(No Model.)

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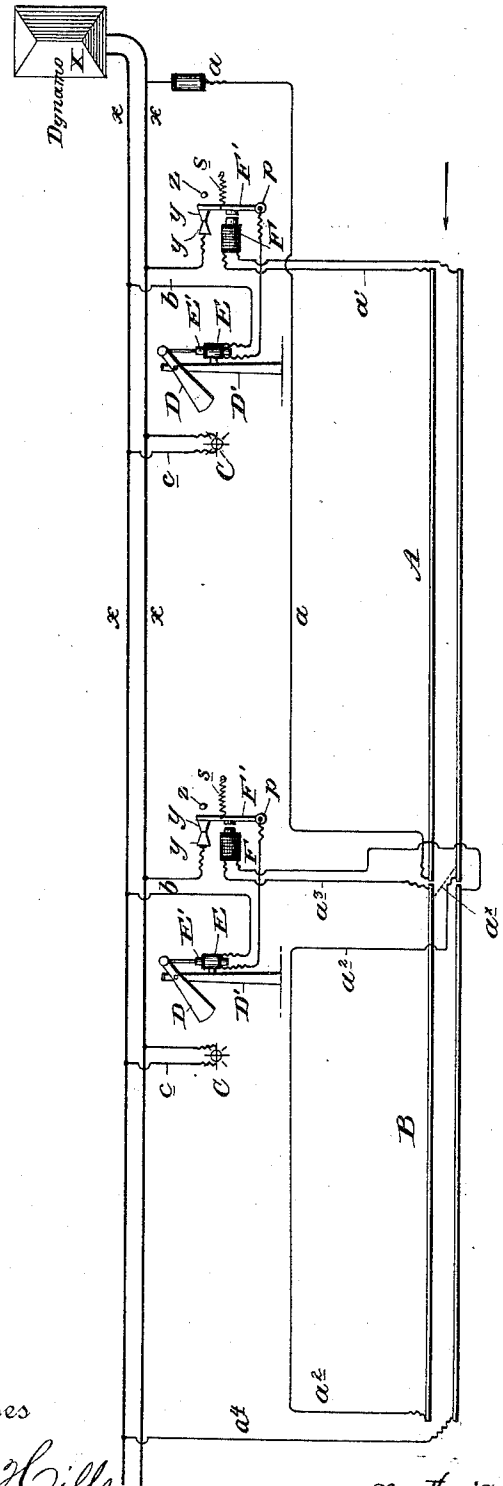
ELECTRIC SIGNALING SYSTEM AND APPARATUS FOR RAILROADS.

No. 427,429. Patented May 6, 1890.



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ELECTRIC SIGNALING SYSTEM AND APPARATUS FOR RAILROADS.

SPECIFICATION forming part of Letters Patent No. 427,429, dated May 6, 1890.

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To all whom it may concern:

Be it known that we, CHARLES HERSCHEL KOYL and JACOB WILLIAM LATTIG, of Easton, in the State of Pennsylvania, have invented certain new and useful Improvements in Electric Signaling Systems and Apparatus for Railroads, of which the following is a specification.

Our invention is directed to an electric automatic block-system which involves the use of a constantly-closed electric circuit, composed in part of the rails of a railroad-track, said circuit containing a magnet (similar to a relay) which controls contacts in a second circuit that includes signal operating or controlling devices, the arrangement being such that when a car is on the rails, thus included in the circuit, the said circuit is diverted through the path of comparatively low resistance offered by the wheels and axle of the car with the effect of demagnetizing or shunting the magnet, and thus through the contacts controlled by said magnet changing the condition of the secondary circuit in which those contacts are included.

We are aware that a railroad signaling system embodying these features is not new in a broad sense.

In expired Letters Patent No. 130,661, of August 20, 1872, reissued July 7, 1874, No. 5,958, the railroad-track is divided into insulated sections, each section being in a constantly-closed circuit which is distinct from and independent of the circuits of the other sections, and includes only the rails of the one section which form part of said circuit. Each of these circuits includes its own independent and separate generator or source of electrical energy, and also a magnet, which, whenever and so long as a car is on the section, is shunted or demagnetized by the diversion of the current through the low resistance offered by the wheels and axles of that car. In said Letters Patent, also, the said magnet is used like a relay to control contacts in an additional or secondary circuit. The feature last named is also described in expired Letters Patent No. 129,425, of July 16, 1872, in the specification of which patent it is stated that "if necessary the primary circuit, which includes the rail or rails, may be caused to actuate a relay of the usual construction, which may in turn actuate the signal by means of a secondary or local circuit from the same or an additional battery in a manner well understood by those skilled in the art of telegraphy." In the said Letters Patent No. 129,425, last referred to, the track is divided into insulated sections, and the rails of each section are included in and form part of a primary circuit which contains its own generator, and is separate from and independent of the other like primary circuits, the system in this respect being similar to that described in Patent No. 130,661. The two systems, however, differ in that while that described in Patent No. 130,661 provides for a constant closed primary circuit, the one described in Patent No. 129,425 demands and provides for a normally-open circuit, which is closed only through the wheels and axles of the car that may happen to be on the individual track-section alone forming part of said circuit.

In our improved system we employ a constantly-closed primary or track circuit, which, as experience has shown, is the most reliable, and, indeed, so far as we are informed, the only really reliable method of protecting trains in case of the failure of the appliances, or of a train breaking in two and leaving a part on the block. We propose, however, to operate a number of blocks or sections from one dynamo or generator or source of electrical energy instead of having one generator for each block or section. To this end we have devised a system which comprises, es
dynamo or other source of electrical supply, a primary or track circuit from said dynamo, including said insulated sections, the circuit-connections being such that not only are the two rails of each section in series with each other, but the successive insulated sections are also in series with one another, a magnet (for operating or controlling the signal devices) being interposed in circuit between the two rails of each section, so that in each section the two rails are in series with each other and with an interposed magnet. By the particular plan or arrangement which we prefer to adopt it is impossible for a break in the

line—as, for example, by a broken or misplaced rail—to occur without it being made manifest at once through the signal devices of the several blocks or sections which are included in the primary or track circuit.

In practice we supply not only the primary or track circuit, but also the several secondary circuits controlling the signal-operating devices of the several blocks from the same dynamo, to which end we extend the circuit-wires from the dynamo along the series of blocks or sections included in the primary or track circuit supplied from that dynamo and connect the several secondary and lamp circuits with the said main circuit-wires, said secondary or signal and lamp circuits being in multiple with each other. The lamp and signal circuits receive the main portion of the current from the dynamo. The track-circuit is of comparatively much higher resistance, so as to take only so much of the current as needed to energize the relay-magnets, which are included in it.

The nature of our invention and the manner in which the same is or may be carried into effect will be readily understood by reference to the accompanying drawing, which is a diagrammatic view of a system embodying our invention as applied to two series—connected blocks or sections—these two blocks being typical also of any greater number of blocks that may be included in series in one track-circuit.

In the drawing the two sections or blocks of the railroad-track, insulated the one from the other, are represented at A B, each composed of two parallel rails or sets of rails, as usual. The arrow indicates the direction of travel of an approaching train.

X is the dynamo or other source of electrical supply, and x x are the main circuit-wires. For each block or section there is an electric lamp C and a signal, such as a pivoted semaphore-arm, (represented conventionally at D D′,) being the post on which the arm is mounted. This semaphore-arm is so nearly counterbalanced that while it will move to one of its two conventional positions by its own weight when unrestrained, it can be moved in the opposite direction and to the other position by the armature-core E′ of a suction-magnet or solenoid-magnet E. In the arrangement shown the semaphore-arm is counterweighted so that when unrestrained its signal end will rise to "danger" position, and the counterweighted end of the semaphore-arm is connected (by a brass rod or link) to the iron core of the solenoid E, which, when the solenoid is inactive, hangs below the center of the latter, so that the sucking action of the energized solenoid shall draw the iron core upward, with the effect of raising the counterweighted end of the semaphore, and consequently of dropping the signal end to "safety" position.

The lamp C is in a branch circuit c, and the coil of the solenoid E is in a branch circuit b, these two branch circuits from the main circuit x x being in multiple or parallel with each other, as shown. In the circuit b, which may be termed the "signal-circuit," are contacts y y, the one fixed, the other movable, the latter forming part of or being otherwise actuated by the armature-lever F′ of a relay, the magnet of which is shown at F. The armature-lever is pivoted at p, and is provided with the usual retracting-spring s and back stop z, (which latter is not in circuit b,) the parts F F′ y y z s being in effect the magnet, armature-lever, back and front stops, movable contact, and retracting-spring of the usual and well-known "neutral" relay. The relay-magnet F is included in the track-circuit, which may be traced as follows: From one of the circuit-wires x at a point near the dynamo by wire a to the extreme end of one of the rails or sets of rails of section A, through that rail or set of rails to the opposite end thereof, thence by wire a' to and through the coils of the relay-magnet F of section A, and then to the end of the other rail or set of rails of section A, through this rail or set of rails to the opposite end thereof, thence in a similar way by a wire a^2 through one of the rails or sets of rails of section B, by wire a^3 to and through the coils of relay-magnet F of section B and to one end of the other rail or set of rails of section B, and from the opposite end of the last-named rail or set of rails by wire a^4 to the other circuit-wire x. The resistance which determines the current upon the track-circuit we prefer to insert in wire a near the point where it joins the circuit-wire x. Under this arrangement it will be seen that the lamp-circuits and the signal-circuits are in multiple or parallel with each other and with the track-circuit. It will also be noted that by the system of connecting the several rails of each section, so that each and every rail throughout its length is in a constant circuit, a break in any one rail will, by interrupting the track-circuit, affect all of the relay-magnets F of the several blocks included in that circuit.

We may in some instances dispense with a connection—such as a^3—and in lieu thereof may make direct connection between the rails of one section A with the nearest end of the other section B, as indicated by dotted line $a^\times$; but this generally is not advisable, because, while under the modified arrangement last suggested, the circuit would still be through the wheels and axles of a car on section B, with the effect of demagnetizing or shunting the relay-magnet F of section B so long as the car was thereon, yet a break in the rail or any one of the set of rails of section B, with which wire $a^\times$ connects, would not be manifested by the signals. We therefore much prefer that the constant track-circuit should normally be through the entire length of the two track-rails or sets of track-rails of each section, and in practice we make the wiring of the circuit continuous, pinning

or otherwise fastening and electrically connecting to the web or flange of the rail the wire between the points where it joins the rail at one end and quits it at the other.

The manner in which the devices operate is apparent from the drawing, and requires but brief description. The track-circuit, as seen, is a constantly-closed circuit, and the relay-magnets F are normally energized thereby to attract their armatures, and thereby close the contacts *y y* of signal-circuits *b*, the arrangement of devices in and controlled by these circuits being such that when the solenoids E are inactive the counterweighted semaphore-arms D will rise to "danger" position. As soon, however, as an approaching train reaches section or block A, for example, the circuit will be completed through the wheels and axles of the cars, thus shunting or demagnetizing the magnet F of that section, with the effect of allowing its spring-retracted lever F′ to open the signal-circuit *b* pertaining to said section through the contacts *y y*, consequently de-energizing the solenoid E in that circuit, and thus raising the semaphore-arm to "danger" position. This condition of affairs continues until the train has left section A, upon which the track-circuit is again completed through the magnet F of that section, with the effect of closing circuit *b*, and thus causing the semaphore to return to its position of safety. As the train reaches and passes over section B, the same operations take place there as described with reference to section A, and so on for any succeeding sections or blocks that may be included serially in the one track-circuit.

Having described our improvements and the best way now known to us of carrying the same into effect, what we claim herein as new and of our own invention is as follows:

1. In an electrical signaling system for railroads, the combination of a generator or source of electrical supply, a constantly-closed circuit supplied therefrom, and a plurality of track sections or blocks insulated from each other, but included in and forming part of said circuit and connected up therein in the manner described, so that both the two rails of each section shall be in series with each other, and the several sections shall also be in series with one another, substantially as and for the purposes hereinbefore set forth.

2. In an electric signaling system for railroads, the combination in one and the same constantly-closed circuit of a generator or source of electrical supply, a plurality of track-sections insulated from one another and forming part of said circuit, being connected up therein, so that the two rails of each section shall be in series with each other, and the sections themselves shall also be in series with one another, and magnets, one for each section, interposed in circuit between the two rails of the sections, substantially as and for the purposes hereinbefore set forth.

3. The combination, with a dynamo or other source of electrical supply and main circuit-wires *x x* therefrom, of a constantly-closed track-circuit in a branch from said circuit-wires, a plurality of track-sections insulated from each other and connected up in said circuit, so that the two rails of each track-section shall be in series with each other and the sections themselves shall be in series with one another, relay-magnets F in said track-circuit, and signal-circuits *b*, connected in multiple to the main circuit-wires *x x*, and including contacts controlled by the armatures of said relay-magnets F, substantially as and for the purpose hereinbefore set forth.

4. The combination, in one and the same constantly-closed circuit, of a generator or source of electrical supply, magnets F, and insulated railroad-track sections or blocks connected up in series in said circuit, and also having the two rails or sets of rails of each section connected in series in such manner that the current shall normally pass over the said two rails or sets of rails successively and from end to end or throughout their length, substantially as and for the purposes hereinbefore set forth.

In testimony whereof we have hereunto set our hands this 28th day of January, 1890.

CHARLES HERSCHEL KOYL.
JACOB WILLIAM LATTIG.

Witnesses:
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CHAS. B. BRUNNER.