J. AMES.

TRAIN CONTROL SYSTEM.

APPLICATION FILED NOV. 2, 1911.

1,053,693.

Patented Feb. 18, 1913.

2 SHEETS—SHEET 1.

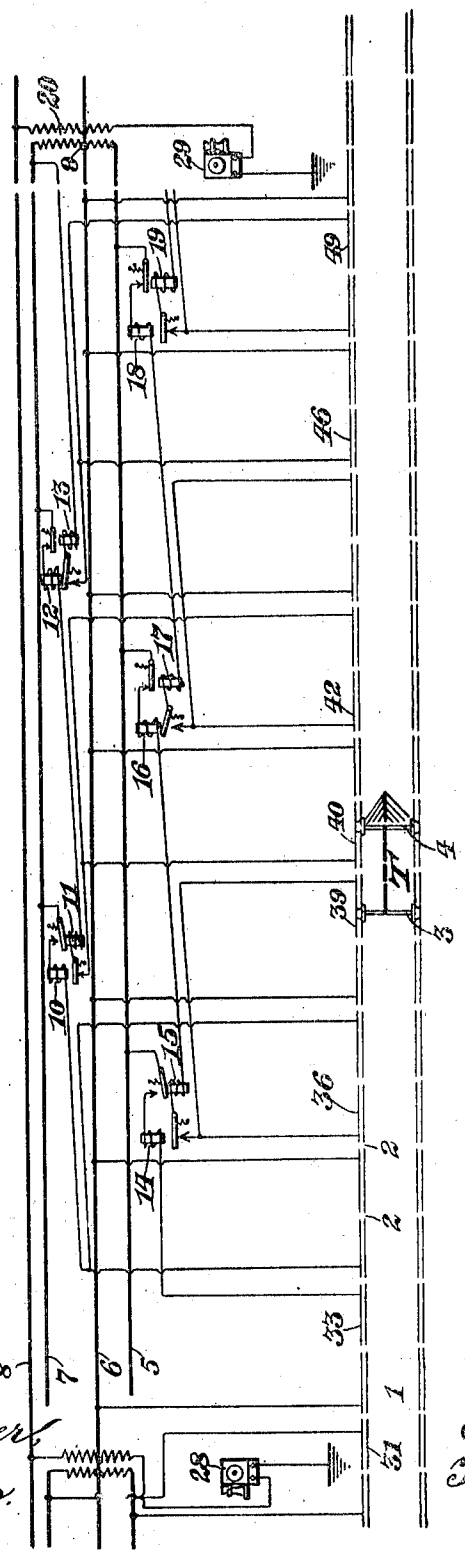

Fig. 1.

Witnesses:
Chas. A. Becker,
W. A. Alexander.

Inventor:
Joel Ames
By E. E. Huffman
Attorney.

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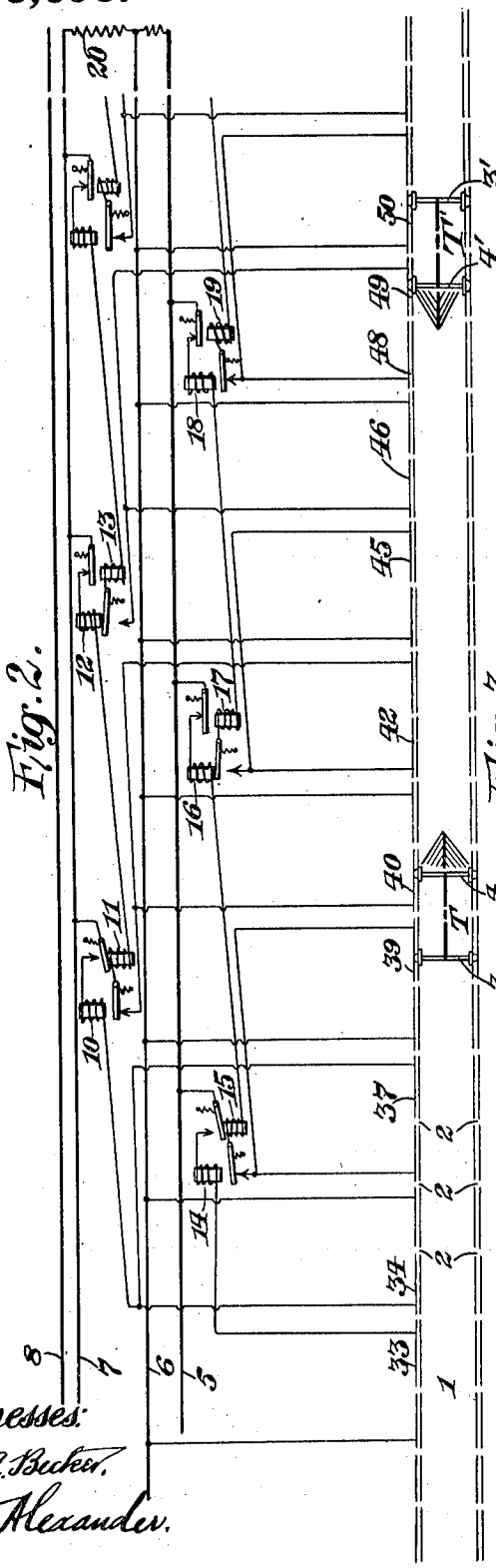

Fig. 2.

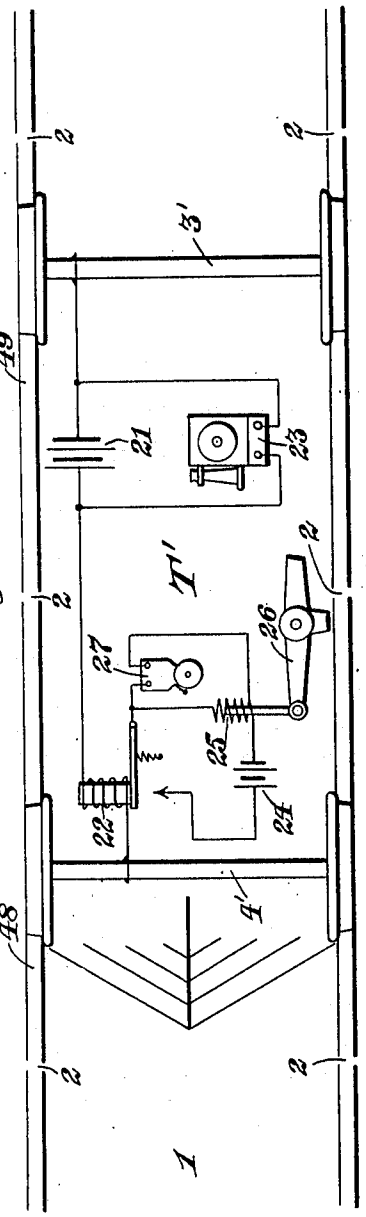

Fig. 3.

Witnesses:
Chas. A. Becker.
W. A. Alexander.

Inventor:
Joel Ames
By E. E. Huffman
Attorney.

UNITED STATES PATENT OFFICE.

JOEL AMES, OF MONTROSE, IOWA, ASSIGNOR OF ONE-SIXTH TO LINCOLN C. MILLER, OF KEOKUK, IOWA, ONE-SIXTH TO EDWARD LEECH, OF MONTROSE, IOWA, AND ONE-SIXTH TO THOMAS S. ROBINSON, OF FARMINGTON, IOWA.

TRAIN-CONTROL SYSTEM.

1,053,693. Specification of Letters Patent. Patented Feb. 18, 1913.

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To all whom it may concern:

Be it known that I, JOEL AMES, a citizen of the United States, residing at Montrose, Iowa, have invented a certain new and useful Train-Control System, of which the following is such full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to a system of train control, its object being to provide apparatus of this character which will be simple in construction and efficient in operation.

The invention comprises means for establishing communication with a moving train by either telephone, telegraph, or a system of signals, and means whereby a train is automatically warned of the approach of another train to within less than a predetermined distance and may even be automatically stopped when such a condition arises. By my system, both rear end and head on collisions are prevented.

Other features of the invention will be hereinafter more fully described, and pointed out in the appended claims.

In the accompanying drawings illustrating one embodiment of my invention, Figure 1 is a diagrammatic view of the connections and parts of the system with the exception of the apparatus carried by the train; Fig. 2 is a view similar to Fig. 1, but showing the circuit conditions when two trains are within the same "block"; Fig. 3 is a diagrammatic view of the portion of the train controlling system which is carried by the train itself, and which is not shown in the other figures.

Like marks of reference indicate like parts in the drawings.

1 is a railroad track, and T represents a train thereon. The track is divided into electrically independent sections insulated from each other at points marked 2. These sections can be of any desired length less than the length of the electrically equipped portion of a train.

3 and 4 represent car trucks which are electrically connected and which may be any trucks of the train, the only requirement being that the trucks be so chosen that the distance between them be greater than the length of one track section and less than two track sections. It will be understood, of course, that means other than the wheels and axles of the train may be used to establish electrical connection between the rails and the train, and also that instead of connecting the train controlling circuits with the rails, a series of contact members may be arranged adjacent the track, in which case the track need not be used as a part of the system.

5, 6 and 7 are main conductor wires suitably carried adjacent to the track and connected to each other at a common point, 9.

10 to 19 designate circuit controllers or relays, through the coils and armatures of which connections are made between various track sections and the main conductor wires.

8 is a telephone wire connected with station telephones 28 and 29, and if desired, with the train despatcher's office. The telephone circuit is connected by means of transformer 20 with the circuits that may be established through the main conductor wires, which circuits I will designate as main train controlling circuits. Included in the connection between the trucks 3 and 4 is a source of current 21 and the coil of the relay 22. In shunt around the battery 21 is a circuit which includes a telephone 23 or other signaling apparatus. The train is also provided with a local circuit which includes the battery, or other source of energy 24, the armature of the relay 22, a solenoid 25, and a brake controlling member 26. In shunt with a coil of 25, an electric bell 27 or other warning device may be provided.

Fig. 1 represents the portion of the system situated between two stations, which may be any distance apart. The portion of the system between any other two stations is the same, and the drawing illustrates the necessary connections between any two portions. It will be observed that, in the arrangement shown, only one of the main conductor wires (6 in the drawing) of one portion is connected to the conductor wires of the preceding portion.

The operation of the system is as follows: Referring first to Figs. 1 and 3, it will be observed that when the train is in the posi-

tion shown in Fig. 1, a closed circuit is established which may be traced from track section 39 through truck 3, relay 22, battery 21, truck 4, track section 40, relay 11, relay 12, main conductor wire 7, main conductor wire 5, relay 16, relay 15, and back to track section 39. The current flowing through this circuit causes the armatures of the relays 11, 12, 15 and 16 to be actuated and thereby breaks the circuits of which these armatures are a part. It will be observed that the armature of relay 15, for example, is a part of a circuit which includes track section 33, to the rear of the train, and that the armature of relay 12 is a part of a circuit which includes track section 49 situated ahead of the train. When the train moves forward to a point where truck 3 is in contact with track section 40, the circuit described above is opened and the armature of relay 15 assumes its normal position, thus permitting a following train to establish a complete circuit which includes the track section 33. When the truck 4 reaches track section 42, circuit is established which causes relay 18 to open the circuit of which its armature is a part. It will thus be seen that as the train progresses it causes train controlling circuits whose track sections are a predetermined distance ahead of it, to be opened, and those whose track sections are a predetermined distance in the rear, to be closed, thus maintaining a protected zone or block whose position changes with the movement of the train. When referring to the train controlling circuits being "closed" by the armatures of the relays, I mean, of course, that the circuit is completed except as to that portion which is carried by the train. There are no fully complete train controlling circuits except these established through the apparatus carried by the train itself.

Fig. 2 shows a second train T′ represented as approaching train T. Train T, when in the position shown, causes the armature of relay 12 to open the circuit which includes the track section 49, and consequently, when truck 4′ comes into contact with track section 49, no circuit is established through relay 22 carried by its train (see Fig. 3), and the armature of this relay is allowed to resume its normal position and close the local circuit which will operate the signal and also actuate the air brake controlling member 26 to set the brakes and either stop the train or slacken its speed, according to the adjustments previously made. When train T has advanced to a point where track section 40 is not in contact with either truck 3 or truck 4, the armature of the relay 12 will resume its normal position and a circuit is then established through train T′, which will operate to open the circuit containing the armature of relay 13, and consequently prevent the establishment of a circuit through train T when truck 3 reaches the track section 40. This condition will cause the train T to be stopped through the operation of its local controlling circuit in the same manner that train T′ was stopped. Should train T′ advance to section 48, for example, before stopping, it would have control of the circuit including the armature or relay 19, and stop train T when its truck reached the track section 42. It will thus be apparent that first one train and then the other has control of the system, and both trains will be automatically stopped before colliding. It will also be clear, from the foregoing description, that a train overtaking train T will be stopped when it reaches track section 33, supposing train T to be in the position shown. By assuming that train T is in any selected position, and then tracing the circuits, it will be found that my system will operate to stop a train which approaches to within less than a predetermined distance from it, and will stop both trains if they are moving toward each other. A block or protected zone may be made to extend over any desired space.

From Figs. 1 and 3 it will be apparent that telephone communication can be established with the train at any time desired, because under normal conditions a complete train controlling circuit which includes the telephone 23 is always in existence, although the particular connections which establish this circuit are constantly changing. As before explained, all train controlling circuits are in transformer relation with the main telephone circuit which connects the stations with the despatcher's office and with each other.

Referring to Figs. 1 and 3, and assuming that the train is in the position shown in Fig. 1, the telephone circuits may be traced as follows:—from telephone 28 through conductor 8, one winding of transformer 20, telephone 29, thence to the ground and back to telephone 28. The telephone 23 on the train is in a closed circuit which includes the track sections 39 and 40, conductors 7 and 5, and the other coil of the transformer 20. It will be apparent, therefore, that by means of the transformer, current impulses corresponding to those in one telephone circuit will be set up in the other circuit and since a closed circuit including the train telephone is constantly maintained as the train advances, communication by telephone between the train and the stations can be established whenever desired.

While I have shown and described but one embodiment of my invention, it is apparent that the form and arrangement of the parts and the details of construction may be varied, and I do not desire that the scope of my invention be limited except as set forth in the appended claims.

I claim.

1. A train control system comprising a plurality of normally open train controlling circuits having terminals placed one after another in operative relation with passing trains, means carried by a train for alternately connecting successive and alternate circuit terminals, means in each train controlling circuit for causing an opening to be made in a train controlling circuit having a terminal located at a point ahead of the train, and also means in each train controlling circuit for causing an opening to be made in a train controlling circuit having a terminal located at the rear of the train.

2. In combination, circuit controlling devices, a track rail divided into insulated sections, each section being connected to the succeeding track section through a circuit controlling device, and each track section being also connected through a circuit controlling device to the second track section in advance.

3. In apparatus of the character described, the combination with circuit controlling devices, of switches operated thereby, a series of insulated contact members, each contact member being connected to the succeeding contact members through a circuit controlling device and a switch, and means carried by a train for establishing electrical connection between adjacent contact members.

4. In apparatus of the character described, the combination with circuit controlling devices of switches operated thereby, a track rail comprising insulated sections, each section being connected to the succeeding section through two circuit controlling devices and two switches.

5. The combination with circuit controlling devices, of switches operated thereby, a track rail comprising insulated sections, each section being connected to the succeeding section through two circuit controlling devices and two switches, each circuit controlling device being adapted to operate a switch in circuit with a track section remote from the track section to which said device is connected.

6. The combination with electro-magnets, of switches operated thereby, a track rail comprising insulated sections, each section being connected to the succeeding section through two electro-magnets and two switches.

7. In a train control system, switches, circuit controlling devices, each adapted to operate a switch, a track rail divided into insulated sections, each track section being connected to another track section through a switch and two circuit controlling devices, the switch operated by one of the said circuit controlling devices being in circuit with a track section remote from and in advance of the sections to which said devices are connected and the switch operated by the other of said circuit controlling devices being in circuit with a track section remote from and to the rear of the sections to which said devices are connected, and means carried by a train for energizing said circuit controlling devices.

8. In a train control system, circuit controlling relays, a track rail divided into insulated sections, each track section being connected to another track section through two relays and the armature of a third relay, the armature of the first of said relays being in circuit with a track section remote from and in advance of the sections to which said relay is connected, and the armature of the second relay being in circuit with a track section remote from and to the rear of the sections to which said relay is connected, and means carried by a train for alternately connecting successive and alternate track sections as the train advances.

9. A train control system comprising insulated track sections, three main conductors carried adjacent to the track and united at a common point, each conductor being connected to one or more track sections, circuit controlling relays, each in circuit with a track section and having an armature in circuit with another track section.

10. A train control system, comprising insulated track sections, three main conductors carried adjacent to the track and united at a common point, each conductor being connected to one or more track sections, circuit controlling relays, each in circuit with a track section and having an armature in circuit with another track section, and means carried by a train for energizing said relays.

11. In a train control system, the combination with circuit controlling devices, of switches operated thereby, a track rail comprising insulated sections, each section being in electrical connection with the succeeding section through two circuit controlling devices and two switches, and means carried by a train for connecting adjacent track sections to form a complete circuit.

12. In a train control system, the combination with circuit controlling devices, of switches operated thereby, a track rail comprising insulated sections, each section being in electrical connection with the succeeding section through a circuit controlling device and a switch, a partial circuit carried by a train for connecting adjacent track sections, a source of energy and an electro-magnet in said partial circuit, and a local circuit also carried by the train and controlled by said electro-magnet.

13. In a train control system, the combination with circuit controlling devices, of

switches operated thereby, a track rail comprising insulated sections, each section being in electrical connection with the succeeding section through a circuit controlling device and a switch, a partial circuit carried by a train for connecting adjacent track sections, a source of energy and an electro-magnet in said partial circuit, a local circuit also carried by the train and controlled by said electro-magnet, and a train brake controlling device in said local circuit.

14. A train control system comprising a plurality of train controlling circuits having terminals arranged along the track, means carried by a train for connecting said terminals to successively close said circuits and a circuit for communicating with the train from stations, said circuit being in transformer relation with each of said train controlling circuits.

In estimony whereof, I have hereunto set my hand and affixed my seal in the presence of the two subscribing witnesses.

JOEL AMES. [L. S.]

Witnesses:
R. E. WORSTER,
J. B. WORDEN.