Y. BURGESS.

ELECTRIC RAILWAY SIGNALING SYSTEM.

APPLICATION FILED DEC. 7, 1907.

904,834.

Patented Nov. 24, 1908.

2 SHEETS—SHEET 1.

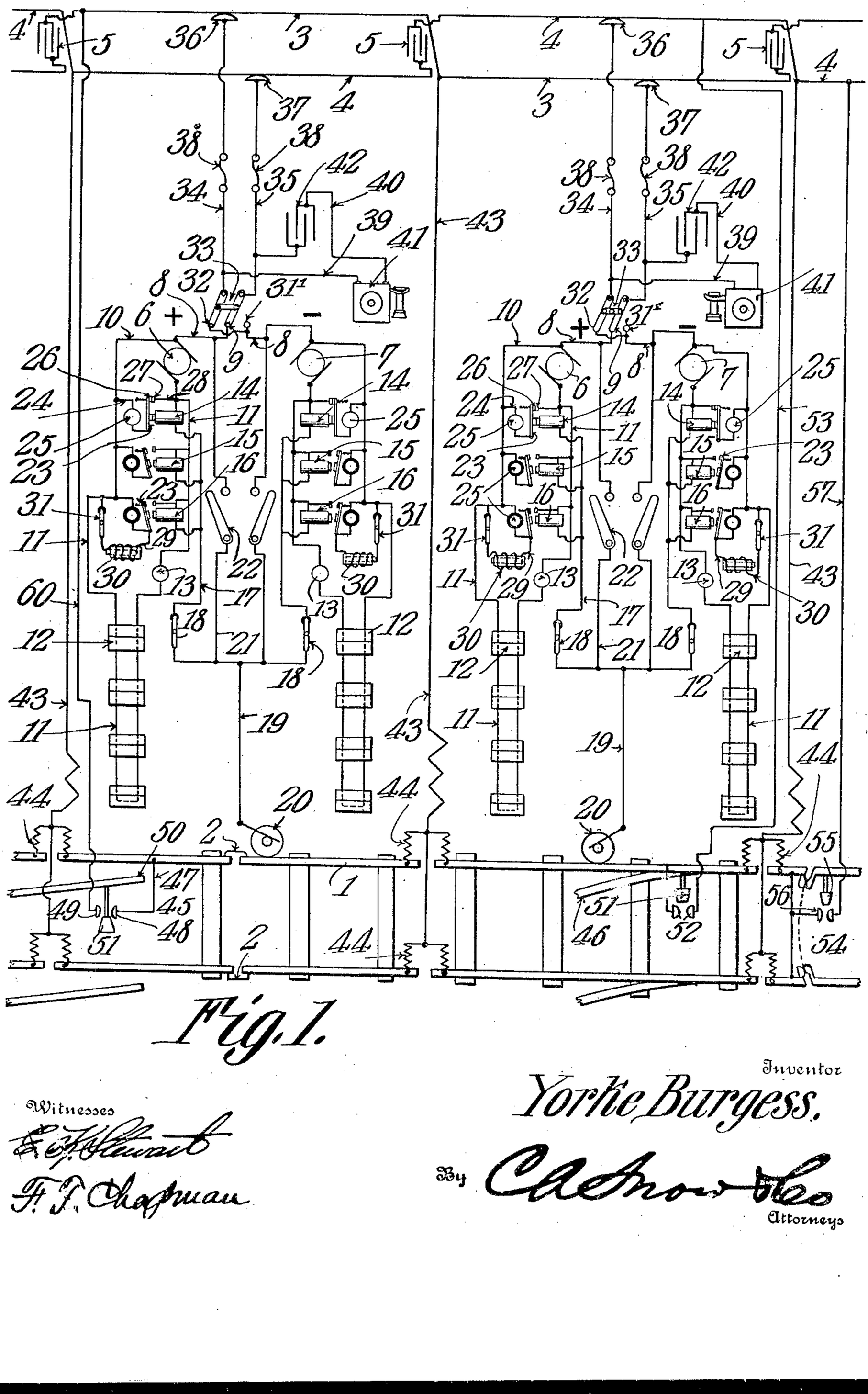

Fig. 1.

Witnesses

E. J. Hunt

F. F. Chapman

Inventor

Yorke Burgess.

By Church & Church

Attorneys

Y. BURGESS.

ELECTRIC RAILWAY SIGNALING SYSTEM.

APPLICATION FILED DEC. 7, 1907.

904,834.

Patented Nov. 24, 1908.

2 SHEETS—SHEET 2.

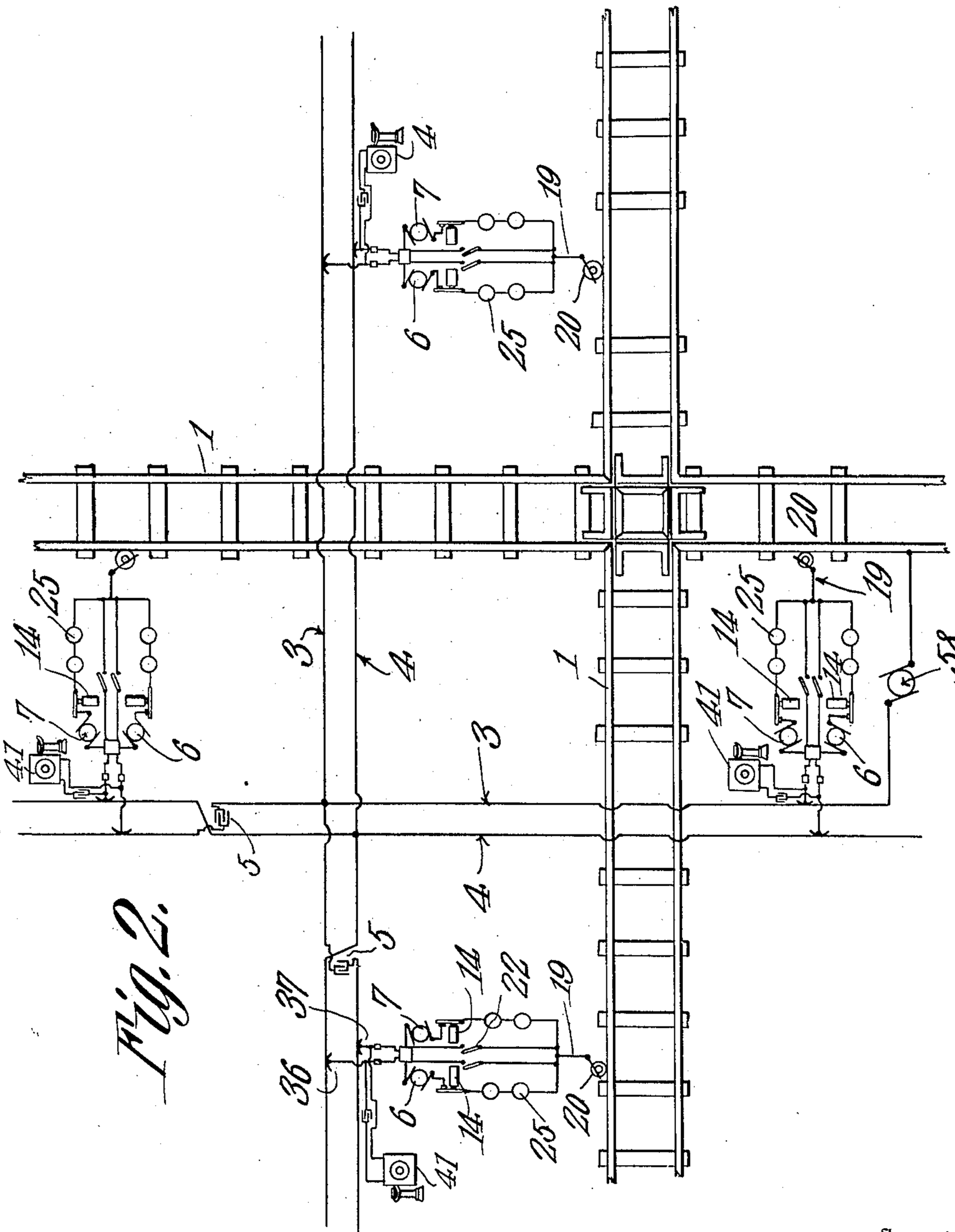

Fig. 2.

Witnesses

E. F. Clement

F. T. Chapman

Inventor

Yorke Burgess.

By Cachow & Co.

Attorneys

UNITED STATES PATENT OFFICE.

YORKE BURGESS, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC RAILWAY SIGNALING SYSTEM.

No. 904,834. Specification of Letters Patent. Patented Nov. 24, 1908.

Application filed December 7, 1907. Serial No. 405,614.

To all whom it may concern:

Be it known that I, YORKE BURGESS, a citizen of the United States, residing at Washington, District of Columbia, have invented a new and useful Electric Railway Signaling System, of which the following is a specification.

This invention has reference to improvements in electric railway signaling systems, and is designed to provide a system of circuits and signaling apparatus whereby a train standing upon a track or running in either direction is notified of the approach of other trains on the same track in either direction.

In accordance with the present invention there is at all times displayed a visual signal, such as a light, which will indicate that the system is in working order, the electric connections extending through the rails and including switches, draw-bridges and other parts of the track structure so that in the event of the continuity of the track being broken or a switch being misplaced or a draw-bridge being opened, the signal will no longer be displayed, thus indicating that the circuit is broken so that the engineer is warned to stop or proceed with caution.

Furthermore, the invention provides means whereby the approach of two trains within dangerous proximity will cause warning signals to be displayed in the cabs of both engines or on other portions of the trains, while should no attention be paid to the warning signals by the enginemen the apparatus will be caused to operate to automatically stop the trains before a collision is possible.

For carrying out the purposes of the present invention there is provided two like series of conductors either in the form of trolley wires or third rails along the line of the track, and these conductors cross each other at intervals throughout the length of the system so that traveling contacts carried by the train will each make contact with the same conductor or section thereof, in alternate order, the return circuit being through the track rail or rails.

In order to provide against certain contingencies that may arise, each train is provided with two sources of electric energy which may be in the form of two small dynamos connected in opposite order to the respective contacts.

In accordance with the present invention there is further provided a continuous circuit throughout the length of the train forming an extension of the cab circuits so that the engineman will be instantly notified in case the train breaks by the failure of the permanent signal to be longer displayed.

In addition to the foregoing the invention likewise provides means whereby the sectional conductors are made continuous to telephonic currents, although operatively discontinuous to straight currents supplied by the dynamos or other like source of electric energy, so that a train despatcher may have full control of all of the trains on the line through telephonic communication.

The invention will be best understood by consideration of the following detail description taken in connection with the accompanying drawings forming part of this specification, in which drawings,

Figure 1 is a diagrammatic representation of the cab circuits of two trains and the track circuits arranged in accordance with the present invention. Fig. 2 is a diagrammatic representation of the system as arranged at the crossing of two lines of railroad.

Referring to the drawings, and more especially to Fig. 1, there is shown a track 1 of the ordinary type the rails of which, except at certain points, are to be suitably bonded so that the track rails become practically continuous conductors.

Extending along the line of way are two conductors 3, 4, which may be in the form of trolley wires or third rails with under-running trolleys, suitably protected against accidental short circuits. Each conductor 3, 4, is made up of a number of sections, one crossing the other at the contiguous ends of the sections of the latter at a point intermediate in the length of the first section. The arrangement is such that each conductor has about one-half of its length in line with about one-half of the length of a section of the other conductor and then the remaining lengths of the conductors alternate with each other in position so that the line conductors are made up of two sectional conductors alternately disposed with reference to each other throughout the length of the system.

The contiguous ends of the sections of each conductor are connected through condensers 5, for a purpose which will presently appear.

Mounted upon each cab are two dynamos 6, 7, each capable of impressing upon the line about fifty volts.

One brush, say that on the positive side of the dynamo 6, is connected by a conductor 8 to a contact terminal 9, and another conductor 10 is also connected to the same brush and ultimately connects to still another conductor 11 leading throughout the length of the train by means of suitable couplings, conventionally indicated at 12, and returning this conductor leads to the other brush or negative side of the dynamo 6, it being understood that both dynamos 6 and 7 are of the straight or continuous current type, and in this conductor 11 there is an indicating lamp 13.

In the conductor 11 is included one side of three relay magnets 14, 15 and 16 in multiple arc branches of this conductor, while the other sides of these three magnets are connected in multiple arc to another conductor 17 leading through a switch 18 to a conductor 19 which may be connected through the metal parts of the locomotive to the rails, and this is conventionally indicated by the wheel 20. The magnets 14, 15 and 16 are wound to respond respectively to different voltages.

The conductor 19 is likewise connected by another conductor 21 through a normally open switch 22 to the conductor 8.

Each magnet 14, 15 and 16 controls an armature 23 in a branch line 24 including a signal lamp 25. The armature terminates in a contact 26, in the path of which is another contact 27 connected by a conductor 28 to the conductor 11. Branched off from the armature 23 of the relay magnet 16 is another conductor 29 including a solenoid 30 and a switch 31 and leads to the conductor 11.

Though not so shown in the drawings it is to be understood that this solenoid 30 is connected to the train-controlling mechanism, such as the throttle lever and air brake mechanism. This last feature being common to many types of electric railway signal systems need not be illustrated in detail.

The dynamo 7 is included in a circuit exactly like that which the dynamo 6 feeds, and therefore is indicated by the same reference numerals and need not be particularly described further than that the conductor 8 of the dynamo 7 is connected to two terminals 31′ and 32 on each side of the terminal 9.

The terminals 9, 31′ and 32 are controlled by a pole-changing switch 33, the two arms of which are connected by conductors 34 and 35 to contact shoes 36 and 37 respectively, the contact shoe 36 being arranged to make contact with the like halves of the sections of the conductors 3 and 4 and the contact shoe 37 being arranged to make contact with the other like halves of the sections of the conductors 3 and 4. In each conductor 34 and 35 are included fuses 38.

Branched off from the conductors 34 and 35 are other conductors 39, 40, leading to a telephone set 41, and included in the conductor 40 is a condenser 42. The intermediate point of each section of the conductors 3 and 4 is connected by another conductor 43 through resistances 44 branched to contiguous ends of the block section of each of the rails 1.

In Fig. 1 are shown two railway switches 45, 46. The switch 45 is presumed to be of the type which is normally in a position to maintain the main line rails 1 in condition for traffic and to be only occasionally moved to connect the main line to a siding, while the switch 46 is presumed to be normally in position to direct a train from the main line to a branch line or siding.

In the case of the switch 45 one of the track rails 1 is connected by a branch conductor 47 to a contact terminal 48, and another contact terminal 49 adjacent to the contact terminal 48 is connected by a conductor 60 to the conductor 3, or sometimes to the conductor 4, while one of the switch points 50 carries a bridging block 51 adapted to open the circuit between the terminals 48 and 49 when the switch is in the position to allow traffic upon the main line, but when a switch is moved to a position to connect the main line to the siding, then the bridging block 51 is moved between the contacts 48 and 49 and the circuit is closed.

The switch 46 has one of its points carrying a bridge block 51 in the path of which are two spaced contact terminals 52, one connected to the traffic rails 1 and the other by a conductor 53, to a section of the conductor 4 or under some circumstances to a section of the conductor 3.

In the case of a draw-bridge, such as indicated at 54, again there is a bridge block 55 carried by the draw-bridge structure, and in the path of this block are terminals 56 one connected to the track 1 and the other by a conductor 57 to the conductor 4. In the case of a railroad crossing the conductors 3 and 4 are coupled at the crossing points to the respective other conductors 3 and 4 of the other line of rails.

At a terminal station there is provided another dynamo 58 connected on one side to the rails and on the other side to the conductor 3 or 4, as the case may be.

The dynamos 6 and 7 may be run by a steam turbine or any other actuating device upon the train, but because a turbine is a small and compact power means it constitutes a convenient type of drive for the dynamo. These generators may be of the shunt wound type and may develop from one-quarter to one-half horse power at fifty volts. If the generator 6 has the positive terminal connected to one of the shoes, say the shoe 37, then the generator 7 will have its negative terminal connected to the shoe

36 and the dynamos of the several trains are so connected that when the trains are brought into the danger zone and are approaching each other either in opposite directions or the same directions, then, one dynamo will be in series with the other dynamo and so the voltage is augmented and the current output is correspondingly increased.

The relays 14 are so wound as to be actuated by a smaller current than the output of each dynamo, and the current is kept down by the resistances 44 under normal conditions. Let it be assumed that the train is upon a clear section of track, then the current will flow from the dynamo to the trolley wire or rails, hence to the conductor 43 and resistances 44 to the track and back through the conductor 19. Under these conditions the lamp 25 controlled by the relay 14 therefore glows continuously so long as these conditions prevail. Suppose, now, the switch 46 should be displaced or the draw-bridge 54 should open, then the resistance 44 is cut out and the full force of fifty volts will flow through the circuit. Under these conditions the relay 15 which is wound to respond only to such increased current, will be energized and the corresponding lamp will glow, this being a caution-indicating lamp. The engineman will then proceed with caution until the switch or bridge is reset and the clear light will again be in evidence.

Suppose, now, that one train is approaching another running in the same direction or that two trains are approaching from opposite directions and come within dangerous proximity. Under these conditions the dynamos of the two trains are connected up in series and there is developed a voltage of one hundred, and this is sufficient to energize the relay 16 wound for such voltage, which will cause the corresponding lamp, a danger lamp, to glow and will likewise energize the solenoid 30, thus shutting off steam and applying brakes in the customary manner employed with railway signals of this character, or the air brakes alone may be operated. The sections of the conductors 3 and 4 may be of course of any length desired, depending upon traffic conditions.

The dynamo 58 will energize the conductors close to a terminal and thus prevent the trains from approaching said terminal except under the desired restrictions.

In the structure shown in the diagram of Fig. 2, two trains cannot approach a crossing where the tracks intersect close enough to cause a collision since at this point a train on one track will control the train on the other track.

The switches 22 are normally open and are closed only when one or the other of the dynamos fails to work. The switch 33 is for the purpose of changing the polar relations of the dynamos with the shoes 36 and 37.

It is not designed that the conductors 3 and 4 shall be continuous for the purposes of the signal and controlling mechanisms, but for telephonic purposes these conductors may be continuous and are made telephonically continuous by the introduction of the condensers 5 and the telephonic set 41 is protected from the effects of the dynamos 6 and 7 by the introduction of the condensers 42.

The conductors 3 and 4 are therefore continuous conductors with respect to the telephonic structure but are sectional or discontinuous conductors with relation to the signal apparatus. The voltage employed in the system may be greater or less than fifty volts, which latter is only illustrative.

It is to be observed that the conductors 43 are connected to the contiguous ends of the rails at the terminals of the block stations or lengths of rails which form a continuous circuit, by the resistances 44 which are branched off from the conductor to both rails of the track on each side of the break in the continuity thereof. There is thus at all times two resistances in multiple-arc with the conductor 43, and these multiple resistances are so adjusted that under normal conditions the current flowing through them is sufficient to energize the relay 14. Should, however, a fault occur in either rail, as for instance, the breakage of the rail or the breakage of the bond between the rail ends or possibly the malicious or accidental removal of the rail, then one of the resistances is cut out, which means that the total resistance at this point is therefore doubled and the several electrical conditions are such that this doubling of the resistance will cut down the current sufficiently to reduce the pull of the magnet 14 to such an extent as to cause the break of the circuit between the terminals 26 and 27. This will occur even though only one rail of the track be disturbed or with a fault occurring only in the one rail and is important because a fault in one rail may be as dangerous to traffic as a fault in two rails.

What is claimed is:—

1. In an electric railway signaling system, a source of electric energy, a number of signaling means on each train, each individual signaling means being responsive to a different strength of electric current, a pair of traveling contacts arranged on each train, means for connecting either contact to the same polar terminal of the source of current, and a pair of sectional conductors arranged along the line of way in the paths of the contacts, said conductors crossing each other at intervals to present portions of their lengths alternately on opposite sides to be engaged by the contacts in alternation.

2. In electric railway signaling systems, line conductors formed in sections, each sec-

tion having portions in different planes and the sections alternating, a source of energy and a signaling means on each train, a pair of contacts carried by each train and arranged to engage one with each of the sections of the conductor, train conductors connecting said contacts to the opposite poles of the source of energy, means connecting one of said current conductors to the local wiring system, a return conductor, and a traveling contact connected to the wiring system of each train and engaging said return conductor.

3. In an electric railway signal system, two sources of electric energy on each train, a pair of traveling contacts on each train, line conductors each alternately in the path of each of the traveling contacts, means for coupling up the contacts each to one of the sources of current, and means for shunting the contacts around either or both of said sources of energy.

4. In electric railway signaling systems, a source of electric energy upon the train, a pair of contacts upon the train, line conductors arranged alternately in the path of each contact, a constantly displayed signal upon the train operative under normal circuit conditions, another signal upon the train responsive to increased current in the circuit, and still another signal apparatus responsive to a still greater increase in the current in the circuit.

5. In an electric railway signal system, a source of constant current electric energy, a signal means on each train, sectional conductors along the line of way, contacts arranged to engage the sectional conductors and couple the same in different relations to the source of energy on each train, a telephone apparatus on each train, and means for maintaining the line circuits sectional to said source of energy on each train but rendering the said conductors continuous to the telephone system.

6. In electric railway signaling apparatus, a source of continuous electric current and a signaling means on each train, a pair of sectional conductors having the sections crossing each other at intervals to present portions of their lengths alternatively on opposite sides, a pair of traveling contacts arranged on each train to engage said conductors in alternation, a telephone apparatus upon each train, and condensers connecting the ends of the sections of each conductor to render the conductors continuous to telephone currents.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

YORKE BURGESS.

Witnesses:
JAS. M. WALKER,
F. T. CHAPMAN.