(No Model.) 4 Sheets—Sheet 1.

J. C. WEST.

ELECTRIC BLOCK SIGNAL AND TRAIN LIGHTING SYSTEM.

No. 560,451. Patented May 19, 1896.

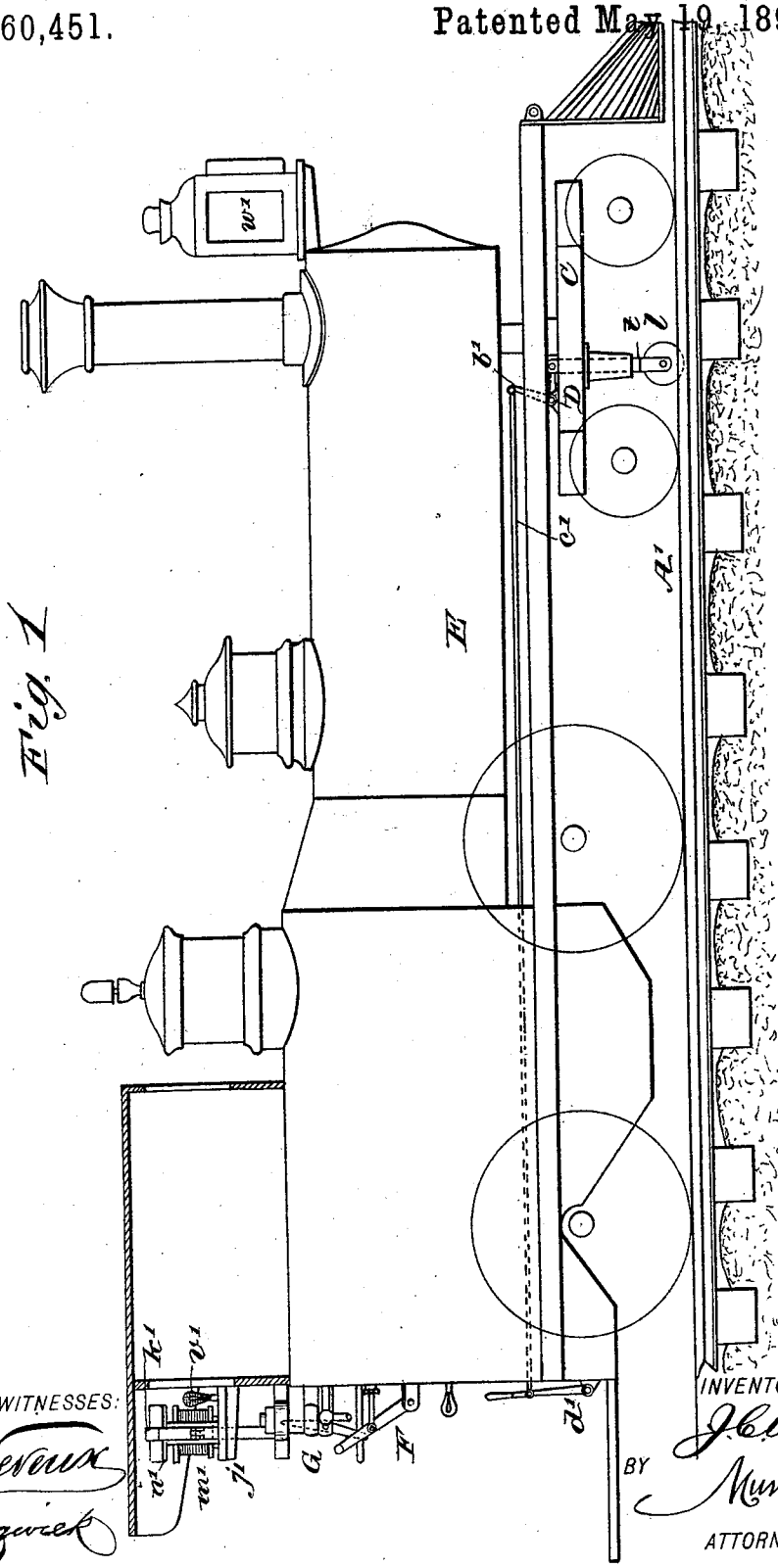

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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ELECTRIC BLOCK SIGNAL AND TRAIN LIGHTING SYSTEM.

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Fig. 3

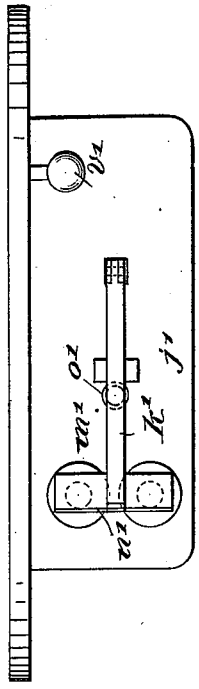


Fig. 4

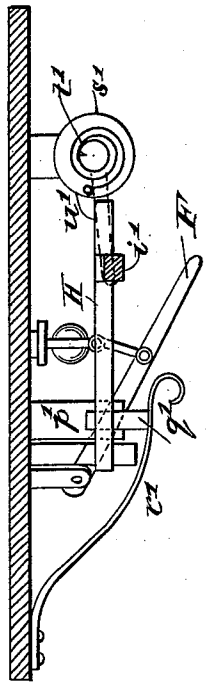
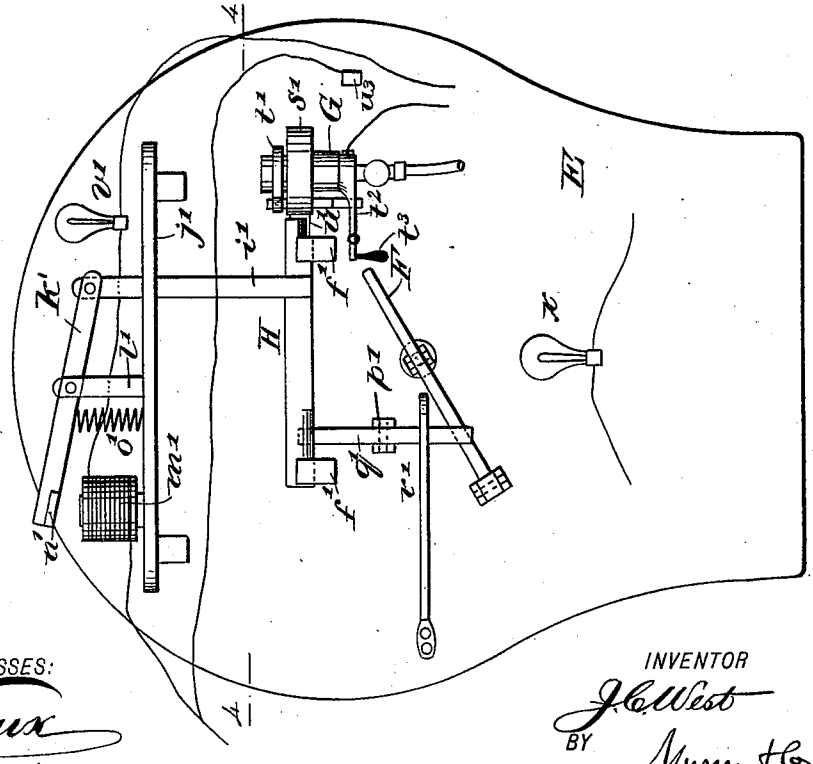


Fig. 2



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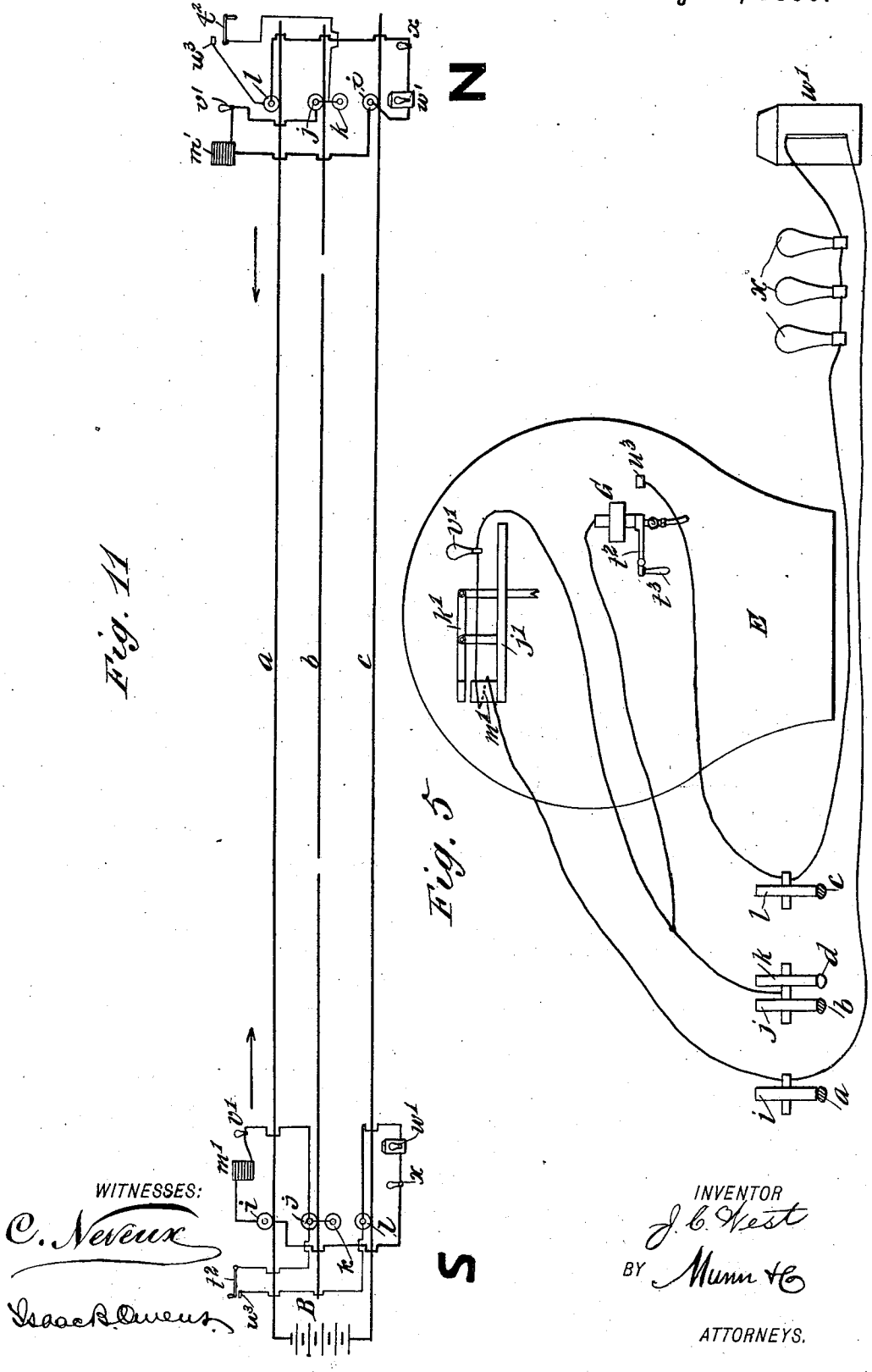

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ELECTRIC BLOCK SIGNAL AND TRAIN LIGHTING SYSTEM.

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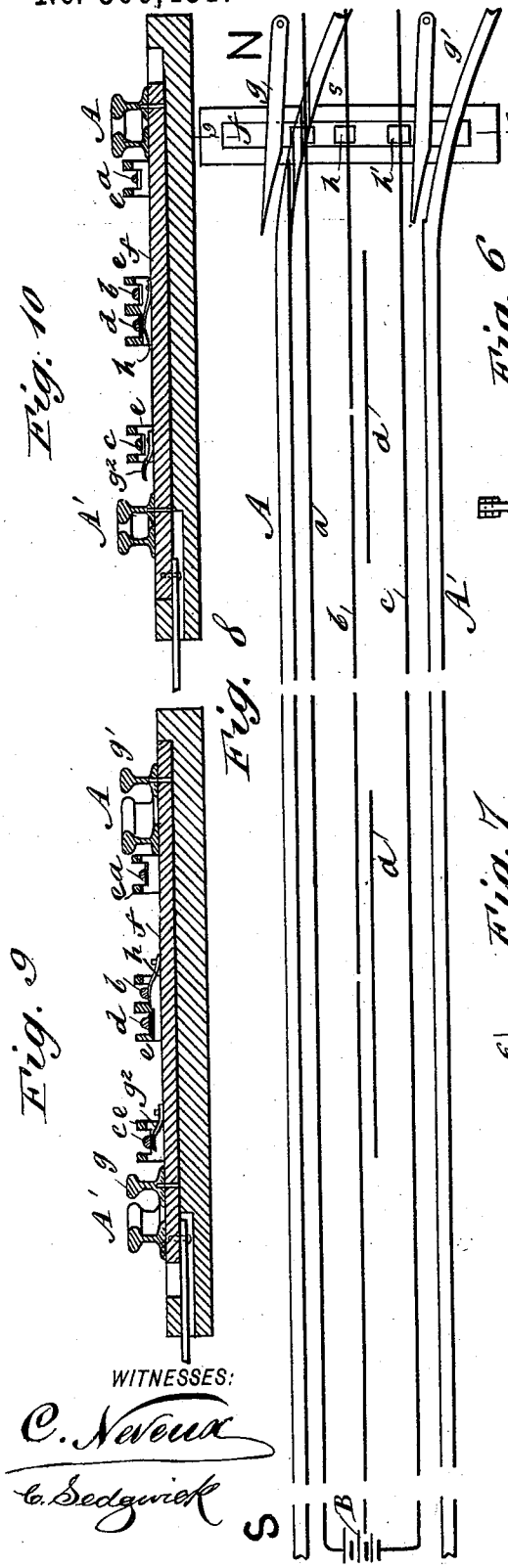

Fig. 10

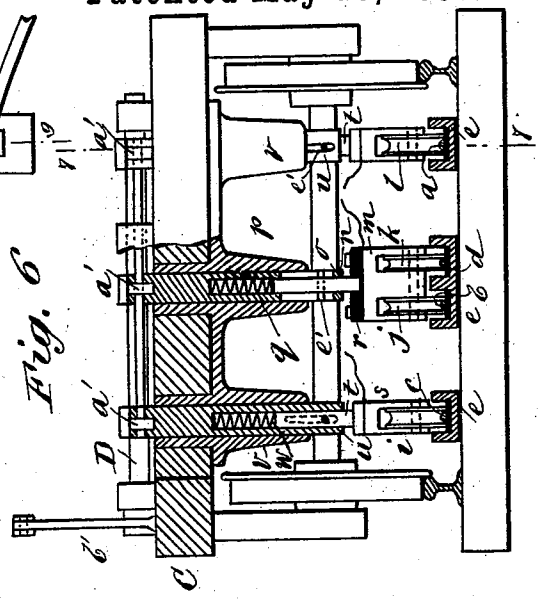

Fig. 6

Fig. 9

Fig. 8

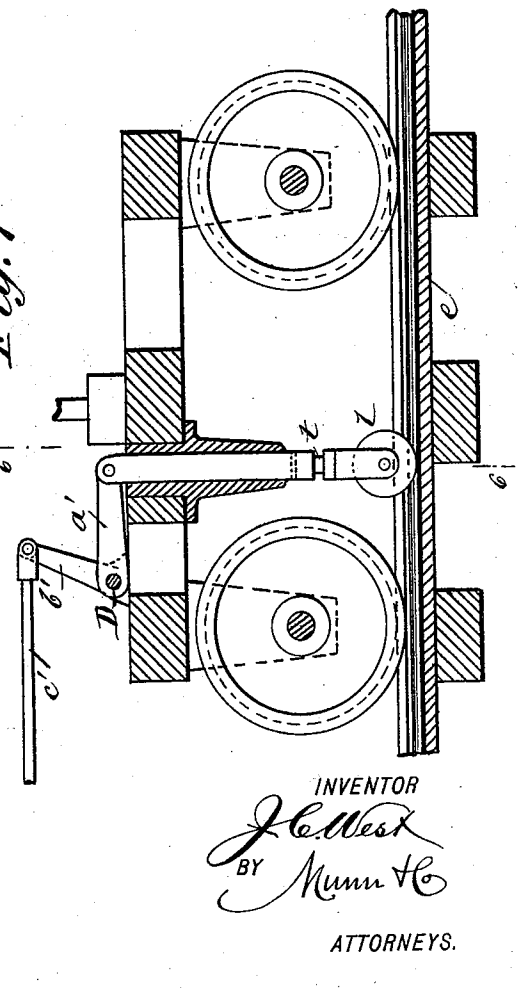

Fig. 7

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UNITED STATES PATENT OFFICE.

JOHN CALHOUN WEST, OF ATLANTA, GEORGIA.

ELECTRIC BLOCK-SIGNAL AND TRAIN-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 560,451, dated May 19, 1896.

Application filed December 23, 1893. Serial No. 494,519. (No model.)

To all whom it may concern:

Be it known that I, JOHN CALHOUN WEST, of Atlanta, in the county of Fulton and State of Georgia, have invented a new and Improved Electric Block-Signal and Train-Lighting System, of which the following is a specification.

The primary object of this invention is to provide a steam-railway system in which it will be impossible for trains to collide with each other or to be accidentally switched.

To this end the invention consists in mechanism for automatically cutting off the steam of two oppositely-moving locomotives and for applying the air-brakes thereof when said locomotives enter the same block, thus stopping the two trains without any operation on the part of the train-hands.

The invention also consists in mechanism for automatically cutting off the supply of steam and for applying the air-brakes of a locomotive when said locomotive enters a block in which there is at a standstill a train bound in the same direction, thus preventing rear-end collisions.

Finally the invention consists in mechanism for automatically cutting off the supply of steam and applying the air-brakes of a locomotive as soon as the same enters a block in which there is an open switch, thus preventing the accidental switching or side-tracking of trains.

The means for obtaining these ends consists, broadly stated, in two main conductors forming parts of an open circuit charged by any suitable source of electricity and extended parallel with each other and along the track, of a broken conductor, the brakes of which are one at each block and with which brakes are associated a series of bridge conductors, and in mechanism carried by the locomotives of the trains and comprising means for electrically controlling the throttle and brake-valves and suitable conducting devices for coöperation with the conductors of the track.

My invention also comprises improved mechanism for lighting trains and headlights.

The invention will be fully described hereinafter, and finally embodied in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the locomotive equipped with my improvements. Fig. 2 is a rear elevation of the locomotive-boiler, showing the same adapted to my invention. Fig. 3 is a plan view of the electromagnet and directly associated parts for furnishing the power whereby the throttle and brake-valve are controlled. Fig. 4 is a sectional view on the line 4 4 of Fig. 2. Fig. 5 is a diagrammatic view showing the arrangement of conductors for a train bound north on the railway system to be hereinafter fully described. Fig. 6 is a sectional view on the line 6 6 of Fig. 7. Fig. 7 is a similar view on the line 7 7 of Fig. 6. Fig. 8 is a diagrammatic view of a railway-track having my conductors applied and embodying a single switch. Figs. 9 and 10 are sectional views on the lines 9 and 10, respectively, of Fig. 8; and Fig. 11 is a diagrammatic view illustrating the track-conductors and the relation therewith of the conductors on the locomotives.

I have shown my invention as applied to a single-track-railway system, and will here describe it in no other connection, although it will be seen that it is easily applicable to more complicated systems. The rails A and A′ of the track are of the usual construction, and in Figs. 8, 9, and 10 are shown to have switch-rails g and g' connected by the usual bar f and coöperating with the rails A and A′ to form a single switch. Extending longitudinally between the rails A and A′ and resting on the cross-ties are three troughs e, the middle of which is double and the outer troughs being single. Each trough carries a conductor, respectively lettered a, b, c, and d. The conductors a and c are respectively arranged in the outer and single troughs e and are of a continuous or unbroken character, forming an open circuit charged by a suitable generator B, (shown in Fig. 8,) while the conductor b, extending in one division of the middle trough e, is broken at each block or division in the railway system, and the conductors d are short-bridge conductors arranged one at each break in the conductor b, as Figs. 8 and 11 best illustrate. The middle trough e, and the trough which is directly ad-

jacent to the rail A, are each provided at a point directly over the switch-bar f with transverse notches, whereby communication may be had with the conductors a and b, the conductor d being protected from electrical contact by means of insulating material laid beneath it, as shown best in Figs. 9 and 10. The third trough and that which carries the conductor c may also be notched; but this is not generally necessary. Fixed to the switch-bar f are two contact-springs h and g^2, said springs being respectively adapted to make contact with the conductors b and c, and the switch-bar is moved to open the switch, such position being illustrated in Fig. 9, while Fig. 10 illustrates the disengaged position of these contacts when the switch is closed.

The above-described parts complete the track-conductors and their immediately-associated elements.

Carried on the pilot-truck C of the locomotive are three transversely-aligned sleeves p and v, the same being preferably cast integral and passed through the pilot-platform, as Figs. 7 and 8 most clearly illustrate. The sleeves v are the outer sleeves, and the sleeve p the middle sleeve, and the outer sleeves v, respectively, carry bars u, which have their lower portions formed with longitudinal bores respectively receiving rods t and expansive spiral springs w, the springs serving to give the rods a tendency downward. The rods u and o, the latter to be hereinafter described, are projected upwardly above the pilot-platform C and are respectively connected to crank-arms a' in turn rocking with a shaft D, from which a crank-arm b' radiates, and the last crank-arm is pivotally connected with a rod c', extending rearwardly and connected with a lever d' in the cab of the locomotive. By this arrangement the rods u and o may be raised or lowered. The sleeve p is provided with the rod o, similar to the rods u, and in the bore of which the rod n is movable, said rod being actuated by a spring q. Each of the rods u and o is provided with a longitudinal slot extending through its bore, and the rods t and n are respectively provided with pins e', slidable in the slots of the rods u and o, whereby the rods t and n are allowed vertical movement, but are prevented from axial movement.

Fixed to the lower end of the rod n through the medium of an insulated block r is a double trolley-frame m, in which the trolleys j and k are respectively mounted, and these trolleys are arranged to make respective contact with the conductors b and d, carried by the middle and double trough e. The lower ends of the rods t are each provided with trolley-frames s, respectively, carrying contact-wheels i and l, the wheel i being arranged to ride on the conductor c and the wheel l on the conductor a, as shown best in Figs. 6 and 11. By the above-described means the conductors a, b, c, and d are made to have electrical connection with the mechanism on the locomotive.

Supported at the upper portion of the head of the boiler E is a table j', on which an electrical magnet m' is mounted and from which an arm l' projects, the said arm having a lever k' fulcrumed on it, and the lever is provided with an armature n', coöperating with a magnet m' and with an expansive spring o', by which the armature-lever k' is raised from engagement with the magnet upon the relaxation of the magnetic influence of the latter. Passing vertically through an opening in the table j' and pivoted to the right-hand end of the armature-lever k' is a vertically-movable rod i', to which a lock-bar H is rigidly fixed, the lock-bar being horizontally disposed and having beveled sides at its ends respectively coöperating with lugs f' held to the boiler-head.

Upon the operation of the armature-lever k' the rod i' is reciprocated to move the bar H vertically and in and out of engagement with the lugs f', which lugs, before the disengagement with the bar H, had served to hold said bar from that outward movement which hereinafter-described parts will tend to give it.

The usual air-brake valve G has affixed to its stem a disk s', provided with a lug u', having a beveled face contiguous to a plane face, and the plane face is adapted to bear against the inner right-hand extremity of the bar H, whereby the movement of the disk s' on the valve-stem and under the influence of the helical spring t' is restrained, said spring being mounted on the air-brake valve to give the disk s', and consequently the valve, a tendency toward an opened position of the valve. The valve-stem is also in rigid connection with an operating-arm t^2, provided with an insulated handle t^3.

Projecting from the boiler-head and in position to make electrical contact with the arm t^2 when the valve G is in an opened position is a contact-block u^3, the purpose of which will be fully described hereinafter in connection with the circuits of my invention.

Fulcrumed on a stud p', projecting from the boiler-head, is a lever q', which has one end in position to engage the throttle-valve F and which has its remaining and upper end restrained by the bar H, a spring r' being fixed to the boiler-head and engaged with the lower arm of the lever q' or that arm which is engaged with the throttle-valve F, so that upon the raising of the bar H the spring r' will be permittted to operate to move the lever q' into forcible engagement with the throttle-valve F and close the same. Supported at the boiler-head is a preferably colored light v', while the train is provided with lights, such as x, and the pilot of the engine with a headlight w', all of which are electrical.

Having thus described the construction of my invention, I will proceed to set forth its operation.

In all locomotives of my system the connections are the same. Referring particularly

to Figs. 5, 8, and 11, and assuming that the end of the railway marked S in Figs. 8 and 11 is the south end thereof and the end marked N the north end thereof, a train passing from south to north should have its trolley *i* and that which runs on the continuous main conductor *a* in connection with a wire or other conductor passing through the magnet *m'* and light *v'* to the trolley *j*, the same being that which travels on the conductor *b*. This train should also have a wire in connection with the trolley *j* and passed to the valve G, so as to electrically charge the same, and a second wire in connection with the trolley *l* and passed to the contact u^3, whereby these two wires will be connected when the arm t^2 is moved to effect an opening of the valve G. This arrangement of the circuits is clearly illustrated in Fig. 5, which, as above described, is the rear elevation of the boiler of the locomotive equipped for passage from south to north. All trains should have the train-lights *x* and the headlight *w'* in connection with the trolleys *i* and *l*, so that said lights will be illuminated. A train moving from north to south will have a wire passing from the trolley *j* to and through the light *v'* and magnet *m'* and returning to the trolley *i*. This south-bound train will also have a wire passing from the trolley *j* to the brake-valve G and a wire passing from the trolley *l* to the point u^3, so as to form a divided conductor connected by the arm t^2, when the valve G is moved to a closed position. Assuming now that the two trains diagrammatically shown in Fig. 11 are moving toward each other and that each enters the same block, it will be seen that the north-bound train has an open circuit in which the magnet *m'* and lamp *v'* are included and which only needs for its closure a connection between the wires *a* and *b*, and that the south-bound train has an open circuit, including the magnet *m'* and lamp *v'*, and only needing for its closure connection between the conductors *b* and *c*. When, therefore, two trains so equipped enter a single block, it will be seen that the connected trolleys *j* and *k* of each train will have electrical contact with the unbroken division of the broken conductor *b*, whereupon the current will be free to pass, say, from the trolley *i* of the north-bound train, through the magnet *m'* and light *v'* of said train and to the trolley *j* of said train, from this point through the said unbroken division of the conductor *b*, and through trolley *j* to the light *v'* and magnet *m'* of the south-bound train and returning to the conductor *c* through the medium of the trolley *i* of the south-bound train.

The result of the completed connection will be an operation of the lights *v'* of each train, which will be to the engineers warning that they are in the said block with an oppositely-moving train, and in an operation of the respective magnets *m'*, which will lift the bars H out of contact with the levers *q* and stud *u'* of each locomotive. When this operation takes place, the springs *r'* will be permitted to press the lower ends of the levers *q'* into engagement with the throttle-valves F and close the same, and the respective disks *s'*, being liberated, the respective springs *t'* thereof will automatically open the valves G. Each train is thus stopped by an automatic closure of the thottle-valves and by an equally automatic application of the brakes, it being observed that the operation takes place without the least action on the part of the train-hands.

The above-described operation is that which prevents head-on collisions, and I will now describe the operation preventive of rear-end collisions. When a train, say the north bound in the diagram of Fig. 11, stops, it will of course be necessary for the arm t^2 to make contact with the block u^3, upon which an open circuit is made on the stopped similar train, which only needs a connection between the conductors *b* and *c* for its closure. When now a train moves in the same block and with an open circuit from the conductors *a* and *b* and including the magnets *m'* and *v'*, it will be seen that this open circuit on the moving train will be closed by the closed circuit from the wires *b* and *c* on the stopped train, thereby causing the current to energize the magnet *m'* and illuminate the lamp *v'*, which operations will result in the stopping of the moving train in the manner above described. It will thus be seen that rear-end collisions are also automatically prevented.

I will now and finally describe the operation which prevents the accidental switching and consequent derailing of the train. Assuming a train to be moving northward on the track of Figs. 8 and 11 and toward the switch in the first-named figure, which switch is shown to be open, it will be seen that this northward-moving train has an open circuit, the closure of which will result in the stopping of the train, and which closure may be effected by establishing electrical communication between the conductors *b* and *c*. This communication is established by means of the contact-springs *h* and g^2 and the switch-bar *f*, which, as shown in Fig. 9, are in position for this communication when the switch is open. Therefore, as soon as the train enters the block, or rather as soon as the trollley *j* of the train rolls on the unbroken section of the conductor *b*, which is in contact with the spring *h*, the circuit on the train, the closure of which is necessary to the stopping of the train, will be so closed and the magnet *m'* will be actuated to permit the closing of the throttle-valve and the application of the brakes. The conductor *b* is in some respects a return wire or conductor, and in some of the following claims it will be so defined.

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

1. In a railway system, two continuous and

charged track-conductors, a broken track-conductor extending alongside the charged conductors, two trains moving on the railway, electrical devices carried by each train, and electrical train connections for each train and respectively including the electrical devices, said train connections forming an open circuit on each train and being respectively in communication with the unbroken track-conductors the train connections being capable of simultaneous communication with one section of the broken track-conductor and of forming a completed circuit in which the track-conductors, electrical devices and the train connections are included, substantially as described.

2. In a railway system, the combination with two continuous and charged track-conductors and a broken track-conductor of a train moving on the railway, mechanism on said train for stopping the same, an opened circuit on said train upon the closure of which said mechanism is operated, a second train, and a conductor on said second train capable of closing the circuit of the first train whereby the said first train is stopped, the said open circuit and the conductor on the second train being joined by engagement with a section of the broken conductor substantially as described.

3. The combination with a truck, of a sleeve fixed thereto, a bored rod movable in the sleeve, a second rod fitting within the bore of the bored rod and having limited movement therein, a trolley carried by the second rod, a rock-shaft connected with the bored rod, and means for rocking said shaft, substantially as described.

4. The combination with a truck, of a sleeve fixed thereto, a bored rod movable in said sleeve, means for moving the rod, a second rod having limited movement in the bore of the bored rod, and a trolley connected to the second rod, substantially as described.

5. The combination with a locomotive, of a throttle-valve, a brake-valve, a spring tending to operate said valve, a locking-bar restraining said spring, a lever fulcrumed on the locomotive and capable of throwing the throttle-valve, said lever being restrained by the locking-bar, a spring pressing against the lever and tending to operate the same, electromagnetic devices capable of raising the locking-bar to disengage the lever and to permit the spring of the brake-valve to operate, and electrical connections, substantially as described.

6. The combination with a locomotive, of means for controlling the same, studs projecting from the locomotive, a locking-bar held by said studs and coöperating with the means for controlling the locomotive, electromagnetic mechanism controlling the locking-bar, and electrical connections, substantially as described.

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