(No Model.)

A. J. WILSON.

APPARATUS FOR ELECTRIC RAILWAY SIGNALING.

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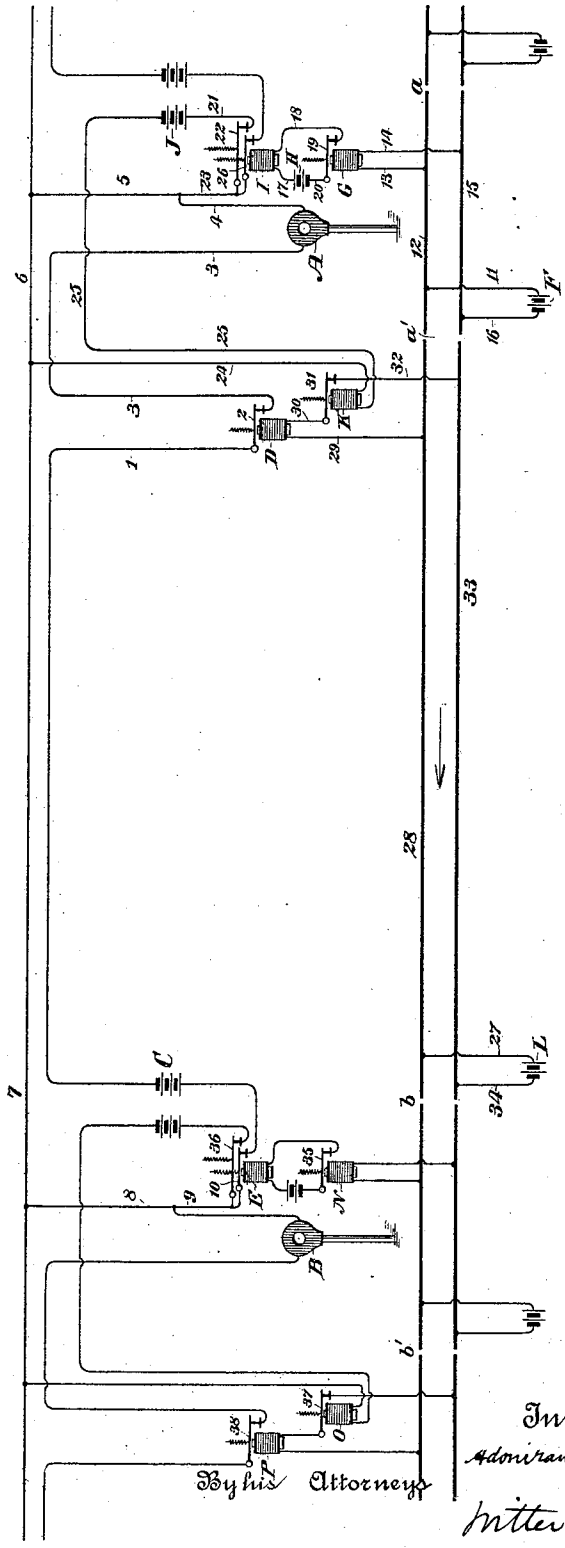

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APPARATUS FOR ELECTRIC RAILWAY SIGNALING.

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To all whom it may concern:

Be it known that I, ADONIRAM J. WILSON, a citizen of the United States, residing at Port Chester, in the county of Westchester and State of New York, have invented a certain new and useful Improvement in Apparatus for Electric Railway Signaling, which improvement is fully set forth in the following specification and the accompanying drawings, which form a part thereof.

My invention relates to that system of automatic electric railway signaling which consists in dividing the line of railway or any desired portion of it into blocks or signal-sections of convenient length—as, say, a mile—at the entrance of each of which blocks or sections a signal is displayed guarding the same, and in further dividing said blocks or sections each of them into one short sub-section or overlap at its beginning, and one long sub-section, the short sub-section or overlap being of convenient length—as, say, eight hundred feet—and the long sub-section being the balance of the block, and finally in operating the signals by the action of the train in passing over the line.

It further relates to that system of such signaling in which the action of the train continues to give the danger-signal after the train has left the block and while any part of it is upon the short sub-section or overlap of the next succeeding block.

The object of my improvement is to attain this end with more absolute certainty than has been possible heretofore, by simpler means than those ordinarily employed, and with a great reduction in the number of unnecessary stoppages of trains.

The accompanying drawings show diagrammatically a portion of a line of railway (consisting of one full block and a portion of another block) to which my invention is applied in the best form known to me, showing the signals and their accompanying electric circuits and the relations of both to the line.

A and B are the signals at or near the entrances to the adjacent blocks, which blocks begin, the one at *a* on the line of railway and the other at *b*. The block beginning at *a* is divided at *a'* into two sub-sections, the sub-section *a a'* (or the "overlap," as it called) being some eight hundred feet long and the sub-section *a' b* being the balance of the mile. Similarly the next block is divided at *b'*. The line of railway is in any desired way insulated at *a a' b b'*, &c., both lines of rails of the one sub-section from those of the next; but the rails of each separate line of rails of a sub-section are electrically connected.

The particular construction of the signals A B is immaterial, as any desired form of signal may be used, although I prefer a signal which is normally held at "safety" by an electric current flowing in a normally-closed signaling-circuit, and which goes to "danger" whenever that current is shunted or interrupted or sufficiently weakened. The drawings show apparatus adapted to such a signal.

The signaling-circuit which operates the signal A may be traced as follows in the drawings: Beginning with its battery C (preferably at the far end of the block) it passes through wire 1, circuit-breaker 2, (near *a'*,) wire 3, signal A, wires 4 5 6 7 8 9, circuit-breaker 10, and back to battery C. This circuit is normally closed, and the current flowing normally through it holds the signal at "safety." It will be observed that the track forms no part of this signaling-circuit, and therefore a strength of battery can be used and a certainty of freedom from accidental loss of the current attained not heretofore attained when the rail has formed any part of the signaling-circuit. It will also be observed that the signaling-circuit is not directly or primarily acted upon by the train, and it is therefore a secondary signaling-circuit. This secondary signaling-circuit is adapted to be broken either at the circuit-breaker 2 (by the failure of the current flowing through the electro-magnet D, as hereinafter described) or at the circuit-breaker 10 (by the failure of the current flowing through the electro-magnet E, as also hereinafter described.) Whenever it is broken anywhere and so long as it remains broken, the current normally flowing through it is interrupted, and the signal being released goes positively to "danger." The signaling-circuit is broken by the circuit-breaker 2 whenever a train or any part of it is on the overlap *a a'* or on the long sub-sec-

tion a' b of the block, in the way to be now described.

The overlap a a' has a battery F at its far end, and at its near end the circuit is completed through an electro-magnet G, the circuit being as follows: Battery F, wire 11, line of rails 12, wire 13, electro magnet G, wire 14, line of rails 15, wire 16, to battery. This circuit, it will be observed, is directly or primarily acted upon by a train or any part of a train upon it to the extent that the current from the battery is short-circuited through the wheels and axles of the train, and is thereby cut off from the electro-magnet G. This breaks the local circuit, consisting of battery H, wire 17, electro-magnet I, wire 18, circuit-breaker 19, and wire 20 at the circuit-breaker 19, which circuit-breaker is controlled and held in circuit-closing position by the electro-magnet G. This breaks the local circuit, consisting of battery J, wire 21, circuit-breaker 22, wires 23 5 6 24, electro-magnet K, and wire 25 at the circuit-breaker 22, and it also breaks the long secondary signaling-circuit of the preceding block or section at the circuit-breaker 26, for these two circuit-breakers 22 and 26 are controlled and held in circuit-closing position by the electro-magnet I. The latter result sets or continues the signal of the preceding block or section at "danger." The former result—to wit, breaking the local circuit at 22—demagnetizes the electro-magnet K, and so breaks the primary circuit on the long sub-section a' b, consisting of the battery L, wire 27, line of rails 28, wire 29, electro-magnet D, wire 30, circuit-breaker 31, wire 32, line of rails 33, and wire 34 at the circuit-breaker 31, for the latter is controlled by and held in its circuit-closing position by the electro-magnet K. This demagnetizes the electro-magnet D, and so breaks the long secondary signaling-circuit of the block in question at the circuit-breaker 2 (which is controlled by and held in its circuit-closing position by the electro-magnet D) and sets the signal A at "danger." Thus the action of the train or of any part of it moving or resting upon the short sub-section or overlap a a' is to set the signal A at "danger," and also to set or continue at "danger" the corresponding signal at the entrance to the last preceding block on the line, all in the way described.

The long sub-section a' b has, as already referred to, a battery L at its far end, and the circuit is completed at the near end through the electro-magnet D, as already described. A train or any part of a train moving or standing on the sub-section a' b will short-circuit the current from the battery through its wheels and axles, and so demagnetize the electro-magnet D, and so break the signaling-circuit of the block at the circuit-breaker 2 and set the signal A at "danger." This is the only effect of a train on the long sub-section a' b. A train on the next overlap b b' will in a precisely similar manner, through the electro-magnet N, circuit-breaker 35, electro-magnet E, and circuit-breaker 10, set or continue the signal A at "danger," and will also in a precisely similar way, through electro-magnet N, circuit-breaker 35, electro-magnet E, circuit-breaker 36, electro-magnet O, circuit-breaker 37, electro-magnet P, and circuit-breaker 38, set the signal B at "danger." When the train finally passes entirely from the overlap b b', the electro-magnet N becomes magnetized again and closes the circuit-breaker 35, and thereby the electro-magnet E becomes magnetized again and closes the circuit-breaker 10, and therefore (the circuit-breaker 2 having been closed when the train left the sub-section a' b) the secondary signaling-circuit of the block in question is now everywhere closed and the signal is therefore set at "safety."

The operation of my device as a whole is therefore as follows, assuming that the train moves in the direction indicated by the arrow on the drawings:

First operation—on train entering sub-section a a': This demagnetizes G, which by breaking the circuit of H at 19 demagnetizes I, which by breaking the circuit of J at 22 demagnetizes K, which by breaking the circuit of L at 31 demagnetizes D, and which by breaking the train-signaling circuit of the block (of which circuit C is the battery) at 2 demagnetizes the operating electro-magnet of the signal A, which is in that circuit and causes the signal A to show "danger." The demagnetizing of I also breaks at 26 the main signaling-circuit of the preceding block, in which circuit is included the operating electro-magnet of the signal at the entrance to said preceding block.

Second operation—on train entering sub-section a' b: This demagnetizes D, which by breaking at 2 the main signaling-circuit of the block (of which circuit C is the battery) demagnetizes the operating electro-magnet of the signal A and causes that signal A to show "danger."

Third operation—on train entering sub-section b b': This repeats the first operation on the corresponding instruments of the next succeeding block—namely, through magnets and circuit-breakers N, 35, E, 36, O, 37, P, and 38. It breaks the main signaling-circuit of that next succeeding block in which is the operating electro-magnet of the signal B, and thereby causes that signal B to show "danger," and through magnets and circuit-breakers N, 35, E, and 10 it breaks the main signaling-circuit, in which is the operating electro-magnet of the signal A, and thereby causes that signal A to show "danger."

Fourth operation—on train entering next long sub-section: This is exactly like the second operation repeated on the corresponding instruments of the second block, and so on.

Instead of operating with a signaling-circuit that is normally closed, one may operate with a signaling-circuit that is normally open.

The necessary changes involved will be evident to any one skilled in the art.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, substantially as hereinbefore set forth, of a series of two or more secondary signaling-circuits, one for each block or section, for actuating or controlling a signal or signals for such block or section, a series of four or more primary signaling-circuits, two for each block or section, adapted to be actuated successively by a train while traversing the said blocks or sections, the first primary circuit of each block actuating or controlling the second primary circuit of that block and also actuating or controlling the secondary circuit of the preceding block and the second primary circuit of each block actuating or controlling the secondary circuit of that block.

2. The combination, substantially as hereinbefore set forth, of a secondary signaling-circuit for actuating or controlling the movements of a signal, a circuit-breaker placed in said secondary circuit, two primary signaling-circuits, and a circuit-breaker in one of said primary circuits, which said primary circuit is normally closed and controls the action of the circuit-breaker in the said secondary circuit and the other of which primary circuits controls the action of the circuit-breaker in the said first primary circuit, the primary circuits being themselves actuated successively by a train while traversing the signal-section protected by said signal.

3. The combination, substantially as hereinbefore set forth, of two adjoining secondary signaling-circuits for actuating or controlling the movements of the signals, respectively, for two adjoining signal-sections, a circuit-breaker placed in each of said secondary circuits, two primary signaling-circuits which are acted upon successively by a train while traversing one of said signal-sections, a circuit-breaker in one of said primary circuits, which said primary circuit is normally closed and controls the action of the circuit-breaker in one of the said secondary circuits and the other of which primary circuits controls the action of the circuit-breaker in the said first primary circuit and also controls the action of the circuit-breaker in the other of the said secondary circuits.

4. The combination, substantially as hereinbefore set forth, of two adjoining secondary signaling-circuits for actuating or controlling the movements of the signals, respectively, for two adjoining signal-sections, a circuit-breaker placed in each of said secondary circuits, two primary signaling-circuits which are acted upon successively by a train while traversing one of said signal-sections, a circuit-breaker in one of said primary circuits, which said primary circuit is normally closed and controls the action of the circuit-breaker in one of the said secondary circuits and the other of which primary circuits controls the action of the circuit-breaker in a local circuit, which local circuit in turn controls the action of a circuit-breaker in the said first primary circuit and also controls the action of the circuit-breaker in the other of the said secondary circuits.

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