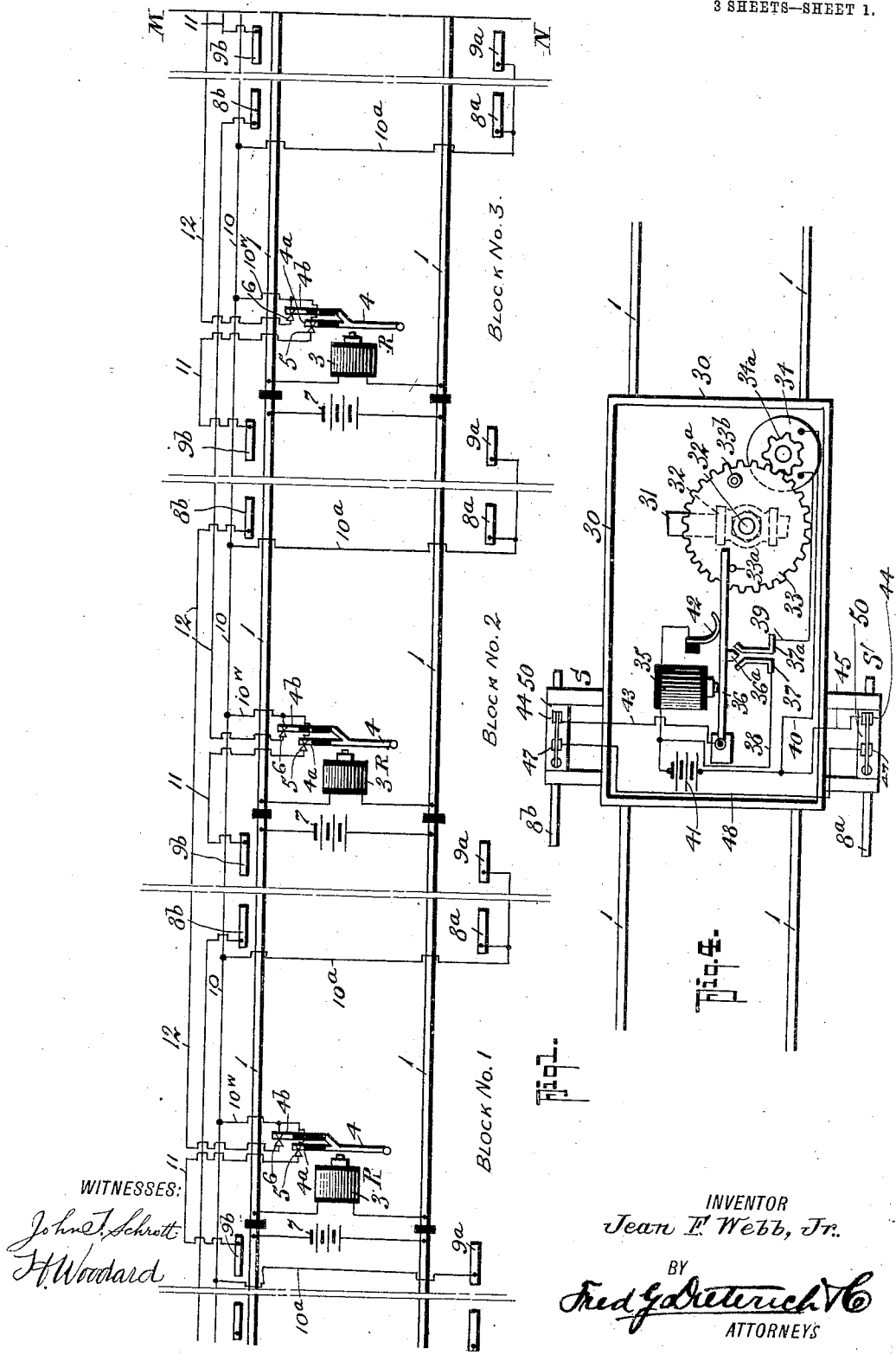




WITNESSES:

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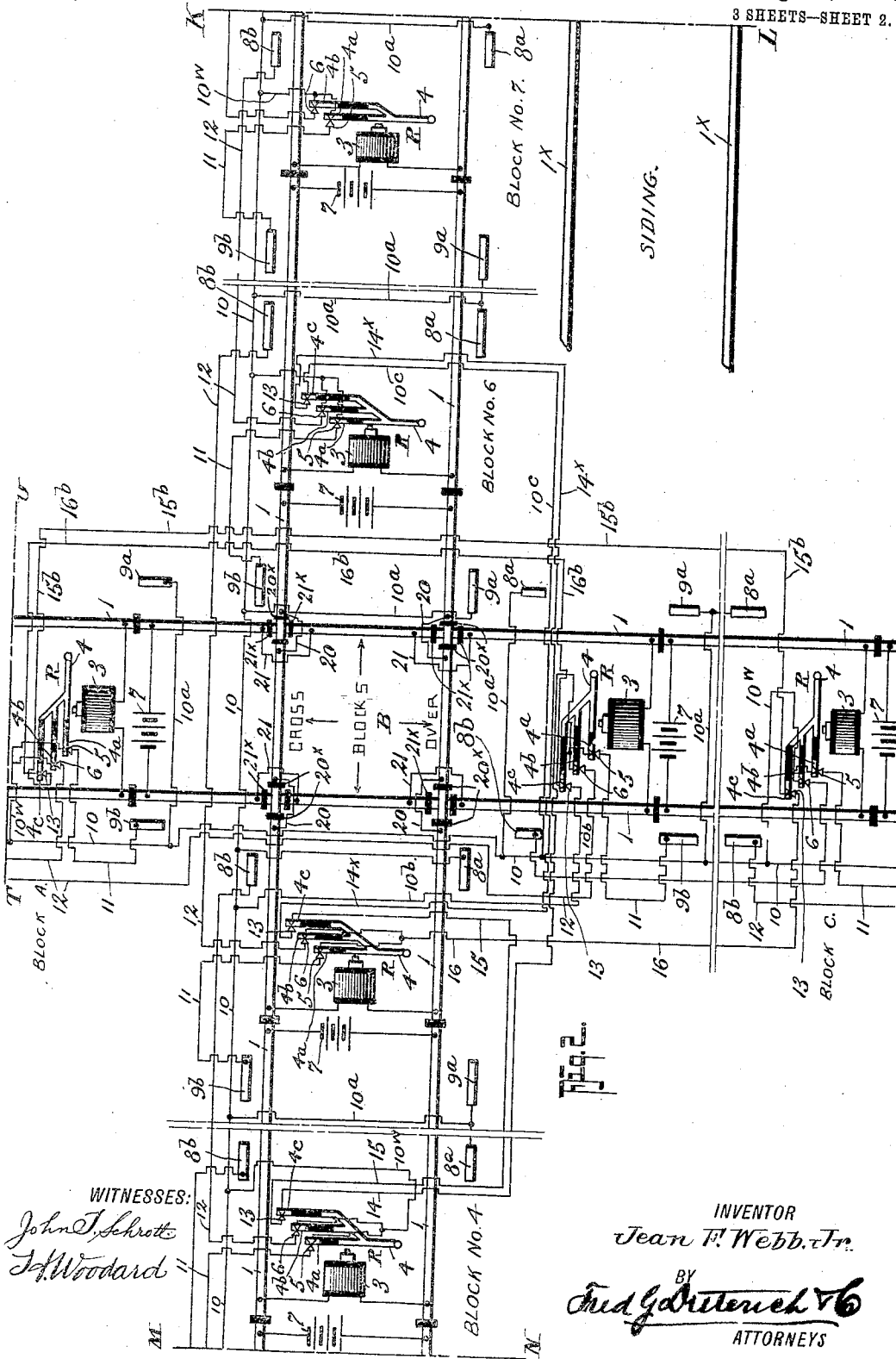
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CLOSED CIRCUIT WIRING FOR AUTOMATIC TRAIN STOPPING SYSTEMS.
APPLICATION FILED SEPT. 1, 1908.

932,925.

Patented Aug. 31, 1909.

3 SHEETS—SHEET 2.



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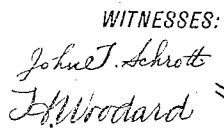
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CLOSED CIRCUIT WIRING FOR AUTOMATIC TRAIN STOPPING SYSTEMS.

Patented Aug. 31, 1909.

932,925.



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UNITED STATES PATENT OFFICE.

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CLOSED-CIRCUIT WIRING FOR AUTOMATIC TRAIN-STOPPING SYSTEMS.

932,925.

Specification of Letters Patent.

Patented Aug. 31, 1909.

Application filed September 1, 1908. Serial No. 451,227.

To all whom it may concern:

Be it known that I, JEAN F. WEBB, JR., residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Closed-Circuit Wiring for Automatic Train-Stopping Systems, of which the following is a specification.

My invention relates to certain improvements in track circuits for train signaling and stopping systems, and it is particularly adapted for use with those systems of the closed circuit type whereby the opening of the circuit between track contacts serves to open or otherwise actuate a train carried circuit to effect certain signals on board the train, or to operate any suitable train carried mechanism whereby a train may be automatically stopped.

My present track wiring system embodies a system of block wiring for straight-line tracks, cross-overs, switches and the like, whereby a train in one block will effect a breaking of the circuit between track contacts in one or more of the other blocks so that should a train enter or be in such other blocks, its train carried mechanism (either a signal or automatic train stopping device, or other kindred appliance for the protection of trains) will be actuated. In this application I make no claim to the train carried mechanism, *per se*, as that forms the subject-matter of my co-pending application filed August 15, 1908, Ser. No. 448,649.

In this application I have disclosed an improved form of contact maker which is particularly designed for use in connection with my train stopping system, but I make no claim *per se* in this application to such contact maker as that forms the subject-matter of my co-pending application filed Aug. 26, 1908, Serial No. 450,367.

The invention also embodies those novel features of construction and cooperative relation of circuits which will be first fully described, and then be specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Figure 1, is a diagrammatic view of a straight line portion of the track. Fig. 2, is a diagrammatic view of a crossing. Fig. 3, is a diagrammatic view of a switch wiring. Fig. 4, is a diagrammatic view of a train car-

ried stopping mechanism that may be used in connection with my present invention, such stopping mechanism forming the subject-matter of my co-pending application hereinbefore referred to. Fig. 5, is a side elevation of one of the train carried contact makers and one of the track contacts that coöperates therewith.

In the drawings, in which like letters and numerals of reference indicate like parts in all of the figures, I have shown Figs. 1, 2, 3 and 4 in such manner that they may be read together as one by assembling the figures so that the lines M—N, K—L, T—U of Fig. 2, will coincide respectively with the line M—N of Fig. 1, K—L of Fig. 3, and T—U of Fig. 4.

In carrying out my invention, the rails 1 of the track are divided into sections which are insulated from one another and the rail sections are arranged in pairs to form "blocks" of any desired length. The "blocks" are indicated in Figs. 1, 2 and 3, as "block No. 1", "block No. 2", "block No. 3", and so on. The rails 1 of each block are electrically joined together near or at one end of the block through the magnet 3 of a relay R, and at or near the other end of the block the rails are again electrically connected through a source of electric energy 7; thus each block forms a closed electrical circuit including the battery 7, rails 1—1 and relay magnet 3 of said block.

Each relay R has an armature 4, which is provided with contacts 4^a—4^b to engage fixed contacts 5—6 respectively when the magnet 3 is energized. (It should be understood that the magnet 3 is a high-resistance one).

A number of track contacts 8^a—9^a are arranged at intervals along one side of the track, while another set 8^b—9^b are located along the other side of the track. These contacts are arranged in pairs 8^a—8^b, 9^a—9^b respectively, each pair being located at any desired place in the block (there being one pair of each to each block) preferably slightly more than a train length from the beginning and from the end of the block. All of the track contacts 8^a—9^a of all the straight-line blocks are joined together and through wires 10^a and a line wire 10.

The fixed contact 5 of the relay R that is located in block 1, is joined through a wire

11 to the track contact 9^b of the preceding block, while the contact 6 of block No. 1, joins through a wire 12 to the track contact 8^b of block No. 2. The contacts 4^a—4^b of the relay armature 4 of all the straight-line blocks except those of the crossed blocks, block No. 5 and block B (see Fig. 2 of the drawings) are electrically joined through a wire 10^w with the line wire 10. The contact 5 of block No. 2, joins through a wire 11 with the track contact 9^b in block No. 1, while the contact 6 of block No. 2, connects through a wire 12 with the track contact 8^b of block No. 3. In a like manner contacts 5—6 of block No. 4, are joined with track contacts 9^b—8^b of blocks Nos. 3 and 5 respectively and so on. It is to be noted that the armature 4 of relay R of block No. 4, and the armatures of the relays of blocks Nos. 5 and 6 are each provided with an additional contact 4^c coöperating with a fixed contact 13.

The rails 1 of the crossing are insulated as at 20^x and 21^x where they cross one another at such crossing, and the alining rails are bonded as at 20 and 21 to complete the respective electric circuits over the crossing. One section of the crossing reading from left to right in Fig. 2, is called "block No. 5" while that at right angles thereto is designated "block B". The block at the top of Fig. 2, is designated "block A", while that at the bottom of the figure is marked "block C".

Blocks A and B have relays R and batteries 7, the same as blocks 1, 2, 3 and 4 etc. They also have corresponding track contacts 8^a—9^a wired together to a line wire 10 and track contacts 8^b—9^b wired to contacts 5 and 6 of the relays of certain blocks of the cross line containing blocks A, B, C, etc. similarly to those of the first line containing blocks Nos. 1, 2, 3, etc.

The armature 4 of relay R of blocks A, B and C of the cross line have auxiliary contacts 4^c which coöperate with fixed contacts 13.

The fixed contact 13 of relay R in block No. 4, joins with contact 4^c of the relay of the crossing block No. 5, through a wire 15, while the fixed contact 13 of relay in block No. 5, joins through a wire 14^x with the fixed contact 13 of block No. 6.

Contact 4^c of relay R of block No. 6 joins through a wire 10^c with the line wire 10 of the cross line. Contact 4^c of block No. 4, joins through a wire 14 to the contacts 4^a—4^b of relay R in crossing block B, while contacts 4^a—4^b of crossing block No. 5 are joined together to a wire 15 which connects to the contact 13 of relay R in block C.

A wire 15^b connects contact 4^c of relay R in block C with the contact 13 of relay R in block A, while contact 4^c of relay in block A joins through a wire 16^b to the contact 4^c of

the relay of crossing block B, the contact 13 of which joins through a wire 10^b to line wire 10 of the first line containing blocks 1, 2, 3, etc.

The purpose of connecting the auxiliary contacts 4^c and 13 of each of the relays R of blocks Nos. 4, 5 and 6 and connecting the same with contacts 4^a—4^b on the relay R in block B in the same circuit, is that, should any of said relays open, say, relay in block No. 4 be opened by a train on such block, then the moment that a train enters block B (coming in either direction,) for example, relay R in block B will release its armature and open the circuit at contacts 4^a—4^b as well as at contact 4^c and 13 and open the circuit between contacts 9^a—9^b of block C and 8^a—8^b (not shown) of block A. The opening of the relay R in block B also opens the circuit containing contacts 4^c—13 of such relay in block B, which contacts are included in a circuit containing wire 16^b that connects with contact 4^c of relay R in block A and containing wire 15^b which connects with contact 4^c in relay R of block C, the contact 13 in the relay in block C connecting through a wire 16 with contacts 4^a—4^b of relay R of block No. 5, thus should a train be in block No. 4 and another train be in block B, or should merely a train be in block B, and should another train attempt to enter block No. 5, in either direction then relay R in block No. 5 will open up and open the circuit between contacts 9^a—9^b of block No. 4 and contacts 8^a—8^b of block No. 6, for a purpose that will be hereinafter more fully apparent.

The wiring of the switch as shown in Fig. 3, is similar to the main line wiring, the switch having its rails insulated as at 1^x and bonded as at 22, 23, 24, 25, 26 and 27. 1^x designates the siding rails, while 1^y represents the movable switch rail and 1^y the guard rail.

In Fig. 5, I have shown diagrammatically a train stopping mechanism adapted to be set in operation when used in connection with my present invention as well as with certain semaphore mechanisms and other track contact controlling means. I have shown this simply to aid in a better understanding of the working of my present invention, and by reference to Fig. 5, it will be noted that 30 represents a train or car carrying laterally projected shoes S—S'. These shoes are best shown in Fig. 6. Each shoe S consists of a plate 50 on which is mounted a knife switch, the knife being pivoted at 44 and coöperating with a fixed contact 47 that is insulated from the plate 50. The knife switch is actuated from a shoe 51 that is pivoted beneath the plate 50, the plate 50 being provided with bristles 52 to form a contact brush to engage the track contacts 8^a—9^a—8^b—9^b, as conditions may require.

On the train 30 is mounted the usual air

brake system containing the air line 31 in which I place an air valve 32 whose shaft 32^a carries a gear 33 that meshes with the pinion 34^a of the electric motor 34, by means of which the valve 32 is opened. A handle 33^b permits the gear 33 to be rotated in a direction opposite to its opening movement to close the valve 32 by hand.

35 designates a relay magnet that has one terminal connected to a contact brush 42 that engages an armature 36 that is held by the magnet 35 normally in a circuit opening position. The magnet 35 is a closed circuit magnet whose other terminal is connected through a source of electric energy 41 and a wire 43 to the plate 50 and to the pivot 44 of one contact shoe S' at one side of the train. The armature 36 is connected through a wire 43 to the plate 50 and pivot 44 of the other contact shoe S at the other side of the train. Fixed contacts 47 of each shoe S—S' are connected together by a wire 48, as shown on Fig. 5, of the drawings.

The normally closed cab or train carried circuit commences at the battery 41, flows from thence through magnet 35, from magnet 35 to contact 42 and through armature 36 and wire 43 to contacts 44 of the knife switch or contact maker S from thence across the knife to fixed contact 47 of contact maker S and from fixed contact 47 of contact maker S through wire 48 to fixed contact 47 of switch of contact maker S' across the knife of said switch to contact 44, and back to battery 41. This constitutes the closed circuit when the knife switches are closed. When, however, they are opened by the contact makers S—S' engaging track contacts 8^a—8^b or 9^a—9^b, as the case may be, then the function of the wire 48 is temporarily dispensed with and the circuit from contact 44 of contact maker S to contact 44 of contact maker S' is from one track contact 8^a to the other 8^b, or 9^a to the other 9^b, as the case may be, through the track circuits where the track circuits are in their normal or safety positions to electrically connect the respective ones of a pair of track contacts.

The motor 34 is connected to the battery 41, by wires 40 and 38—39, the wires 38—39 being connected to fixed contacts 37—37^a respectively. These contacts are adapted to be electrically connected by a contact 36^a on the armature 36 when the magnet 35 is deenergized. The gear 33 is provided with a pin 33^a that comes into engagement with the armature 36 as soon as the valve 32 has about reached its open position, so as to break the motor circuit at the contacts 37—37^a and stop the operation of the motor when the valve is fully opened.

Operation: Assume a train to be in "block No. 1," its axles and wheels will result in short-circuiting the rails 1 of such block and deenergize the magnet 3 of the relay

of such block. This permits the armature 4 to recede and open the circuits between contacts 5 and 6 and 4^a—4^b respectively of the relay R in "block No. 1." The circuit being thus opened results in opening the circuit between track contacts 8^a—8^b of "block No. 2" as well as the circuit between track contacts 9^a—9^b of the block preceding "block No. 1" if there be such a block. Assume now that another train enters "block No. 2," while the first train is in "block No. 1." As soon as such other train has its brushes S—S' in engagement with track contacts 8^a—8^b of "block No. 2" the local train carried circuit will be broken by the knife switch, and inasmuch as the circuit between the track contacts 8^a—8^b of "block No. 2" is broken no current will flow through the magnet 35 which will allow armature 36 to drop and close the local motor circuit to open the air valve, and hence stop the train. As soon as the valve 32 has been opened, the pin 33^a will have engaged the armature 36 and broken the motor circuit to prevent a further operation of the air valve. The train in "block No. 2" correspondingly short-circuits the rails of said block and breaks the circuit at the relay R of "block No. 2," thus opening the circuit between contacts 9^a—9^b of "block No. 1" and contacts 8^a—8^b in "block No. 3," so that as soon as the train in "block No. 1" engages the track contacts 9^a—9^b of its own block, such train will also be automatically stopped in a manner similar to the stopping of the train in "block No. 2," and in addition, should another train enter "block No. 3" while "block No. 2" is occupied, such train will be likewise stopped.

The action of the crossing is very similar to the action just described. However, assume a train to be in "block No. 4" and another train on the crossing "block No. 5," the circuit will be broken between the crossing contacts 8^a—8^b of relay R in "block No. 5" by the train in "block No. 4" and the circuit between contacts 9^a—9^b of "block No. 4" would be broken by the train on crossing "block No. 5" and the train will be brought to a stop. The presence of a train in "block No. 4" or in "block No. 5" or "block No. 6" serves to break the circuit that includes wires 14—15—14^a—10^a and cross line wire 10 which renders contacts 9^a—9^b of "block C" and contacts 8^a—8^b of "block A" dead so that should a train enter "blocks A or C," while a train is in "block No. 4," crossing "block No. 5" or "block No. 6" it will be brought to a stop correspondingly. Any train entering "block C" will stop any other train that might enter "block No. 4," crossing "block No. 5," "block No. 6" or "block A," during the time such train is in "block C," "block No. 5" or "block A," thus protecting both lines

from trains in opposite directions on the respective lines and from cross trains on opposite lines.

The operation of the switch circuit is substantially the same as that of the straight line track and will be readily understood by reference to Fig. 3, of the drawings, making a detail description of such operation, it is thought, unnecessary.

I desire to call attention to the fact that while I have shown and described the track contacts S^a as formed of a single contact member it may be composed of several separate members, parallelly arranged and electrically connected so as to insure good electric connection between the train carried contact maker and the track contact and I do not desire to limit myself to such specific construction shown.

I further desire to say that I do not wish it understood that I limit myself to any specific details of mechanical construction or arrangement of parts or that I limit myself to the exact details of wiring shown in the accompanying drawings further than is specifically brought out in the appended claims.

From the foregoing description taken in connection with the accompanying drawings, it is thought the complete construction, operation and advantages of my invention will be readily understood by those skilled in the art to which the invention appertains.

What I claim is:

1. In a train controlling system, sectionalized tracks divided into blocks, a normally closed electric circuit including the tracks of one section, a relay interposed in said normally closed circuit, fixed contacts independent of the track arranged in pairs adjacent to said tracks, and means electrically connecting said track contacts with said relay to normally electrically connect certain of said contacts, and means for deenergizing said relay as a train enters the block to open the circuit between said predetermined fixed contacts combined with a train carried normally closed circuit including a pair of train carried contact makers to cooperate with a pair of fixed track contacts, and means whereby a pair of track contacts, when the relay controlling the same is energized, may be brought into series with said train carried circuit.

2. In a train controlling system, a train carried stopping mechanism including a normally closed train carried circuit and a pair of train carried contacts in said circuit, combined with sectionalized tracks divided into blocks, pairs of track contacts for each block independent of the tracks to cooperate with the train carried contacts at times, and train controlled means cooperating with the tracks and the track contacts for electrically connecting and disconnecting certain pairs

of track contacts, and means carried by the train for opening the train carried circuit and simultaneously bringing such track contacts into series therewith, whereby when the track contacts are electrically connected the train carried closed circuit will be maintained through the track contacts and their connections and when the track contacts are electrically disconnected the train carried circuit will be maintained open.

3. In a track circuit for train controlling mechanisms, a main line and a second line crossing thereover, said main line and said second line being divided into blocks with the rails of each block insulated from those of the other blocks, pairs of fixed contacts mounted adjacent to the main line tracks and other pairs of fixed contacts mounted adjacent to the cross line tracks, and means whereby when a train enters a cross block the circuit between a certain pair of track contacts in each of the blocks next adjacent the cross block in the same line will be electrically disconnected.

4. In a track circuit for train controlling mechanisms, a main line and a second line crossing thereover, said main line and said second line being divided into blocks with the rails of each block insulated from those of other blocks, a relay bridged across the rails of each block and a source of electric energy also bridged across the rails of each block, pairs of fixed contacts mounted adjacent to the main line tracks and other pairs of fixed contacts mounted adjacent to the cross line tracks, and means electrically connecting certain of said relays of the main line track with certain of the main line fixed contacts and certain of the cross line fixed contacts.

5. In a track circuit for train controlling mechanisms, a main line and a second line crossing thereover, said main line and said second line being divided into blocks with the rails of each block insulated from those of the other blocks, a relay bridged across the rails of each block and a source of electric energy also bridged across the rails of each block, pairs of fixed contacts mounted adjacent to the main line tracks and other pairs of fixed contacts mounted adjacent to the cross line tracks, means electrically connecting certain of said relays of the main line track with certain of the main line fixed contacts and certain of the cross line fixed contacts, and means for electrically connecting certain of said relays of the cross line blocks with certain of the track contacts of the main line blocks.

6. In a train controlling system, a main line having its rails divided into insulated blocks, a cross line crossing said main line and having its rails divided into insulated blocks, fixed contacts arranged adjacent to the track of the main line and other fixed contacts arranged adjacent to the tracks of

the cross line, and means in certain of the main line blocks for electrically connecting certain of the track contacts of the cross line blocks.

1. In a train controlling system, a main line having its rails divided into insulated blocks, a cross line crossing said main line and having its rails divided into insulated blocks, fixed contacts arranged adjacent to the track of the main line and other fixed contacts arranged adjacent to the tracks of the cross line, and means in certain of the main line blocks for electrically connecting certain of the track contacts of the cross line blocks and vice versa.

8. In a train controlling system, a main line having its rails divided into insulated blocks, a cross line crossing said main line and having its rails divided into insulated blocks, fixed contacts arranged adjacent to the tracks of the main line and other fixed contacts arranged adjacent to the tracks of the cross line, means in certain of the main line blocks for electrically connecting certain of the track contacts of the cross line blocks, and certain of the fixed contacts of certain of the main line blocks.

9. In a block system for railways, a main line and cross line each having its rails divided into insulated block sections, said block sections including a cross over block section in the main line, and a crossing block section in the cross line insulated from that of the main line, pairs of track contacts for each block mounted adjacent to the tracks, means in one block of the main line for electrically connecting certain pairs of fixed contacts of the main line and certain other pairs of fixed contacts of the cross line, and means whereby when a train enters one of said blocks the means connecting said fixed contacts will be released to electrically disconnect said fixed contacts.

10. In a train controlling mechanism, a main line having its rails divided into insulated blocks, and a cross line having its rails divided into insulated blocks, said main and cross lines each including a crossing block insulated one from the other, a pair of contacts for each block of the main and cross lines, combined with means for normally electrically connecting said pairs of track contacts, and means in virtue of which when a train enters a block next adjacent the cross-over block of one line, the circuit will be opened between certain pairs of track contacts in the block next adjacent the cross-over block of the cross line, and the circuit will be opened between a certain pair of track contacts of the cross-over block.

11. In a train controlling mechanism, a main line having its rails divided into insulated blocks, and a cross line having its rails divided into insulated blocks, said main and cross lines each including a crossing block

insulated one from the other, a pair of track contacts for each block of the main and cross lines, combined with means for normally electrically connecting said pairs of track contacts, and means in virtue of which when a train enters the cross-over block of one line the circuit will be open between a pair of track contacts at each of the blocks on both lines adjacent to the cross-over blocks.

12. In a train controlling system comprising sectionalized tracks divided into blocks, a normally closed electric circuit for each block including the tracks of the respective block section, a relay for each block interposed in said normally closed circuit of the respective block, pairs of oppositely disposed contacts for each block arranged adjacent to said tracks, means electrically connecting certain of said track contacts with certain of said relays to normally electrically connect said track contacts in pairs, means for deenergizing the relay of one block as a train enters such block to open the circuit between pairs of track contacts in the blocks next adjacent to the block in which the train is present, and a train stopping mechanism having means for cooperating with said track contacts, in virtue of which when the circuit is opened between a pair of track contacts and a train passes thereover, the train will be stopped.

13. In a train controlling system, sectionalized tracks divided into blocks, a normally closed electric circuit including the tracks of one section, a relay interposed in said normally closed circuit, fixed contacts arranged adjacent to said tracks, means electrically connecting said track contacts with said relay to normally electrically connect certain of said contacts, means for deenergizing said relay as a train enters the block to open the circuit between said predetermined fixed contacts, and a train stopping mechanism having means for cooperating with said track contacts in virtue of which when the circuit is open between a pair of track contacts and the train passes thereover, the train will be stopped.

14. In a track circuit for train controlling mechanisms, a main line and a second line crossing thereover, said main lines and said second line being divided into blocks with the rails of each block insulated from those of the other blocks, a relay bridged across the rails of each block and a source of electric energy also bridged across the rails of each block, pairs of fixed contacts mounted adjacent to the main line tracks and other pairs of fixed contacts mounted adjacent to the cross line tracks, means electrically connecting certain of said relays of the main line track with certain of the main line fixed contacts and certain of the cross line fixed contacts, means for electrically connecting certain of said relays of the cross line blocks

with certain of the track contacts of the main line blocks, and a train stopping mechanism having means for cooperating with said track contacts in virtue of which when the circuit is open between a pair of track contacts and the train passes there-over, the train will be stopped.

15. In a train controlling system, a main line having its rails divided into insulated blocks, a cross line crossing said main line and having its rails divided into insulated blocks, fixed contacts arranged adjacent to the track of the main line and other fixed contacts arranged adjacent to the tracks of the cross line, means in certain of the main line blocks for electrically connecting certain of the track contacts of the cross line blocks, and a train stopping mechanism having means for cooperating with said track contacts in virtue of which when the circuit is open between a pair of track contacts and the train passes there-over, the train will be stopped.

16. In a train controlling system, a main line having its rails divided into insulated blocks, a cross line crossing said main line and having its rails divided into insulated blocks, fixed contacts arranged adjacent to the track of the main line and other fixed contacts arranged adjacent to the tracks of the cross line, and means in certain of the main line blocks for electrically connecting certain of the track contacts of the cross line blocks and vice versa, and a train stopping mechanism having means for cooperating with said track contacts in virtue of which when the circuit is open between a pair of contacts and the train passes there-over, the train will be stopped.

17. In a train controlling mechanism, a

track circuit comprising rails divided into sections to form blocks, the sections of one rail being opposite those of the other rail to form blocks, a source of electric energy bridged across the rails of each block at one end thereof and a relay bridged across the end of each block at the other end thereof to form a closed electric circuit including a source of energy, the track rails of the block and the relays, said relays having armatures provided with a plurality of contacts, a common wire connected to all of said armature contacts, two pairs of track contacts for each block, the contacts of each pair being directly opposite one another to be brought into operation simultaneously, connections between the track contacts at one side of the track of all of the blocks and said common wire, said relays each including a pair of fixed contacts, connections between a fixed contact of a relay in one block with a track contact in another block and connections between the other fixed contact of said relay and a track contact of a third block, combined with a train carried normally closed circuit including a pair of train carried contact makers, one to cooperate with one of a pair of track contacts and the other to cooperate with the other of a pair of track contacts, and means for opening the train carried circuit and simultaneously connecting it with a pair of track contacts to bring electrical connection between the respective pair of track contacts in series with the train carried circuit.

JEAN F. WEBB, JR.

Witnesses:

J. F. MORRISON,
WALTER KUHNE.