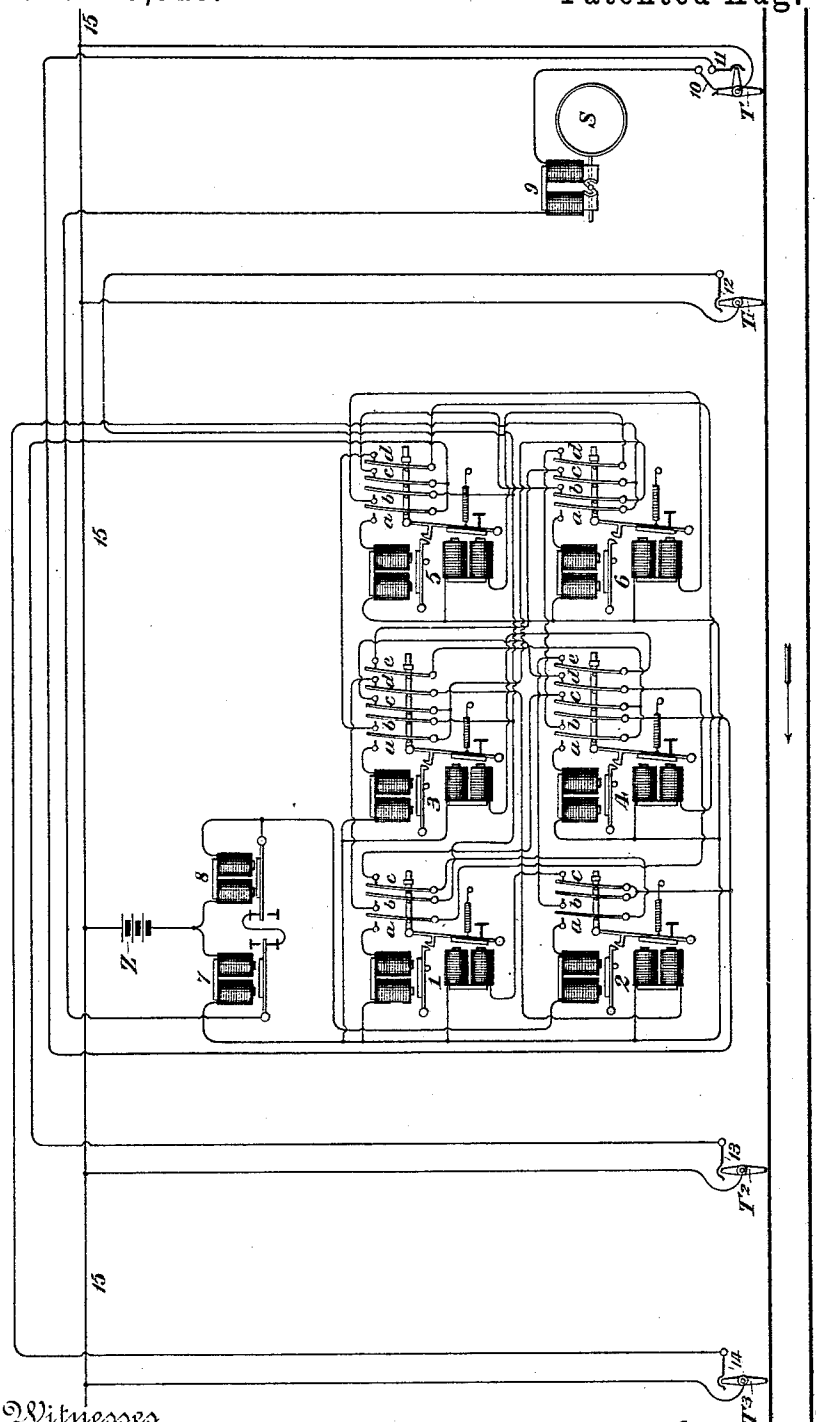
(No Model.)

A. J. WILSON.

ELECTRIC SIGNALING APPARATUS.

No. 479,928. Patented Aug. 2, 1892.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 479,928, dated August 2, 1892.

Application filed November 9, 1891. Serial No. 411,292. (No model.)

To all whom it may concern:

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

The invention relates to automatic electric block-signaling apparatus, and has for its object to permit of the presence of more than one train at a time on the guarded block without the passage of one of such trains from the block clearing the signal behind another following train or trains that may be still on the block.

The invention consists of the apparatus or system herein described and claimed.

The accompanying drawing illustrates diagrammatically my invention as applied to an overlapping block system in the best form known to me and as adapted to permit of the presence of three or any less number of trains upon the block at any one time (moving in the direction indicated by the arrow) and arranged to operate a single visual signal at the entrance to the block.

The apparatus shown in the drawing is one complete set for one block, the same thing being duplicated for each other block of the line.

T T′ T^2 T^3 are track-instruments, T being at the entrance to the block and T^2 being at the entrance to the next block, T′ and T^3 being placed, respectively, at the end of the overlap in the two blocks. The drawing shows at each track-instrument only those of the parts operated by the train at that instrument that affect the signal-circuit of the block of the drawing. For instance, the train at track instrument T operates a third contact, (not shown in the drawing,) which third contact is a part of the signal-circuit of the last preceding block, just as the contact-spring shown at 13 is a part of the signal-circuit of the block of the drawing, and similarly the train at track-instrument T′ operates a second contact, which also forms a part of the signal-circuit of the last preceding block, like the contact-spring shown at 14. Similarly T^2 has two contact-springs (not shown) and T^3 has one contact-spring (not shown) all belonging to the signal-circuit of the block at and near the entrance to which they stand, contact-springs holding the same relations to that signal-circuit that the springs shown at T and T′ hold to the signal-circuit shown in the drawing.

S is the signal, which is operated by the system of circuits shown. It is placed at or near the entrance T to the block in question. The length of the block (T to T^2) and that of the overlaps (T to T′ and T^2 to T^3) may be anything desired, as, say, the one a mile and the other eight hundred feet.

The system shown in the drawing can best be described by its successive operations under the succesive actions of trains in moving over the track.

The main signaling-circuit, which in the special form of apparatus shown in the drawing is normally closed, may be traced as follows: battery Z, battery line-wire 15, track-instrument T, contact-piece 10, magnet 9, armature of relay 7, armature of relay 8, coil of relay 8, to battery. Magnet 9 holds the signal S at "clear" so long as this main signaling-circuit remains closed throughout and the parts are all in normal condition and operation.

First operation, on first train striking track-instrument T. This momentarily breaks contact of that track-instrument with contact-piece 10 and makes contact of the instrument with contact-piece 11. The break at 10 is a break of the main signaling-circuit described above and it demagnetizes 8 and 9. The demagnetizing of 9 causes the signal S to fall to "danger," and the demagnetizing of 8 causes its armature to fall, which introduces a second (and this a permanent) break in the main signaling-circuit. This main signaling-circuit manifestly cannot be remade at this point (to wit, at the armature of relay 8) until that relay is again magnetized by being included in some other circuit, and so the break indirectly caused by the train at armature of relay 8 is permanent in comparison with that of the direct break occasioned at 10, and the signal S is thus kept permanently at "danger." The function of the relay 8 and its armature

is thus to transform any temporary break in the main signaling-circuit into a permanent break, subject to being remade only by including the coil of this relay 8 in some other circuit and thereby magnetizing it, and it may therefore be called the "main signaling-relay." The temporary contact made by track-instrument T with contact-piece 11 completes a branch circuit, as follows: battery, line 15, track-instrument T, contact-piece 11, contact-springs *c* of multiple-circuit instrument 2, lower or reversing magnet of multiple-circuit instrument 1, coil of relay 7, and battery. This temporary magnetizing of the relay 7 makes a temporary break at its armature in the main signaling-circuit, which break sets or resets the signal S at "danger," if by any mischance this has not been already done. The relay 7 thus insures the setting or resetting of the signal at "danger" and may be called the "resetting-relay." It is an important safeguard employed in practice, but is not essential to the invention herein described and claimed, and it is not herein claimed, but forms part of the subject-matter of another application which I have filed under Serial No. 439,234, dated July 7, 1892. The magnetizing of the lower or reversing magnet of the multiple-circuit instrument 1 reverses and locks that instrument, reversing the contacts of its contact-springs *a b c* from their normal positions, which normal positions are those shown in the drawings. This reversal of the points of multiple-circuit instrument 1 it will be important to bear in mind in following the successive operations.

Second operation, on the first train striking track-instrument T′. This makes a contact at 12 and completes the following branch circuit: battery, line, T′, 12, *b* of 1, *d* of multiple-circuit instrument 3, lower or reversing magnet of 2, resetting-magnet 7, and battery. This locks the multiple-circuit instrument 2 and reverses its points *a b c* from their normal positions shown in the drawing.

Third operation, on second train striking track-instrument T, with first train still on the block. This breaks contact at 10, as before, (thus insuring the setting of signal S at "danger,") and it also makes contact at 11. The latter, in the now reversed positions of the points of multiple-circuit instruments 1 and 2 from their normal positions, completes the following circuit: line, T, 11, *b* of 2, *e* of 4, lower or reversing magnet of 3, resetting-magnet, and battery. This locks the multiple-circuit instrument 3 and reverses its points *a b c d e* from their normal positions. (Shown in the drawings.)

Fourth operation, on second train striking track-instrument T′. This in the reversed positions of the points of multiple-circuit instruments 1, 2, and 3 completes the following branch circuit: line, T′, 12, *b* of 3, *d* of 5, lower or reversing magnet of 4, resetting-magnet, and battery. This locks multiple-circuit instrument 4 and reverses its points *a b c d e* from their normal positions. (Shown in the drawings.)

Fifth operation, on third train striking track-instrument T, with the first two trains still on the block. This in the reversed positions of the points of the multiple-circuit instruments 1, 2, 3, and 4 completes the following branch circuit: line, T, 11, *b* of 4, *d* of 6, lower or reversing magnet of 5, resetting-magnet, and battery. This locks the multiple-circuit instrument 5 and reverses its points *a*, *b*, *c*, and *d* from their normal positions. (Shown in the drawings.) The operation also, as before, breaks the main signaling-circuit, at 10, thus insuring the setting of signal S at "danger."

Sixth operation, on third train striking track-instrument T′. This in the reversed positions of the points of the multiple-circuit instruments 1, 2, 3, 4, and 5 completes the following branch circuit: line, T′, 12, *b* of 5, lower or reversing magnet of 6, resetting-magnet, and battery. This locks the multiple-circuit instrument 6 and reverses its points *a b c d* from their normal positions. (Shown in the drawings.)

Seventh operation, on first train striking track-instrument T^2. This in the reversed positions of the points of all the multiple-circuit instruments completes the following branch circuit: line, T^2, 13, *a* of 5, upper or unlocking magnet of 5, resetting-magnet, and battery. This unlocks multiple-circuit instrument 5, restoring its points to their normal positions.

Eighth operation, on first train striking track-instrument T^3. This in the reversed position of the points of multiple-circuit instruments 1, 2, 3, 4, and 6 completes the following branch circuit: line, T^3, 14, *a* of 6, upper or unlocking magnet of 6, resetting-magnet, and battery. This unlocks multiple-circuit instrument 6, thus restoring its points to their normal positions.

Ninth operation, on second train striking track-instrument T^2. This in the reversed positions of the points of multiple-circuit instruments 1, 2, 3, and 4 completes the following branch circuit: line, T^2, 13, *c* of 5, *b* of 6, *a* of 3, upper or unlocking magnet of 3, resetting-magnet, and battery. This unlocks multiple-circuit instrument 3, restoring its points to their normal positions.

Tenth operation, on second train striking track-instrument T^3. This in the reversed positions of the points of multiple-circuit instruments 1, 2, and 4 completes the following branch circuit: line, T^3, 14, *c* of 6, *e* of 3, *a* of 4, upper or unlocking magnet of 4, resetting-magnet, and battery. This unlocks the multiple-circuit instrument 4, restoring its points to their normal position.

Eleventh operation, on third train striking track-instrument T^2. This in the reversed positions of the points of multiple-circuit instruments 1 and 2 completes the following branch circuit: line, T^2, 13, *c* of 5, *b* of 6, *c* of

3, *d* of 4, *a* of 1, upper or unlocking magnet of 1, resetting-magnet, and battery. This unlocks multiple-circuit instrument 1, restoring its points to their normal position.

Twelfth operation, on third train striking track-instrument T^3. This in the reversed positions of the points of multiple-circuit instrument 2 completes the following branch circuit: line, T^3, 14, *c* of 6, *e* of 3, *c* of 4, *c* of 1, *a* of 2, upper or unlocking magnet of 2, main signaling-magnet 8, and battery. This unlocks multiple-circuit instrument 2, restoring its points to their normal positions, and by magnetizing the main signaling-magnet 8 it draws up the armature of that magnet, thereby completing the main signaling-circuit, which had been permanently broken at that point by the first operation, above described. The main signaling-circuit being thus restored throughout, the current of the battery Z flows through it as at first, magnetizing the magnet 9 and setting the signal S at "clear." The system is then in every part restored to its original and normal position, ready to pass again through the several operations above described.

If there is but one train at a time upon the block, the successive operations of that train on track-instruments T, T', T^2, and T^3 will be those numbered first, second, eleventh, and twelfth, respectively, in the above enumeration. If there are but two trains at a time upon the block, their successive operations upon the successive track-instruments will be, respectively, those numbered first, second, third, fourth, ninth, tenth, eleventh, and twelfth, in the above enumeration. If after one of the three trains on the block has passed off the block (operating the system according to the seventh and eighth operations, enumerated above) a fourth train enters upon the block, the operations of that fourth train upon the track-instruments T and T' will be those numbered fifth and sixth in the above enumeration, and the first of the three trains then on the block to leave the block will repeat upon the track-instruments T^2 and T^3 the operations numbered seventh and eighth above, and so on. It will thus be seen that in the arrangement of circuits shown in the drawing any number of trains may be upon the block at one and the same time up to three trains—that is to say, there may at times be one train upon the block, at times two trains, at times three trains, at times no train, &c.—and the system will automatically manipulate the signal S in such a way as to keep it at "danger" so long as there is any train at all upon the block or its overlap and to keep it at "clear" so long as there are no trains upon the block or its overlap.

Referring to the general invention, it will be evident that the track-instruments T' and T^3 may, if desired, be dispensed with, it being necessary in that case to have only half the number of multiple-circuit instruments. It will also be evident from the above description that in order to accommodate or provide for a greater number of trains upon a block at once than three it will only be necessary to proportionately increase the number of multiple-circuit instruments with their proper connecting branch circuits to be manipulated through them by the successive trains acting upon the successive track-instruments. Speaking of the general invention, it will be also evident that it is not limited to the automatic manipulation of a visual signal S, as the place of that signal in the system may be taken by an audible signal, as a bell, or by a locking device in an interlocking system, &c. Again, the visible or audible signal or lock may be operated by some other power (as steam, compressed air, dynamos, storage-batteries, &c.) and the current of the battery Z be employed merely to control or direct that other power. It will also be evident that the invention is not limited to any particular kind of track-instrument T T' T^2 T^3, as any form of track-instrument might be employed that would do the work above described in the system without departing from the invention, and the place of the track-instruments (or of some of them) in the system might be taken by rail-circuits suitably arranged to be operated by the passing trains and to in turn suitably operate the circuits and branch circuits of the invention. It is also evident that many modifications might be made in the specific construction of the multiple-circuit instruments and in the specific arrangement of the branch circuits without departing from the invention.

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

1. In a permissive block-signal system, a signaling-circuit operating or controlling the operation of a signal guarding a given section of track, in combination with a series of branch circuits and a corresponding series of multiple-circuit instruments controlling said branch circuits, all arranged to be operated in succession in one direction by trains successively entering the guarded section of track, one set by the first train, a second set by the second train, a third set by the third train, and so on, and all arranged to be operated in reverse succession and direction by said trains on their subsequently successively leaving the guarded section of track, the last to be restored by the first train to leave, the next to the last to be restored by the next train to leave, and so forth, whereby a train entering the guarded section of track throws the signal to "danger" but does not clear said signal on leaving the guarded section if another train or trains have meantime entered the guarded section behind it and does clear said signal if such be not the case, substantially as and for the purposes set forth.

2. In a permissive block-signal system applied to overlapping blocks, a signaling-circuit operating or controlling the operation of a signal guarding a given section of track,

consisting of one block and an overlap on the next succeeding block, in combination with a series of double sets of branch circuits and a series of double sets of multiple-circuit instruments controlling said branch circuits, all arranged to be operated in succession in one direction by trains entering the overlap and leaving the overlap in succession, and to be operated in reverse succession and direction by said trains on their subsequently and one after another entering the overlap of the next succeeding block and on their leaving the same, substantially as and for the purposes set forth.

ADONIRAM J. WILSON.

Witnesses:
RALPH B. HIBBARD,
ROBERT A. BECKER.

Corrections in Letters Patent No. 479,928.

It is hereby certified that in Letters Patent No. 479,928, granted August 2, 1892, upon the application of Adoniram J. Wilson, of Port Chester, New York, for an improvement in "Electric Signaling Apparatus," errors appear in the printed specification requiring correction as follows: In lines 58–9, 68–9, 79–80, and 92–3, page 2, the clause printed and punctuated "their normal positions. (Shown in the drawings.)" should have been printed and punctuated *their normal conditions shown in the drawings;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the papers pertaining to the case in the Patent Office.

Signed, countersigned, and sealed this 9th day of August, A. D. 1892.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

N. L. FROTHINGHAM,
Acting Commissioner of Patents.