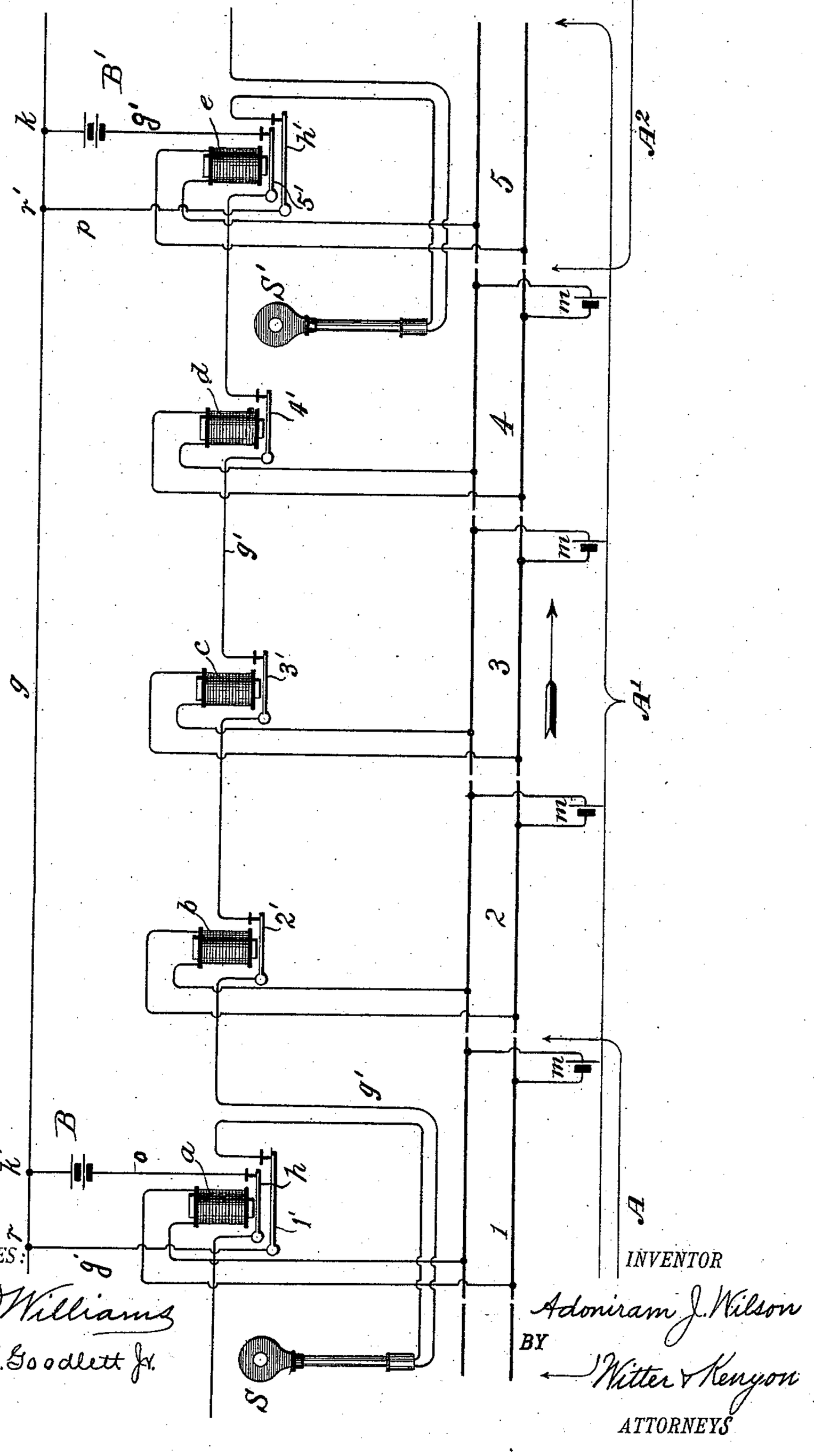
(No Model.)

A. J. WILSON.

ELECTRIC RAILWAY SIGNAL.

No. 528,245. Patented Oct. 30, 1894.



UNITED STATES PATENT OFFICE.

ADONIRAM J. WILSON, OF PORT CHESTER, NEW YORK, ASSIGNOR TO THE HALL SIGNAL COMPANY, OF MAINE.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 528,245, dated October 30, 1894.

Application filed November 21, 1892. Serial No. 452,631. (No model.)

To all whom it may concern:

Be it known that I, ADONIRAM J. WILSON, a citizen of the United States, and a resident of Port Chester, Westchester county, State of New York, have invented a certain new and useful Improvement in Electric Railway-Signals, of which the following, taken in connection with the accompanying drawing, forming part hereof, is a specification.

My present invention relates to automatic electric railway signals for block systems and has for its object to improve and render more certain the operation thereof, thus reducing the liability of false signals, and also to provide for an increase in the present length of the blocks beyond which it is now not practicable to operate the signals.

It consists of the devices and their arrangement hereinafter set forth.

In systems of this class it has been usual to divide the track into a series of sections, locating a signal at the beginning of each section and to control these signals by means of normally closed signal circuits operated by circuits which include the rails of the corresponding track section. These track sections have generally been not more than one mile in length and the rails which form part of the circuit of each section have been laid directly upon the cross ties and without the intervention of any insulation. As the train advanced upon the section, it operated the signal by bridging the rails and thus shunting the battery from the magnet included in the circuit with the rails and thus breaking the signal circuit. It is of course apparent that anything that might break the signal circuit or connect the rails of a track section would necessarily operate the signal. Ordinarily the battery of each track circuit finds the normally closed metallic circuit through the magnet and rails thereof of so much less resistance than that offered by the cross-ties which mechanically bridge the rails, or than that offered by the gravel, stone, ashes or other similar material of which the road bed is generally made, that there is little possibility of the battery being short circuited through the cross-ties or roadbed to such a degree that the signal would be thrown to danger; but if the track section is materially increased in length its resistance is likewise increased while the resistance of the material composing the roadbed remains the same. It is therefore obvious that there must be a limit to the length of the track section which can safely be employed, for, when its resistance approximates that of the material of the road bed lying between the rails, the battery is likely to be short circuited and produce false signals. For this reason it is not usual to employ a track circuit in systems of this character longer than one mile. There are cases, however, where it has been found advantageous to employ sections two or three miles in length, or even longer, but the increased resistance of the track circuits and the consequent liability of short circuits between the rails, and therefore false signals, has rendered their employment impracticable. Again, it has been found that the resistance afforded by roadbeds varies considerably in accordance with the particular material used and with the care with which the roadbed may be constructed. For example, it has been ascertained that a cinder roadbed offers less resistance than one made of earth, and also that, where perfect drainage is not provided for, pools of water standing on the track and either bridging the rails or soaking the cross-ties may provide a short path for the circuit. Moreover it may be desirable in some cases to increase the strength of the track battery to such an extent that a considerable portion of its current may find a short path across the rails while scarcely enough finds circuit through the magnet to render the operation of the signal certain.

These various objectionable features and limitations of construction are largely obviated by my present invention, the embodiment of which permits sections of considerable length to be employed, and permits this to be accomplished notwithstanding poor insulation of the roadbed, and permits sections of ordinary length to be employed where the condition of the roadbed would prevent efficient operation with the signaling devices and circuits heretofore employed.

My invention also includes an exceedingly

simple and efficient arrangement of circuits, and arrangement and construction of other apparatus.

In the accompanying drawing which represents diagrammatically my invention, the circuits are shown in their normal condition, *i. e.*, when there is no train on the track to operate the signals.

A′ designates one block or section of the track and is provided with the wire circuits, signals, &c., hereinafter fully set forth. A is the preceding section and A^2 is the section following section A′. The rails of section A′ are divided into any convenient number of sub-sections, here shown as five in number, and the end sections, viz., 1 and 5, are common to sections A′ and A and to sections A′ and A^2 respectively, thus making an overlap for each section. Each sub-section of the track is provided at its inner end with a battery *m* and at its outer or entering end with a bridge circuit including a magnet, lettered respectively *a*, *b*, *c*, *d* and *e*.

Each of the sections is guarded by its signal S, S′, &c., located at its outer end and therefore at the beginning of the overlap. That entire portion of the track which is guarded by any one signal is what I call a track section. Extending along the track is a wire *g*, to which is connected a wire *g′* at points *r* and *k* opposite or approximately opposite respectively the outer and inner ends of section A′. This wire *g′* extends from point *r* through circuit breakers 1′, 2′, 3′, 4′ and 5′, controlled respectively by magnets *a*, *b*, *c*, *d* and *e*, but passing to the operating devices of signal S between the circuit breakers 1′ and 2′.

The circuit *g*, *g′* includes at some convenient point a battery B′, which serves to hold the signal operating devices in their normal position and the signal at safety. To the wire *g* is connected at *r′* a circuit wire *p*, belonging to section A^2, which passes through a second circuit-breaker *h′*, controlled by the magnet *e*, then to the operating devices of signal S′, thence through the circuit controllers of the track magnets and the battery of section A^2 back to wire *g* in the same way as wire *g′*.

At the point *k′* is connected a circuit wire *o*, belonging to section A, which passes through battery B, circuit breaker *h*, controlled by magnet *a*, and thence through the circuit controllers of the track magnets, the battery and signal mechanism of the section A back to wire *g*. Thus it will be seen that a portion of any two adjoining track sections is arranged to operate both the signal circuits for these track sections at the same time so that when a train is upon this portion of the track common to the two track sections, it operates the signals of both sections simultaneously.

The operation is as follows:—A train entering overlapping sub-section 1, shunts battery *m* from magnet *a*, breaks the circuits at *h* and *l′* and throws to danger the signal of section A and signal S of section A′. As it passes off the sub-section 1, circuit breaker *h* is restored to normal and the signal of section A returns to safety. The circuit breaker *l′* at the same time returns to normal, but before the train has passed entirely from sub-section 1 it has entered upon sub-section 2 and broken the circuit at 2′, and before it has restored the circuit at 2′ it has broken it again at 3′, and so on throughout the section. When the train enters sub-section 5 it not only breaks again its signal circuit *g* *g′* at 5′, holding signal S at danger until it has passed off overlapping sub-section 5, but also breaks the circuit of signal S′ at *h′*. Thus signal S is maintained at danger from the moment the train enters section A′ till it has passed entirely off the section and at the same time the train throws the signal S′ to danger the moment it enters the overlap of section A^2 and before it has left section A′. By introducing into each signal circuit as thus set forth a number of circuit breakers, each controlled by a comparatively short track circuit it is obvious that the length of a section or block may be indefinitely increased, whatever may be the character of the roadbed, without endangering in any degree the certainty of operation of the system. It is also obvious that inasmuch as the track circuits may be shortened to any degree, whatever may be the length of the section, the batteries *m* will always find ready circuit through their magnets and maintain the signal circuit intact. In fine, whatever may be the condition of a roadbed and its liability to shunt a track battery or whatever may be the strength of a track battery or the length of a signal section desired, my system may be adjusted to meet fully the requirements of each case.

I do not confine myself to any particular character of signal or signal operating mechanism, as they of course may be varied at will.

Various other changes may be made without departing from the spirit of my invention. For instance, the track circuits for each sub-section need not necessarily include the rails of the track but the train may operate these track circuits by means of track instruments. Again the means for operating the signal circuit through the track circuits may be widely varied and the system need not be confined to normally closed circuits either broken or shunted by the train, but may employ normally open circuits as well. The wire *g* need not be a general circuit wire extending continuously along the track, but may extend approximately from end to end of its section and the overlapping feature need not necessarily be employed.

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

1. In an electric signaling system for railways, the combination of a series of track sec-

tions, each divided into sub-sections, a track circuit for each sub-section, a series of signal circuits corresponding to the track sections and each adapted to be operated upon a change in the electric condition of each of its track circuits, each track section overlapping the succeeding track section and each signal circuit overlapping the succeeding signal circuit, substantially as and for the purpose set forth.

2. In an electric signaling system for railways, the combination of a series of track sections, each divided into sub-sections, a track circuit for each sub-section, an overlapping signal circuit for each track section adapted to be operated upon a change in the electric condition of each of its track circuits, the inner sub-section of a track section being also the outer sub-section of the succeeding track section, substantially as and for the purpose set forth.

3. In an electric signaling system for railways, the combination of a series of track sections, each divided into sub-sections, a track circuit for each sub-section, an overlapping signal circuit for each track section adapted to be operated upon a change in the electric condition of each of its track circuits, the inner sub-section of a track section being also the outer sub-section of the succeeding track section, the inner end of one side of a signal circuit being also the outer end of one side of the succeeding signal circuit, substantially as and for the purpose set forth.

4. In an electric signaling system for railways, the combination of a series of track sections, each divided into a series of sub-sections, the inner sub-section of each section being also the outer sub-section of the succeeding section, a normally closed track circuit for each sub-section, an overlapping signal circuit for each track section adapted to be operated upon a change in the electric condition of the track circuits, substantially as and for the purpose set forth.

5. In an electric signaling system for railways, the combination of a series of track sections, each divided into a series of sub-sections, the inner sub-section of each section being also the outer sub-section of the succeeding section, a normally closed track circuit for each sub-section, an overlapping signal circuit for each track section, provided with normally closed circuit breakers each adapted to be opened upon a change in the electric condition of each of its track circuits whereby a train entering upon a track section will throw the signal to danger and retain it there until it has passed entirely off the overlap of the succeeding section, substantially as and for the purpose set forth.

6. In an electric signaling system for railways, the combination of a series of track sections, each divided into a series of sub-sections, the inner sub-section of each section being also the outer sub-section of the succeeding section, over-lapping signal circuits one for each section, one side of which extends continuously along the track and the other side of which extends approximately from end to end of the section, a series of normally closed circuit-breakers in each signal circuit, a normally closed track circuit for each sub-section including the rails thereof and a magnet for operating the circuit breakers upon a change in the electric condition of said track circuit, substantially as and for the purpose set forth.

ADONIRAM J. WILSON.

Witnesses:
S. MARSH YOUNG,
W. W. SALMON.