-rod and the valve mechanism, but that the latter is operated by the impingement of the piston-rod against the valve stem or rod. This leaves the said valve perfectly free to be operated at any time by the usual lever.

The triple valve E′ has a valve 1, which when the train is running is in the position shown in Fig. 10. That is to say, it is normally unseated, and the air from the main reservoir and the train brake-pipe can flow into the auxiliary reservoir through the ports 2, 3, and 4, as indicated by the arrows, while the port 5 into the cylinder D′ is closed by the valve portion 1^a on the stem of valve 1. So soon, however, as the pressure is reduced in the brake-pipe by the escape of air from the valve F to the atmosphere, the pressure above valve 1 is also reduced, and the back pressure from the auxiliary reservoir will raise the valve 1 1^a, closing the passage or port 3 and placing into communication ports 4 and 5, which permits air to flow from the auxiliary reservoir into the cylinder D′ to operate its piston and close the throttle-valve.

6 is the exhaust-port, which, when valve 1 1^a is in normal position, as first described, is in communication with port 5, but which, when said valve is raised, is closed by the portion 1^a.

The engineer's valve E^4 is capable of performing the ordinary functions necessary in such valves and has in addition an automatic valve 7, which is located in the main passage 8 from the main reservoir to the train brake-pipe below the auxiliary passage 9. This valve 8 is normally held away from its seat by a spring 10.

When air escapes from the valve F, the pressure below this valve is reduced, and the pressure from the main reservoir, through the main passage 8 or the auxiliary passage 9, (according to the position of the cocks 11,) at once closes the said valve and shuts off all air from the main reservoir into the train-brake pipe. To unseat the said valve an air-passage 12 is provided, which passage at one end opens into the main passage 8, below valve 7, and which at its other end communicates with a port 13 of the cock 11 when the latter is in its release position, as shown. To unseat this valve the engineer has merely to put the cock 11 in release position to admit pressure below such valve, when its spring 10 will throw it open against the pressure from above.

I wish it understood, however, that I do not confine myself to any particular arrangement or construction of the various valves, and that, while I have shown and described suitable means for effecting the desired result, I may employ other mechanism for the purpose. For instance, the valve F, as it is shown in Fig. 4, will perform the same function as the automatic valve above described. In this figure the said valve F is in its normal position, with its through-port in alinement with the passage through the train-pipe. When, however, the magnet is energized, the armature F^2 is attracted and the

valve is rocked in its seat sufficiently to uncover the escape-opening *f* to permit air to pass out of the train-pipe, by way of the passage *f'*, while at the same time the opposite end of the through-port is closed from all communication with the pipe E^2 and the main reservoir.

The auxiliary reservoir is of great importance in this preferred form of the invention for the following reason: As soon as air is permitted to escape from the train-pipe by the operation of the valve F the engineer's valve operates automatically to cut off all communication between the train-pipe and the main reservoir. The air which escapes through the valve F comes entirely, therefore, from the train-pipe, and the air which operates the piston comes from the auxiliary reservoir alone. Consequently there is no loss of pressure from the main reservoir, as would be the case if the cylinder D' were supplied directly from the train system and the main reservoir, in which case there would be a constant loss of pressure until the parts were returned to their normal positions.

The general operation of the appliance will be readily understood. Whenever two or more trains happen upon the same block or section at the same time, or when they are within a given distance of each other upon adjacent sections, a complete circuit is immediately established through the dynamos and batteries, the magnets, and the conductors. The brake-valves are opened, which sets the brakes, the pistons K are actuated to close the throttle-valves, and both trains come to a full stop. It will also be observed that in addition to the operation above described the invention provides means whereby the operation of any of the conductors or escape-valves throughout the train to apply the brakes will also act automatically to close the throttle and shut off steam, since the escape of air from the train brake-pipe at any point on the train will result in the same operation as follows the escape from the magnet-controlled valve F.

Where the generator is carried upon the train it will of course be necessary to provide upon each locomotive a pole-changing device *s*, whereby all trains going in one direction may be made to send into the conductors a current of the same direction or sign in order that there shall be no opposition of currents. Such devices are well known and need not be described.

In Fig. 6 I have shown an arrangement of conductors such as may be employed upon double tracks and with a normally-closed circuit supplied from stationary batteries or generators T. As upon a double-track road it is necessary to guard against the rear-end collisions only, the auxiliary conductors may be dispensed with. It will be understood that the train in advance will complete the circuit, so that there will be no current left for the train following when it enters upon the same section. Consequently the armature of its magnet will cease to be attracted and its spring will open the valve and set the brakes. The operation of the armature and valve is of course directly the reverse in open and in closed circuit systems.

In Fig. 7 I have shown an arrangement of the conductors at a siding. In this figure, A designates the main trackway, and A' the siding-track. B B are the main conductors, and B' B' are conductors on the siding. A^2 designates the movable or point rail of the rail-switch, A^3 the switch-bar, and A^4 an electric switch for directing the current from the main conductors into the siding-conductors. For this purpose the ends of the conductors B B are attached, respectively, to the terminal posts or contacts *a a' a² a³*, while the ends of the conductors B' B' are attached to the posts or contacts *b b'*. B^2 B^2 are two movable switch arms or levers, which swing from the posts *a a'*, and are designed to contact with the posts *a² a³*, or with the posts *b b'*, as may be desired. Connected to said arms is a switch-bar B^3, which is also connected with the rail-switch bar A^3. When the track-rails are in position to run a train onto the siding, the electric switch is in such position that the siding-conductors B' B' are in the circuit, whereby, after a train is run onto the siding, should the operator fail to throw the rail-switch back, such train will be protected from a second train, which might otherwise run onto the siding.

In Fig. 9 I have shown means for carrying the conductors B B, which may be employed when such conductors consist of wires or light strips and which are especially designed for a closed-circuit system. A series of spikes, one of which is shown at T, are driven into the ties or road-bed at suitable intervals from each other, said spikes being preferably barbed at the points to prevent their withdrawal. These spikes are formed with downwardly-bent T-heads, which carry insulators *t'*, to which the respective conductors are secured. T' designates a forked trolley-arm, formed in two parts insulated from each other. The forks of the trolley are bent so as to pass under the arms of the spike, having contact with the respective conductors at the points *t*. The end portions of the trolley-forks are bent upwardly to form hooks *w*. In the event of a train leaving the track from any cause, these hooks will catch the conductors and tear one or both of them loose, thus breaking the circuit and stopping other trains which may approach.

The provision of the storage battery enables a steady current to be maintained in the circuit whether the trains are in motion or not.

The invention is equally adapted for use where steam is employed in the brake system.

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

1. In an appliance for the purpose described, the combination with the fluid-brake system and throttle mechanism of a railway-train, of a valve located in the train-pipe of the brake system, said valve being arranged to normally form a free passage through the train-pipe, and when operated, to close said passage and to permit the direct escape of pressure from the said pipe to the atmosphere, an electromagnet carried by the train, its armature and armature-lever, the latter of which is connected with the said valve, means whereby said magnet is energized whenever two trains come within a predetermined distance of each other upon the same track, and mechanism for closing the throttle which is automatically thrown into operation by the escape of pressure from said valve, the whole being so arranged that when the said magnet is energized the brakes are first set and the throttle-valve subsequently closed by the reduction of pressure caused by the setting of the brakes, substantially as specified.

2. The herein-described means for preventing collision between railway-trains, comprising a sectional conductor or conductors arranged upon or adjacent to the trackway, an electromagnet carried upon the train and having an armature which is connected with a valve of the brake system of the train, means for establishing an electrical connection between said magnet and the conductor or conductors a source or generator, an auxiliary pressure-reservoir connected with the main reservoir of the brake system, an automatic valve between the main and the auxiliary reservoir which controls the admission of air to the latter, a cylinder connected with said auxiliary reservoir, a piston working in said cylinder and having a rod arranged to operate upon and close the throttle-valve of the locomotive, and valve mechanism whereby the setting of the brakes admits air to said cylinder to operate the piston and close the throttle-valve, substantially as specified.

3. In an appliance for preventing collision between railway-trains, the combination with the main pressure-reservoir and the train-pipe of the air-brake system of a train, of an electromagnet, its armature, a connection between said armature and a brake-valve in said train-pipe, an auxiliary pressure-reservoir connected with the main reservoir, an automatic valve between the main and the auxiliary reservoir which controls the admission of air to the latter, a cylinder connected with the auxiliary reservoir, a piston-rod arranged to operate upon and close the throttle-valve of the locomotive, springs for normally holding said rod away from the valve and for taking up concussion, valve mechanism for automatically admitting air to said cylinder, when the brakes are set, and means whereby said magnet is energized under proper conditions, substantially as specified.

4. In an appliance for the purpose described, the combination with the main reservoir of the train-brake system, the train-brake pipe and the escape-valve therein, of the magnet which controls the said valve, the auxiliary reservoir connected with the main reservoir, the cylinder connected with said auxiliary reservoir, an automatic valve which controls the admission of pressure into the said auxiliary reservoir and also from the said reservoir into the said cylinder, and means whereby the communication between the main reservoir and the train-brake pipe is shut off when the said escape-valve is opened, and means for energizing the said magnet under predetermined conditions, substantially as specified.

5. In an appliance for the purpose described, the combination with the T-spikes having their horizontal arms bent downwardly and provided with insulators which carry the conductors, of the forked trolley, the arms of which are adapted to contact with the said conductors and whose end portions are bent upwardly behind and above the said conductors to form positive hooks, adapted to forcibly engage the said conductors upon lateral movement of the trolley, substantially as and for the purpose described.

6. The combination with the train-brake system, having a train-pipe provided with an escape-valve, and the main reservoir which supplies the said pipe, of an auxiliary reservoir on the cab supplied from the main reservoir, a piston-cylinder supplied from the auxiliary reservoir, valve mechanism whereby said auxiliary reservoir is automatically cut off from the main reservoir and put into communication with the said cylinder when the escape-valve is open, a piston working in the said cylinder and having a rod arranged to act upon the throttle-valve of the locomotive to close the said valve when pressure is admitted to the said cylinder, substantially as specified.

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

HENRY W. HARRIS.

Witnesses:
PHILIP C. MASI,
GEORGE H. PARMELEE.