S. M. DUNCAN.

AUTOMATIC TRAIN STOP.

APPLICATION FILED JUNE 28, 1909.

955,059. Patented Apr. 12, 1910

3 SHEETS—SHEET 1.

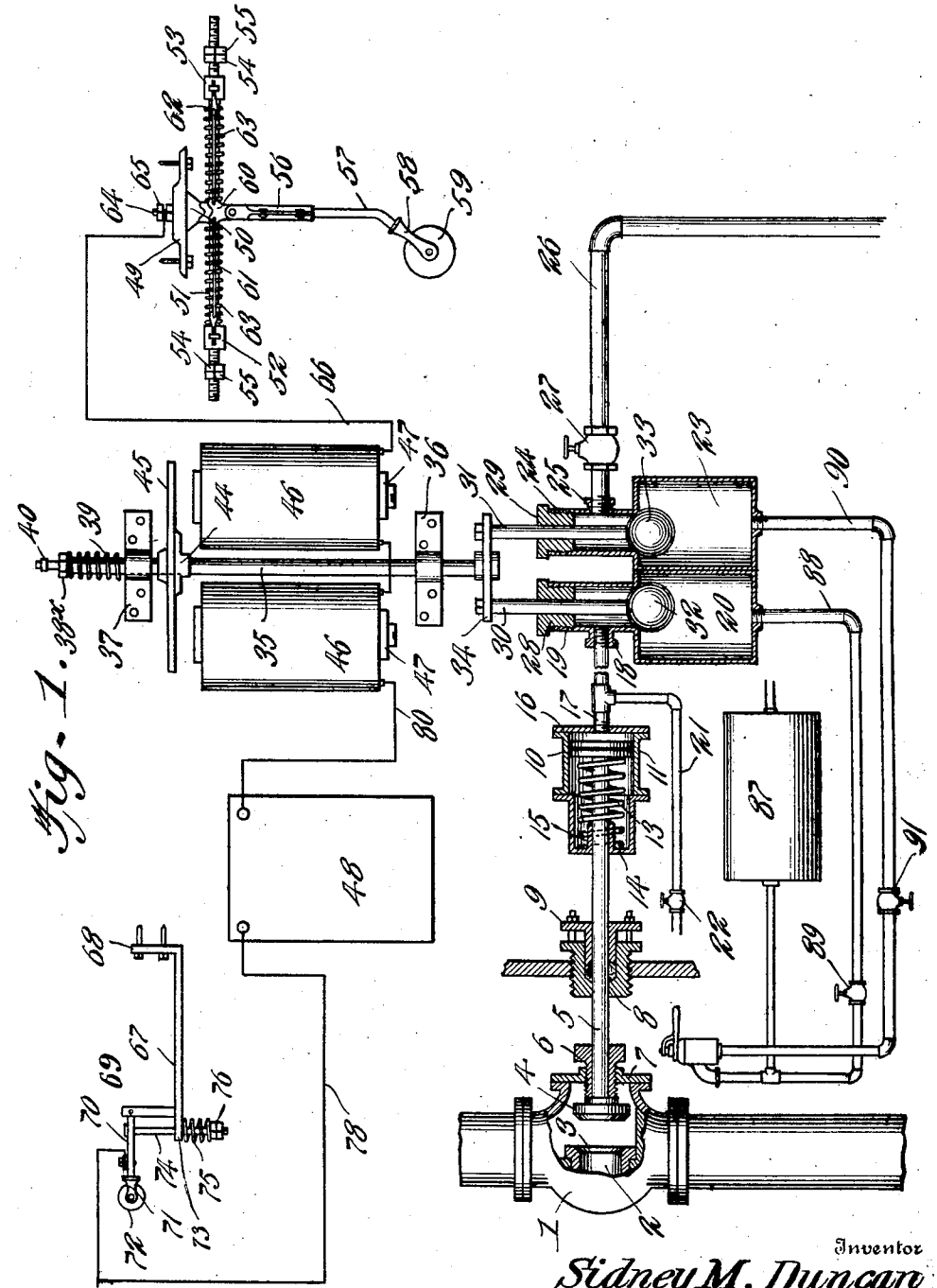

Fig. 1.

Witnesses

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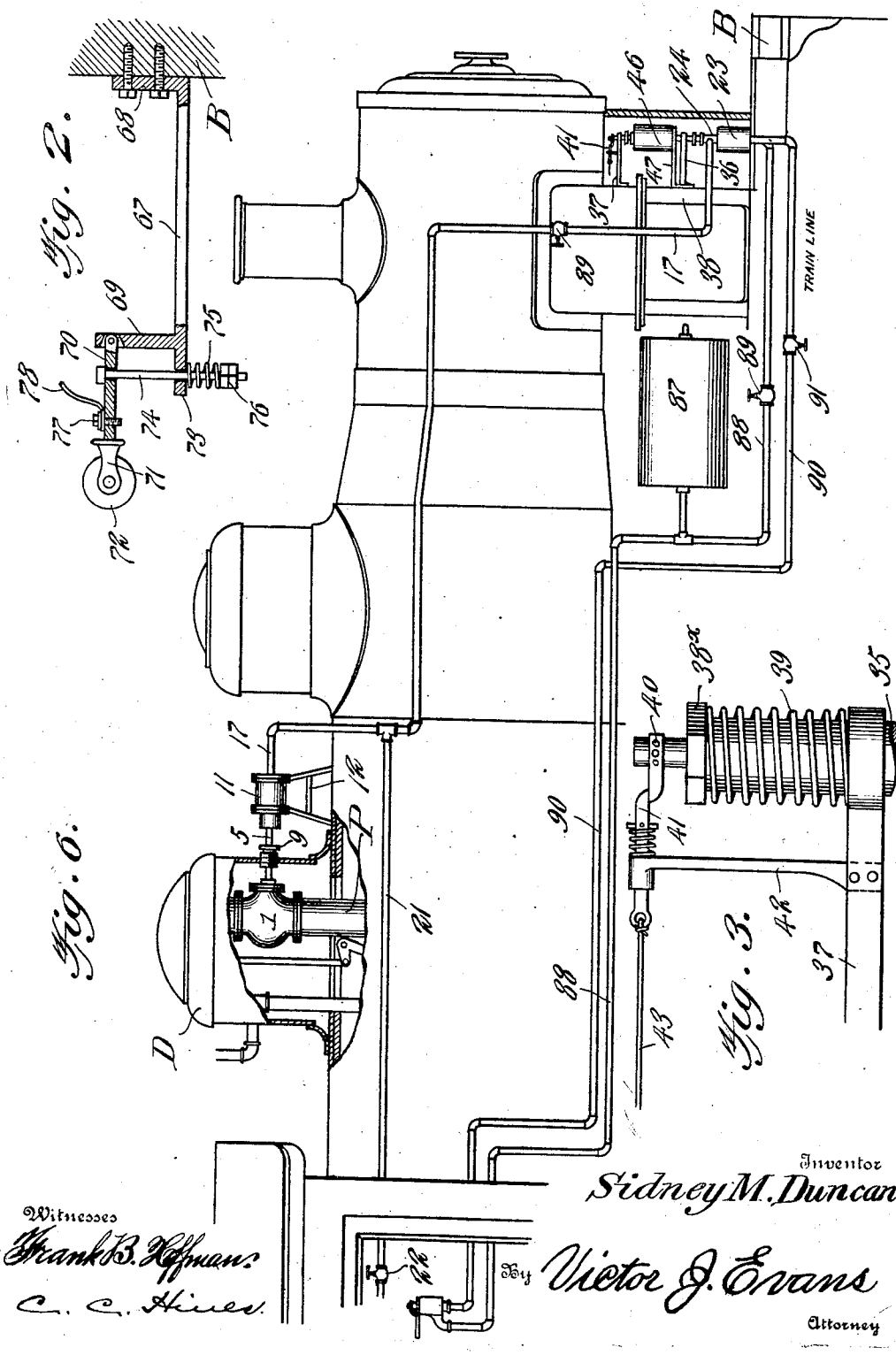

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3 SHEETS—SHEET 3.

Fig. 4.

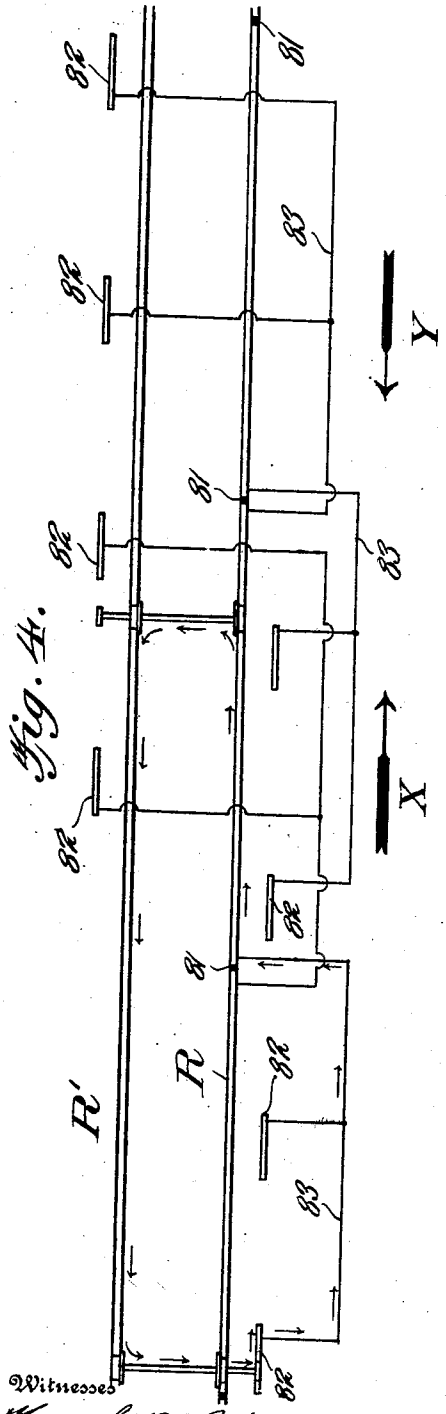
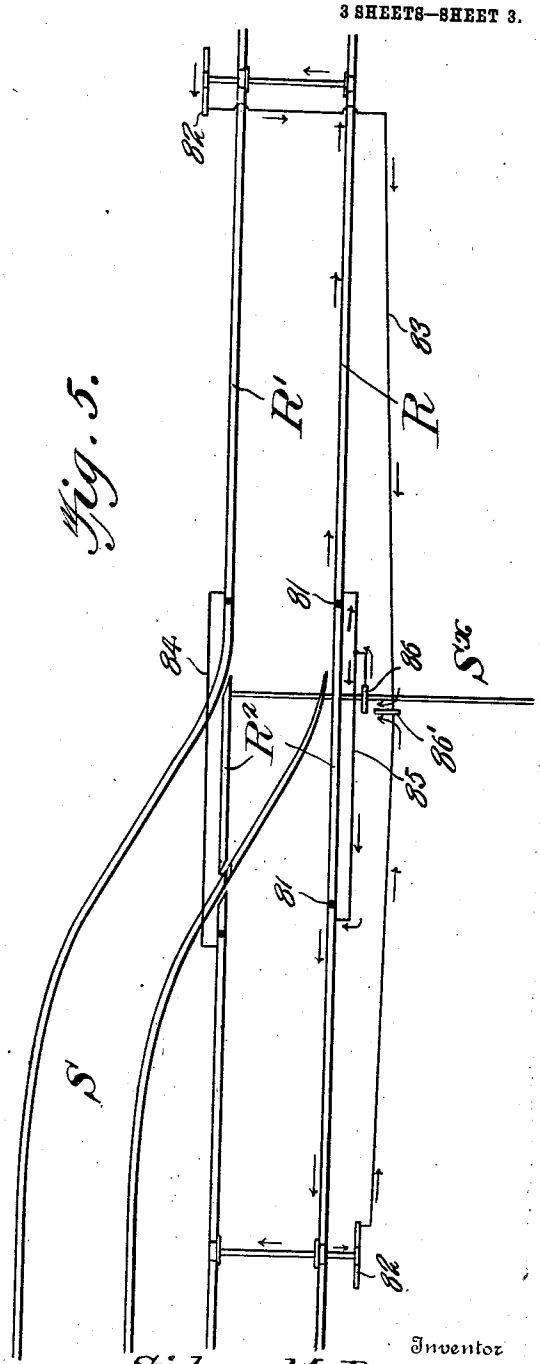


Fig. 5.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC TRAIN-STOP.

955,059. Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed June 28, 1909. Serial No. 504,801.

To all whom it may concern:

Be it known that I, SIDNEY M. DUNCAN, a citizen of the United States, residing at Eastend, in the county of Hamilton and State of Tennessee, have invented new and useful Improvements in Automatic Train-Stops, of which the following is a specification.

This invention relates to systems for the prevention of railway accidents.

The object of the invention is to provide a novel, practical, automatic, and effective means to prevent head-on or rear-end collisions, and the running of a train into an open switch or into a wreck.

With the above and other objects in view, as will appear as the nature of the invention is better understood, the same consists in the novel construction and combination of parts of a system for the above purposes, as will be hereinafter fully described and claimed.

In the accompanying drawings forming a part of this specification, and in which like characters of reference indicate corresponding parts:—Figure 1 is a view in elevation, somewhat in the nature of a diagram, of the mechanism carried by the engine for causing stoppage of a train. Fig. 2 is a detail view of a portion of the mechanism shown in Fig. 1, and on an enlarged scale. Fig. 3 is a similar view of another portion of the mechanism. Fig. 4 is a plan view of a section of railway track, showing the arrangement of the wiring and other parts co-acting with the electrical and air operated mechanism on the engine to secure the objects of the invention. Fig. 5 is a similar view to Fig. 4 of a section of track including a switch. Fig. 6 is an elevation partly in section of a locomotive showing the location of the mechanism exhibited in Fig. 1.

Referring to the drawings, D designates the steam dome of a locomotive and P the throttle pipe. The latter instead of being in one piece, as usual, is divided and includes intermediate of its ends a globe valve 1 having a lateral port 2, in which is fitted a valve seat 3. This seat is engaged by a valve 4 carried by one end of a stem 5, that is slidably mounted in a bearing nut 6, threaded into a plate 7 bolted to the globe valve opposite the port 2. The intermediate portion of the stem works in a stuffing box. The other or outer end of the valve stem is provided with a piston head 10 which works in a two-part cylinder 11 supported by a suitable pedestal 12 bolted to the boiler. Within the cylinder is disposed a coil spring 13 that encircles the stem and bears at one end against the piston head 10 and at its other end against the cylinder head 14 and serves to hold the valve 4 normally unseated.

In order to guide the stem in its reciprocatory movements, and also to provide for it an extended bearing, the cylinder head 14 is furnished internally with a teat or boss 15 as clearly shown in Fig. 1. Threaded into the cylinder head 16 is one end of a pipe 17, which extends downward and along one side of the boiler and connects at its other end with a pipe-socket 18 carried by a short section of pipe 19 communicating at its lower end with the top of an air chamber 20. The pipe 17 has tapped into it one end of a pipe 21, the other end of which projects into the locomotive cab just in front of the engineer's seat and carries a valve 22 by which the engineer can exhaust the cylinder 11 of air, for a purpose that will presently appear. Arranged adjacent to the chamber 20 and supported in common therewith on the bumper beam B of the engine, is a second cylinder 23, with which communicates the lower end of a pipe 24 provided with a pipe-socket 25 into which is threaded a vent pipe 26 carrying a controlling valve 27. The upper ends of the pipes 19 and 24 have threaded thereinto glands 28 and 29 respectively and through these two glands pass valve stems 30 and 31 carrying at their lower ends ball valves 32 and 33 respectively which valves engage valve seats formed in the tops of the two chambers. The upper end of each of the stems 30 and 31 is reduced in diameter and threaded, and each projects through a bar 34, nuts threaded on the extensions serving to secure the bar in place.

Projecting through and secured in an opening in the center of the bar is the lower end of a rod 35 which works in guides 36 and 37 secured to a bracket 38 bolted to the boiler. The upper end of the rod is reduced and threaded and carries a nut 38× designed to adjust the tension of a coiled spring 39

encircling the rod and engaged at its lower end with the bearing 37. Above the nut is secured an arm 40, the under face of the extremity of which is beveled or rounded, and engaging this arm is a spring pressed latch 41 that works in a guide formed in a bracket 42 secured to the bearing 37. The inner end of the latch or that which engages the arm 40 is beveled in a direction opposite to that of the latter and at its outer end has connected with it one end of a wire 43 the other end of which is carried into the engineer's cab. The object of the latch and arm is, under certain conditions to hold the valves 32 and 33 unseated for a reason that will presently appear. Secured to the rod adjacent to the bearing 37 is a cross-arm 44 to which is firmly attached an armature 45 disposed to co-act with two electro-magnets 46 that are suitably supported by brackets 47 bolted to the boiler head. The electro-magnets are energized, under conditions that will appear later on from a source of electrical energy, in this instance a battery 48 which is also supported on the bumper beam.

The means for completing the circuit through the electro-magnets comprises a trolley and its appurtenances to engage contacts arranged adjacent to the rails, and a rolling contact to engage with the front axle of the engine truck. The trolley embodies a bracket 49 bolted to the under side of the bumper beam near one end. Depending from the center of the bracket is a boss 50 to which is rigidly secured, intermediate of its ends, a bar 51, and on each terminal of this bar is slidably mounted a block 52 and 53 respectively, and these blocks are adjusted longitudinally of the bar by nuts 54 which are held against working off by jam nuts 55.

Pivotally connected with the bracket 50 is a socket 56 in which is secured the upper end of an arm 57, the lower end of which is provided with a yoke or harp 58 between the members of which is rotatably supported a trolley wheel 59. The upper end of the arm is provided, above its pivotal point, with a pair of orificed ears 60 each of which is engaged at one end by a rod 61, the other end of each rod being connected with an eye bolt 62, the two bolts being suitably secured to the blocks. In order to hold the trolley arm in proper but yielding position, two coiled springs 63 are employed, which encircle the bar 51, and bear respectively, against the opposite sides of the bracket and the inner faces of the blocks 52 and 53. From this arrangement of parts it will be seen that the trolley arm will not only be free to yield in two directions, thus to cause it to adapt itself to inequalities in the contacts, but will also be caused properly to engage therewith.

The bracket 49 is provided intermediate of its ends with an upstanding threaded stem 64, and engaging the stem are two nuts 65 between which is clamped one end of a conductor 66 the other end of which connects with the helix of the electro-magnet 46.

The rolling contact for engaging the front axle of the truck, embodies a bracket 67 formed at one end with a right-angled extension 68 which is firmly bolted to the rear side of the bumper beam at or near its median line. Adjacent to the other end of the bracket is an extension 69 which is disposed in alinement with the member 68 and is transversely orificed or slotted to receive one end of a trolley arm 70 in which it is pivoted, the other end of the arm being provided with a yoke or harp 71 between the members of which is rotatably supported a trolley wheel 72 arranged to contact with the front axle (not shown) of the engine truck. The end portion 73 of the bracket is orificed as is also the trolley arm, and through the two orifices extend a bolt 74 the head of which bears upon the upper side of the trolley arm. The lower end of the bolt extends some distance below the bracket in order to accommodate a coiled tension spring 75 which is held assembled with the bolt and adjusted by nuts 76 to insure proper contact with the truck axle. The arm 70 carries a binding post 77 which serves to hold combined with the trolley arm one end of a conductor 78, the other end of which is connected with the negative pole of the battery 48. The positive pole of the battery has connected with it one end of a conductor 80, the other end of which connects with the helix of the electro-magnet 46, and this completes the circuit between the two trolley wheels.

To render the mechanism above described operative to cut off the steam and apply the air brakes in ample time to prevent an accident, the arrangements of circuit closers shown in Figs. 4 and 5 are employed, in the former of which a length of single track is shown and in the latter a length of single track and a switch and side track. One of the rails designated R is divided into sections of any desired length by insulation 81, and each block in the present instance contains three of such insulated sections, although this number may be increased if desired. Secured at determined intervals to the ties on the outside of the rails R, R′, on opposite sides thereof, and in alternating series, are contact rails 82, which are constructed of bars of steel say thirty feet in length and about two inches higher than the rails, and which are engaged by the trolley wheel 59. These contact rails are electrically connected with the rails by wires 83, one end of each of which is secured to the contact rails and the other end to one of the railway rails, the intermediate portion of the wire being supported by telegraph poles. By alternating the arrangement of the con-

tact rails, the apparatus on the engine will be rendered operative when a train is running in either direction.

Where a side track S is employed, as shown in Fig. 5, the rail section R^2 in the line of both rails R, R′ at the switch S^x are electrically connected by bond wires 84 and 85 each of which is of a length sufficient to bridge the insulated rail sections R^2 so as to insure passage of the current from the battery 48 to complete the circuit. In addition, there is provided, on some part of the switch mechanism, as the switch rod, a spring contact 86 which if the switch be wholly or partly open, will impinge against a contact 86′ connected with the conductor 83, and thus establish electrical conditions essential to insure the effective operation of the apparatus on the engine.

The operation of the system is as follows:—Suppose one train to be running in the direction of the arrow X and one in the direction of the arrow Y Fig. 4, establishing thereby conditions that are assumed to be certain of resulting in a head-on collision. Now as soon as the trolley wheel 59 of the train running in the direction of the arrow X passes on to the first contact rail of the block in which the approaching train is running the circuit through the electro-magnets is completed, whereupon the armature 45 is drawn into contact with the cores of the electro-magnets. When the magnets are energized, the rounded surface of the latch 40 will ride against the like surface of the arm 41 and snap under the same and prevent the return of the armature-carrying rod 35 to its normal position. The downward movement of the rod 35 unseats the two valves 32 and 33, whereupon air from the main reservoir 87 will pass through the pipe 88 to the chamber 20 and thence through the pipe 17 to the cylinder 11, the quantity of air thus supplied being regulated by a valve 89. The air that enters the cylinder 11 shifts the piston head and causes the valve 4 to engage the valve-seat 3 and thus cut off the supply of steam to the steam chests of the engine. Synchronously with this operation the train pipe 90 is bled, the air therefrom passing into the chamber 23 which is in communication therewith, and thence out through the pipe 26 to the atmosphere thus automatically applying the brakes and stopping the train. The amount of air passing from the pipe 90 into the chamber 23 and the consequent reduction of pressure is controlled by a valve 91 in said pipe 90. It is to be understood that the counterpart of the above operation takes place on the train moving in the direction of the arrow Y. In the case of an open or partly open switch, the same result ensues. In both Figs. 4 and 5 the course of the current through one of the apparatus of one of the engines is traced by arrows.

When the trains come to a standstill and are again ready to start the engineer draws upon the wire 43 thus releasing the latch from engagement with the arm, whereupon the spring 39 will cause the armature to resume its normal position and again place the apparatus in condition for further action. Of course it is to be understood that the trolley wheel 59 will have to be lifted clear of the contact rail should the engine stop on one in order to permit the armature to resume its operative position.

While the apparatus herein shown and described is adapted to secure all of the objects stated, yet it is to be understood that the invention is not to be limited to the particular arrangement of parts shown, as any changes, within the scope of the claims, may be adopted without departing from the spirit thereof.

I claim:—

1. In a train controlling system, a locomotive having a valve for controlling the supply of steam to the cylinders thereof, a pneumatic device for operating the valve, a valve controlling communication between the air brake system and the pneumatic device, a brake applying valve and electrical means for simultaneously opening both valves.

2. In a train controlling system, a locomotive having a valve for controlling the supply of steam to the cylinders thereof, a pneumatic device embodying a cylinder and a spring retracted piston therein for operating the valve, a source of communication between said cylinder and the air brake system of the locomotive, a valve normally controlling said source of communication to prevent the feed of air to said cylinder, a brake applying valve and electrically controlled means for simultaneously opening the two last-named valves.

3. In a train controlling system, a locomotive provided with a pneumatically operated valve for controlling the feed of steam to the cylinders thereof, valve controlled means for supplying air from the air brake system of the locomotive for operating said valve, electro-mechanical means for opening the latter named valve for the flow of fluid pressure to operate the first named valve, a brake applying valve adapted to be opened simultaneously with said latter named valve by said electro-mechanical means, means for maintaining said electro-mechanical means in its valve opening position after actuation, and means for releasing and permitting the parts of said electro-mechanical means to return to normal position.

4. In a train controlling system, pneumatic means controlling the supply of motive fluid to the cylinders of a locomotive, a vent for the exhaust of air from and the reduction of pressure in the main feed pipe of

the air brake system of the locomotive, automatically closing valves controlling the same, electro-mechanical valve opening means, means for energizing the same simultaneously to open both valves, means for maintaining said electro-mechanical means after actuation in valve opening position, and means for releasing and permitting the parts of the electro-mechanical means to be returned to normal position and the valves to close.

5. In a train controlling system, a locomotive provided with motive fluid cut off and brake applying valves, electro-mechanical means for simultaneously operating both valves to cut off the supply of motive power and set the brakes, means for locking said electro-mechanical means in valve operating position, and means for releasing and permitting the parts thereof to return to normal position and to simultaneously retract both valves.

6. In a train controlling system, a locomotive provided with valves for cutting off the supply of motive power and setting the brakes, an armature controlling both valves, an electro-magnet adapted to be energized to attract the armature to open the valves, means for closing and maintaining the valves in closed position upon the deënergization of the magnet, circuit connections for energizing the magnet, means for maintaining the armature in valve opening position, and means for releasing and returning the armature and valves to normal position.

7. In a train controlling system, a locomotive having a valve for cutting off the supply of motive fluid from the cylinders thereof, a pneumatic device for closing said valve having a source of communication with the air brake system, a vent for the reduction of pressure in said system, valves controlling said source of communication and vent, armature controlled means automatically operable for normally holding the valves closed, an electric circuit including a circuit closing device and an electro-magnet therein adapted when energized to attract the armature for the movement of the valves to open position, means for locking the parts in valve opening position, and manually controlled means for releasing them for return to normal position.

8. In a train controlled system, and in combination with suitable electrical track connections, and motive fluid and brake controlling devices upon the locomotive, of an electric circuit upon the locomotive embodying means for actuating said devices, and a switch controlling said circuit and adapted for coöperation with said track connection, said switch comprising a bar, a pivotally mounted contact device, elements slidably mounted on the bar and connected with said contact device, springs mounted on the bar and acting on said elements to normally resist movement of the contact device in either direction, and means for regulating the action of the springs.

9. In a train controlling system, a locomotive provided with a valve for cutting off the flow of motive fluid to the cylinders thereof, a spring retracted piston for operating the valve, fluid supply and exhaust passages communicating with the air brake system for the respective feed of air to operate the piston and the reduction of pressure within the system, valves controlling said passages, an electric circuit on the locomotive including means for opening and closing said valves upon the opening and closing of the circuit, and a switch operative to open and close said circuit.

10. In a train controlling system, a track having insulated rail sections, contacts associated therewith, electrical conductors between the contacts and rail sections, controlling devices on the locomotive including valves for cutting off the feed of steam and setting the brakes, an electric circuit in which said devices are included, means in said circuit for simultaneously opening both valves, and a switch controlling said circuit and adapted for coöperation with said contacts.

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

SIDNEY M. DUNCAN.

Witnesses:
JOHN McC. CAHILL,
J. P. TUCKER.