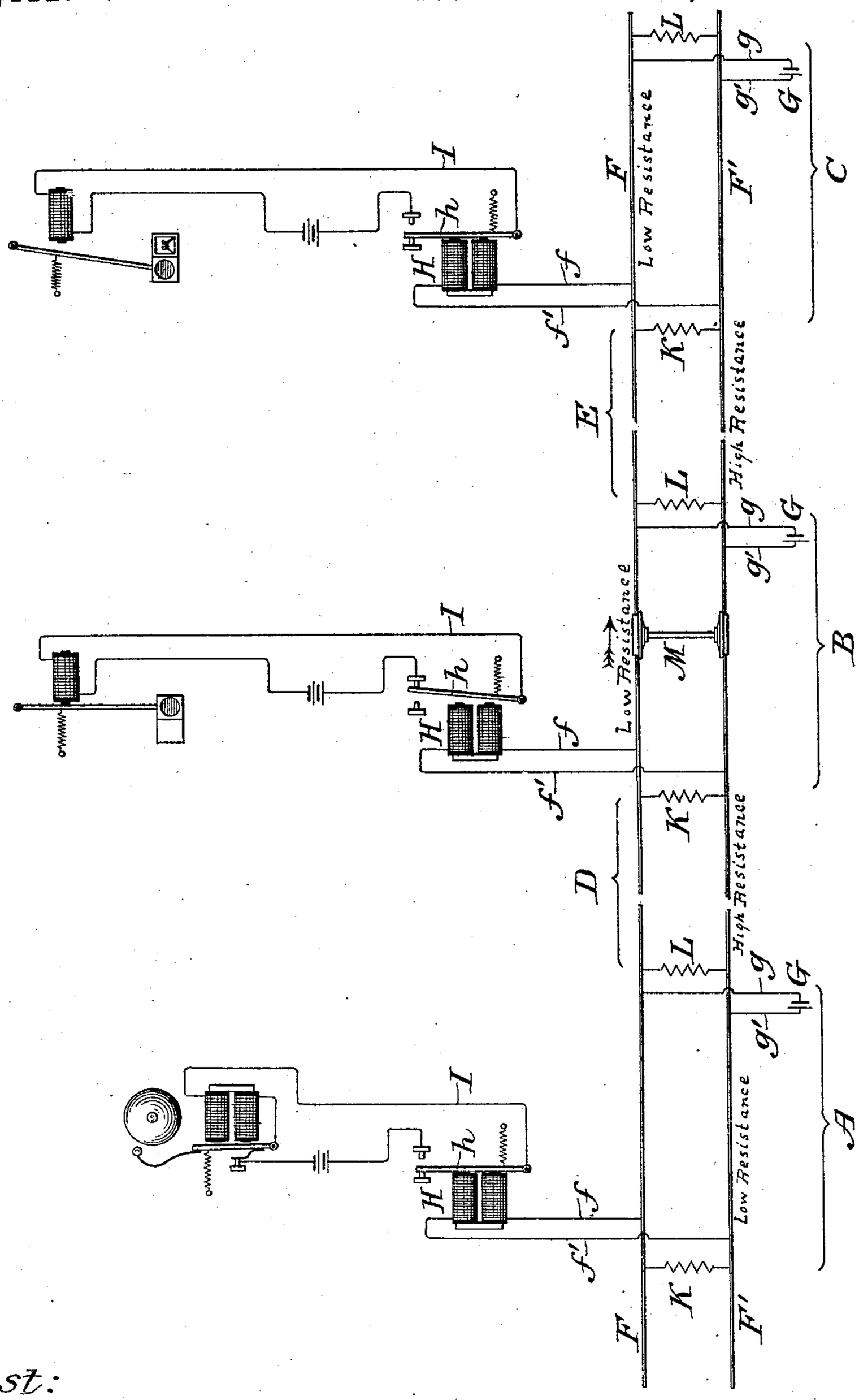
(No Model.)

L. F. JOHNSON.

TRACK CIRCUIT.

No. 521,412. Patented June 12, 1894.



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TRACK-CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 521,412, dated June 12, 1894.

Application filed April 7, 1894. Serial No. 506,159. (No model.)

To all whom it may concern:

Be it known that I, LOUIS F. JOHNSON, of Poughkeepsie, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Track-Circuits; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention relates to electric signaling systems for railways of that general class wherein a circuit is completed from one line of rails of a section to the other line of rails through the wheels and axles of the car which may happen to be on such section. Usually the electrical connection of successive rails is insured by bridge wires while at the end of each section the rail is insulated from the adjacent rail beyond the section. It is somewhat difficult to effect and maintain perfect insulation and frequent renewal is necessary. It has been proposed to so arrange the circuit and its connections as to permit the usual insulation to be dispensed with, reliance being placed upon the resistance which is offered by the usual fish-plate connection of the rails. Under the most favorable conditions it is possible that the proposed arrangement may give satisfactory results, but in wet weather, when the conductivity of the rails is greatly increased, it becomes unreliable. Moreover it requires that the batteries of successive sections shall be all connected to the rails of the respective sections in the same manner as to polarity, but those who have had practical experience with long lines of railway protected by such devices know that it is in fact impossible to rely upon the signal men always to connect up their batteries as they are instructed. Having the difficulties above referred to in mind I have devised a track circuit in which the rails at the end of the sections may be connected by fish-plates in the usual manner without requiring the addition of insulation and in which the limits of each section shall be defined with reasonable exactness in wet weather as well as in dry, so that there shall be no interference with the signals of one circuit or section by the battery of another section either in wet weather or even if the wires from the rails to the signal should be broken. In accordance with my invention I connect the opposite lines of rails of each section preferably at each end of such section, through a resistance which bears a certain relation to the resistance of the relay which operates the local and which should also bear a certain relation to the resistance afforded by that portion of the track which intervenes between one protected section and the next protected section.

The drawing represents diagrammatically a portion of a railway track including three protected sections A, B, and C. Between the protected sections are unprotected sections, as indicated at D and E, which might be a mile or two miles or more or less in length, according to the necessities of the case. The lines of rails are represented at F and F′ as continuous, but it will be understood that the rails of each line within the section are so connected to form a good conductor while the rails of each line outside of a protected section may be united by fish-plates in the ordinary manner and consequently do not form a good conductor under ordinary circumstances.

At a suitable point in the section, preferably near one end thereof, conductors *f* and *f′* are connected to the respective lines of rails F and F′ and include a relay H. The latter, when energized, keeps the local circuit I open, but when it is deprived of current its armature *h* closes the local circuit and actuates the signal in the usual manner.

The battery G for each protected section is preferably connected thereto near the end farthest from the signaling device by suitable conductors *g* and *g′*. The polarity of the battery G, as will more clearly appear hereinafter, may be disregarded in connecting it to the track. At one end of the protected section, within the portion of high conductivity but outside of the connections *f* and *f′*, the opposite lines of rails are connected through a resistance K which is preferably slightly in excess of the resistance of the relay H. At the opposite end of the protected section, also within the portion of high conductivity but outside of the battery connections *g* and *g′*, the opposite lines of rails are connected through a resistance L which is substantially equal to the resistance K. The exact rela-

tion which the resistances K and L should bear to the resistance H is not material but the sum of each resistance K or L plus the resistance of the rails of the section should be between the resistance offered by the relay H and that offered by the line of rails from the end of one protected section to the adjacent end of the next protected section and is preferably only slightly in excess of the resistance of the relay H, in order that the intervening sections D and E may not have to be longer than would be required for safety.

It will be understood that under normal conditions the current of the battery will pass through the wheels and axle of any car which may happen to be upon a protected circuit, as indicated at N, and that the battery will thereby be short-circuited and the relay H cut out, setting the signal at danger. As the car passes beyond the end of the circuit the relay H will be energized by that portion of the current which takes the path through the same. Another path is offered for the current of the same battery through the rails beyond the section and through the axle of the moving car. As the rails outside of the protected section are not so connected as to be of high conductivity the resistance of this path is rapidly increasing, but in wet weather it might happen, and as a matter of fact it does happen in the arrangement previously referred to, that a sufficient portion of the current reaches the relay H of the next protected section to energize the same after the car has passed onto such next section and beyond the connections *f*, *f'*, thereby rendering the system unreliable. It is in order to prevent such action that I have connected the opposite lines of rails at the end of each protected section through the resistance L, for when the car has passed over a certain length of the unprotected section which varies with the conductivity of the rails, the resistance of such rails will be greater than the resistance L and the current will take the latter path. The resistance K at the beginning of each section acts in an obvious manner to guard the relay of that particular section from the introduction of currents from outside the circuit and it also acts, in case the wires *f* and *f'* should be broken or the path through the relay should be otherwise interrupted, to offer a path for the current of the battery of that particular section and thereby to prevent it from following the rails of the intermediate section far enough to perhaps depolarize the battery of the preceding section in case the polarities of the two batteries should not be the same.

No further description of the mode of operation of my invention will be necessary here but it will be obvious, from what has already been stated that when normal conditions prevail no effect will be produced by the addition of the resistances K and L and that such resistances come into play only under abnormal conditions and then operate to prevent interference with one section by the battery of an adjacent section and consequently to maintain the system always in a condition of efficiency.

I claim as my invention—

1. A railway signaling system comprising a series of protected sections composed of two opposite lines of rails the rails of each line being connected to offer low resistance, intermediate sections composed of lines of rails of relatively high resistance, a battery and a relay connected to each protected section and a connection between the opposite lines of rails at the end of each protected section, said connection having a resistance approximating that of the relay and less than that of the adjacent unprotected section, substantially as shown and described.

2. A railway signaling system comprising a series of protected sections composed of two opposite lines of rails the rails of each line being connected to offer low resistance, intermediate sections composed of lines of rails of relatively high resistance, a battery and a relay connected to each protected section, and a connection between the opposite lines of rails at each end of each protected section, each of said connections having a resistance approximating that of the relay and less than that of the adjacent unprotected section, substantially as shown and described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS F. JOHNSON.

Witnesses:
A. N. JESBERA,
A. WIDDER.