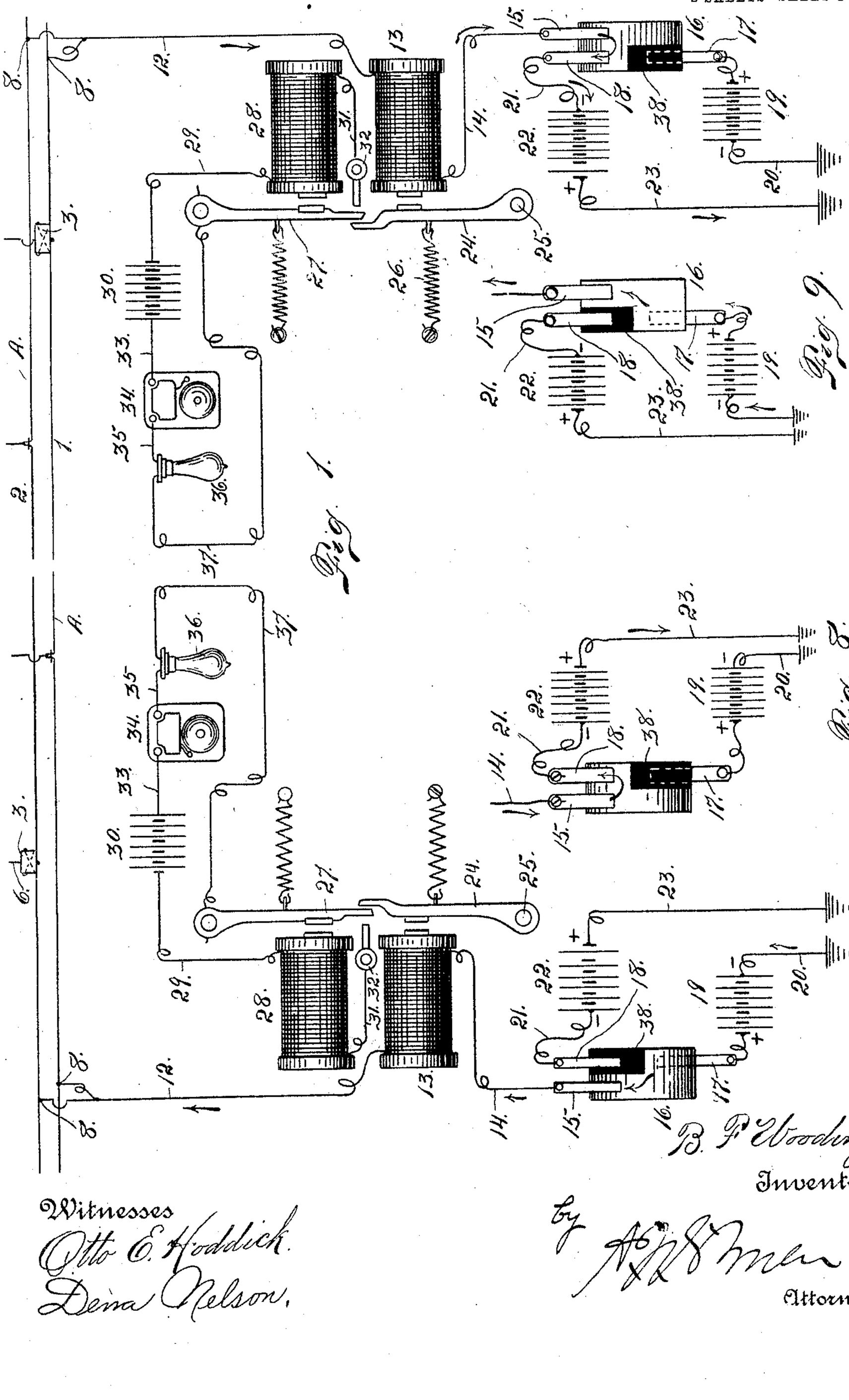
No. 815,315. PATENTED MAR. 13, 1906.

B. F. WOODING.

RAILWAY ELECTRIC SIGNALING APPARATUS.

APPLICATION FILED NOV. 10, 1904.

2 SHEETS—SHEET 1.



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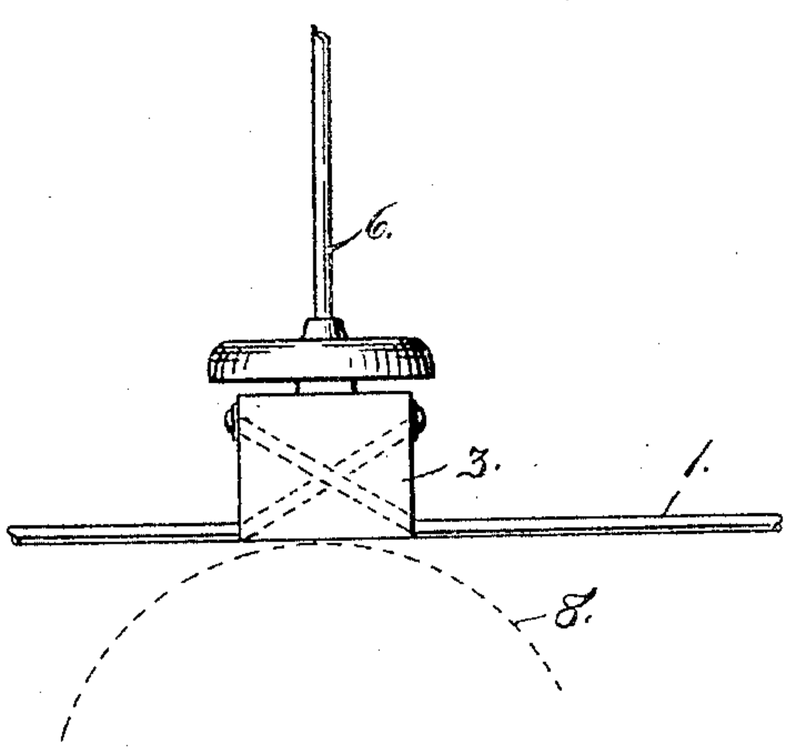

Fig. 2.

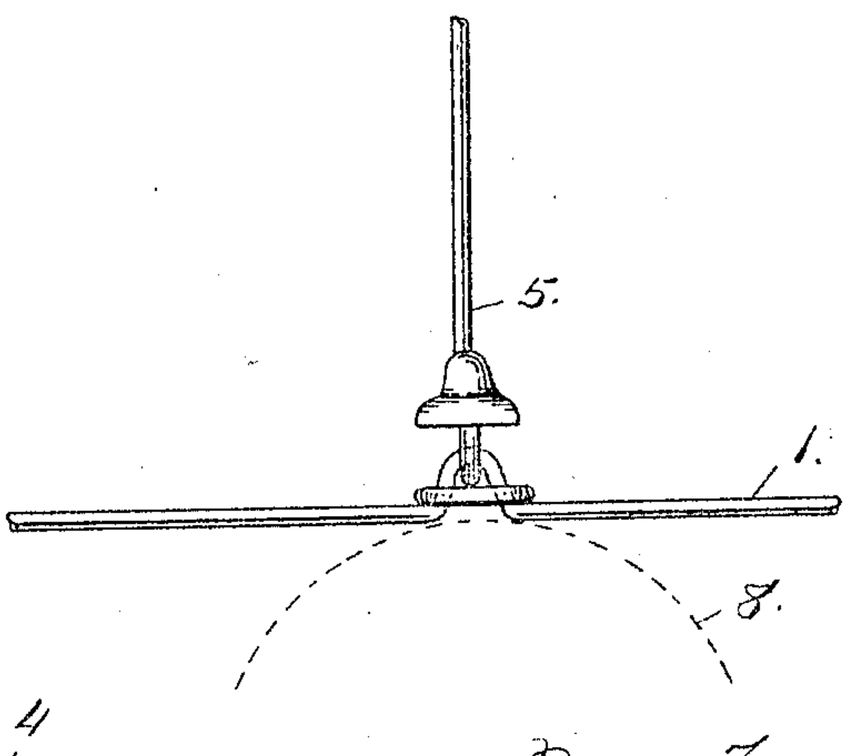

Fig. 3.

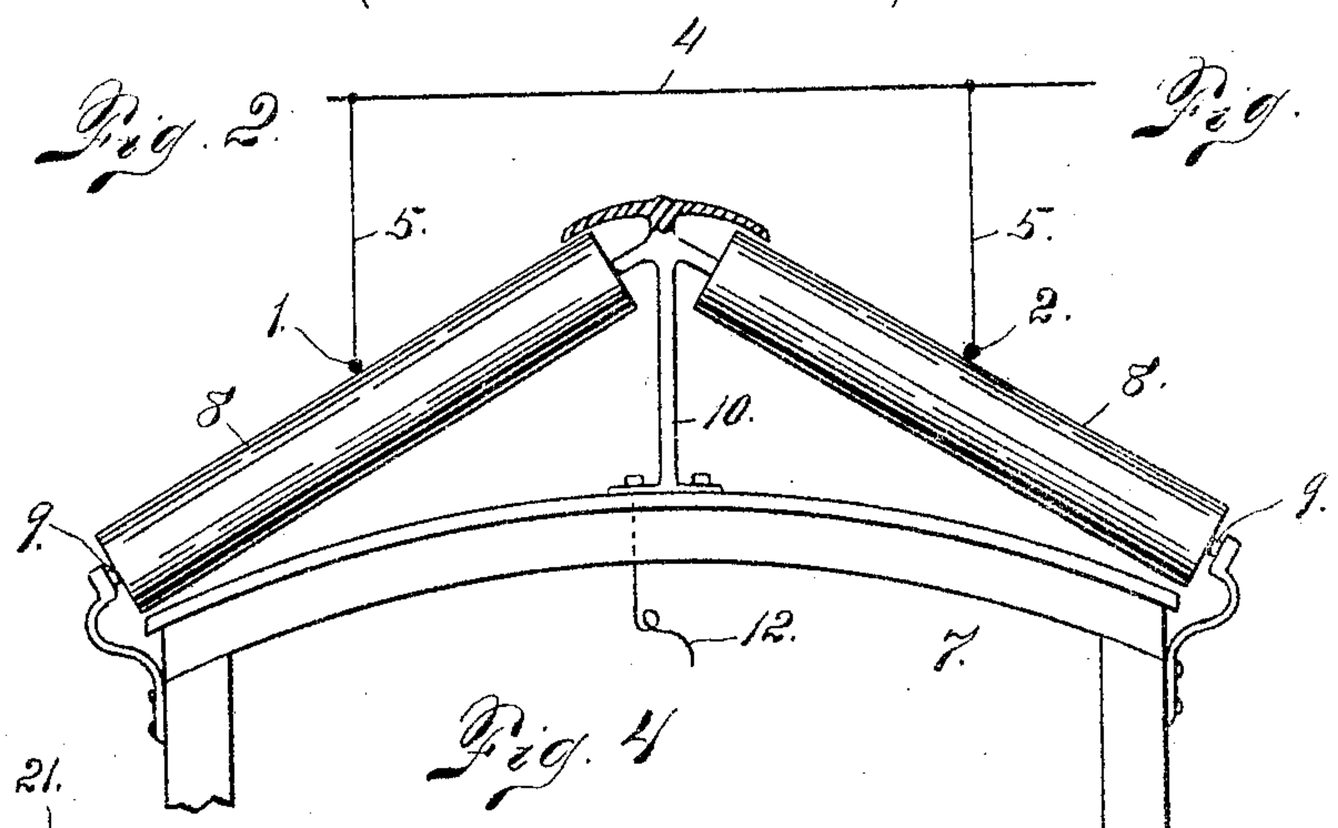

Fig. 4.

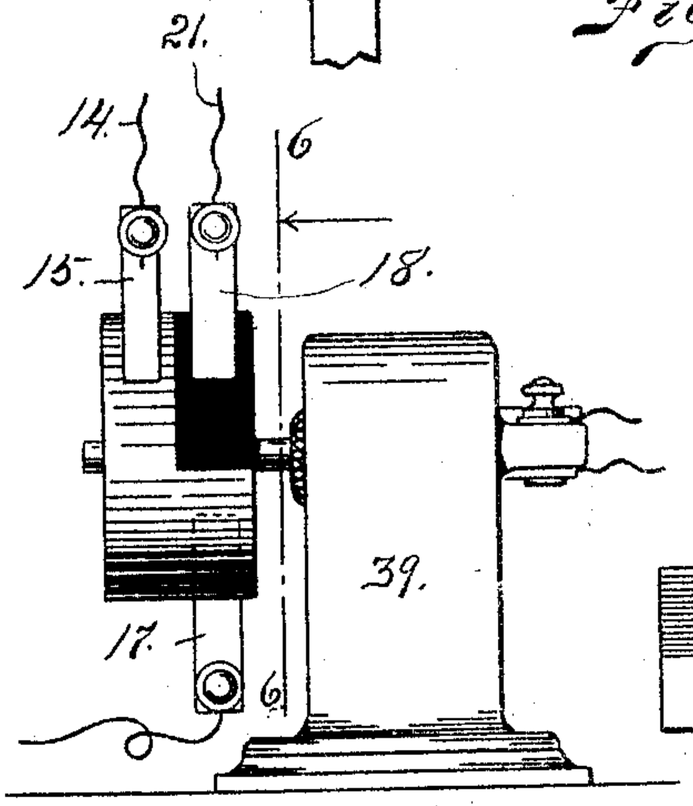

Fig. 5.

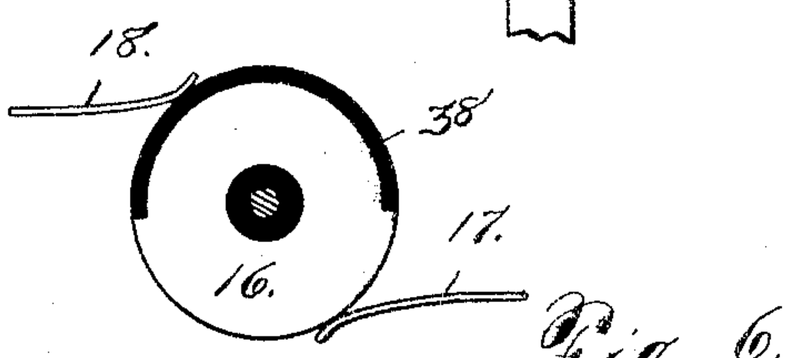

Fig. 6.

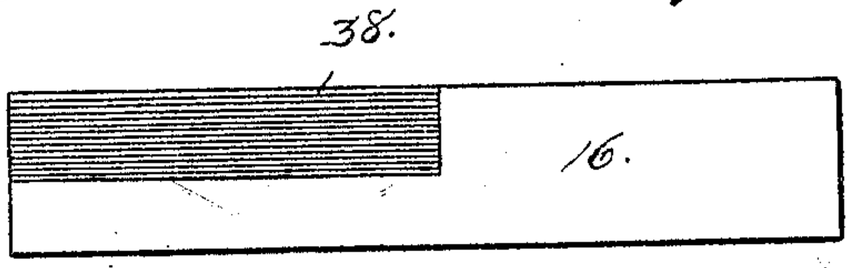

Fig. 7.

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UNITED STATES PATENT OFFICE.

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RAILWAY ELECTRIC SIGNALING APPARATUS.

No. 815,315. Specification of Letters Patent. Patented March 13, 1906.

Application filed November 10, 1904. Serial No. 232,104.

To all whom it may concern:

Be it known that I, BENJAMIN F. WOODING, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Railway Electrical Signaling Apparatus; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to electrical signaling apparatus for railways, its object being to prevent collisions between trains going either in the same or opposite directions. This object is automatically accomplished through the instrumentality of my improved apparatus, which includes contacts carried by the train and engaging overhead conductors formed into blocks or sections of any desired length by insulating the adjacent extremities of the conductor-sections from each other. In my system I employ two overhead conductors, and the divisions between the sections are staggered—that is to say, the divisions between the sections of one conductor are located midway between the extremities of the opposite section of the other conductor. By virtue of this arrangement it becomes impossible for two trains to approach nearer than half a section from each other without both being signaled by virtue of the signaling mechanism mounted on each train. The sections may of course be of any desired length, whereby two trains cannot approach nearer than a predetermined distance without each receiving notification of the approach of the other. As soon as both trains have reached the same section or block a circuit will be closed on each train, in which circuit is located a signaling device consisting of a bell or lamp, or both, or any other suitable means calculated to notify the engineer or other person in charge of the train of the dangerous proximity of another train.

In my improved apparatus I employ electromagnets for operating spring-held arms which act as armatures of the magnets, whereby the signaling-circuit is closed on each engine as soon as both trains are in the same block or section. In the main circuit I employ two batteries on each train, the said batteries having opposite poles connected with the ground. The two batteries are connected by a pole-changer in such a manner that when two trains are in the same block it is impossible for more than an exceedingly short space of time to elapse before opposite battery-poles on the two trains will be grounded, in which event the circuit will be closed and the signaling mechanism on each train operated.

The contacts mounted on each train are a very important feature, since they are mounted to rotate and occupy an inclined position, whereby they are adapted to engage the overhead conductors at all times regardless of the swaying motion of the train.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a diagrammatic view illustrating the invention and showing the signaling equipment for each train, together with the intermediate line conductors. Fig. 2 is an enlarged detail view illustrating the manner of insulating the conductor-sections from each other. Fig. 3 is a detail view illustrating the manner of supporting the line conductors. Fig. 4 is a fragmentary view of an engine-cab, showing the inclined roller-contacts. Fig. 5 is a detail view of a pole-changer and its operating-motor. Fig. 6 is a section taken on the line 6 6, Fig. 5. Fig. 7 is an extended view of the periphery of the pole-changer. Figs. 8 and 9 are views showing the two sets of batteries and the pole-changer in different relative positions.

The same reference characters indicate the same parts in all the views.

Let the numerals 1 and 2 designate the overhead line conductors. These conductors are divided into blocks or sections whose extremities are insulated from each other, as shown at 3. The sections of each conductor are designated A and the insulated divisions of the two conductors are staggered—that is to say, the division 3 between any two sections of one conductor is located half-way between the divisions 3 of the sections of the other conductor—whereby it becomes impossible for two trains to approach nearer than half the length of any conductor-section without both being within the influence of the conductor-section for signaling purposes. The conductors 1 and 2 are suitably

suspended above the railway-track. This may be accomplished by means of cross-wires 4, from which depending hangers 5 extend, as illustrated in Figs. 3 and 4. As shown in the drawings, these hangers 5 may be located at any desired point. A slightly-different form of construction of hanger, which I will designate 6, is employed where the insulating blocks or divisions 3 are employed. (See Fig. 2.) These blocks 3 are composed of suitable insulating material, and, as shown in the drawings, they are bored to receive the extremities of the conductor-sections, which are passed diagonally therethrough in opposite directions, as indicated by dotted lines in Fig. 2.

Referring to Fig. 4, let 7 designate the cab of the engine, upon which are mounted rollers 8, occupying an inclined position and supported by suitable axles 9. These rollers are of suitable diameter and are of considerable length, whereby they are kept in contact with the conductors 1 and 2 regardless of the swaying motion of the train. The upper extremities of the axles 9 are supported by a standard 10, and the relation between the rollers and the standard is such that the electrical current may pass from either roller through the standard to a conductor 12 to one terminal of the coil of an electromagnet 13. To the other terminal of the magnet-coil leads a conductor 14 to a metal brush 15, which engages a rotary pole-changer 16. Two brushes 17 and 18 are also connected with the rotary pole-changer. The brush 17 leads to the positive pole of the battery 19, while from the opposite pole of the battery a conductor 20 leads to the ground. From the brush 18 a conductor 21 leads to the negative pole of a battery 22, while from the positive pole of the said battery a conductor 23 leads to the ground. Mounted adjacent the magnet 13 is a movable arm 24, pivoted at 25 and connected with a spring 26, intermediate its extremities. This arm 24 may be said to constitute the armature of a magnet 13. When the magnet 13 is energized, it acts on the arm 24 to draw the latter toward the magnet. This arm 24 overlaps a smaller arm 27, mounted in front of a magnet 28, one terminal of whose coil is connected by a conductor 29 with one pole of a battery 30, mounted on the engine. From the other terminal of this magnet-coil a conductor 31 leads to a contact 32, which lies in the path of the free extremity of the arm 27. From the pole of the battery 30 opposite that connected with the conductor 29 leads a conductor 33 to a bell 34. From this bell a wire 35 leads to a lamp 36; from the lamp conductor 37 leads to the arm 27. The mechanism just described as mounted on the train is preferably located on the engine and may be said to constitute the train equipment for signaling purposes. This equipment is the same for each train. Hence it will be unnecessary to describe the mechanism further in detail, since that to the right and left of Fig. 1 is precisely the same. The pole-changing disk 16 has a portion of its peripheral face insulated, as shown at 38.

In the diagrammatic view shown in Fig. 1 the points of the conductor 12, engaging the conductors 1 and 2, may be designated 8, since they are intended to indicate the position and function of the rollers in Fig. 4. Hence the position of one pair of rollers is shown at the right of Fig. 1 and the position of the other pair of rollers at the left of Fig. 1. It may be assumed that these two pairs of rollers 8 are carried by two different trains which are approaching each other. It will also be assumed that the train equipment shown at the right and left, respectively, of Fig. 1 is mounted on two separate locomotives. Now if these two locomotives or trains are approaching each other, when at the distance indicated in Fig. 1 there will be no signal on either train, since both are not on the same block or conductor-section. Assuming now that the train on the right approaches to a point at the left of the first insulating-block 3, the two trains will then be in the same block or section, and the electrical current may be said to pass from the wire 1 down through the conductor 12 to the magnet 13, thence through the coils of the magnet and out through the conductor 14 to a metal brush 15 of the pole-changer 16, thence to the brush 18, and from the latter through the conductor 21 to the negative pole of the battery 22, and thence from the positive pole of said battery to the ground on one train, while the current may be said to pass from the ground upwardly through the conductor 20 on the other train to the negative pole of the battery 19, and thence from the positive pole of said battery to the brush 17, to the pole-changer, to the brush 15, through the conductor 14 to the magnet 13, and from the latter through the conductor 12 to the overhead conductor 1 or to the point of beginning. Now as the magnet 13 is energized the arm 24 will be drawn toward it, and since this arm overlaps the arm 27 the latter will be actuated or brought into engagement with the contact 32, closing the local circuit having the battery 30 and in which the bell 34 and lamp 36 are located. It is evident that this will happen on both trains and that the person or persons in charge of both will be signaled or notified of the dangerous proximity of the other train. Now if it happens that the pole-changers are in a different relative position from that shown in Fig. 1—that is to say, the position shown in Figs. 8 and 9—the direction of the current will be changed, as indicated by the arrows in the last-named figures.

It is assumed that a motor 39 (see Fig. 5)

or other suitable instrumentality is employed on each train for rotating the pole-changer. The current for operating the motor may be supplied in any suitable manner.

It is evident that the bell of the signaling mechanism may be connected with a telephone on each train, whereby in addition to receiving a signal each engineer will have access to a telephone, whereby they may converse together. This would only require ordinary connections, and therefore need not be illustrated or described in detail.

Having thus described my invention, what I claim is—

1. In electrical signaling apparatus for railways, the combination of a pair of overhead wires or conductors arranged in sections or blocks, the extremities of the sections of one conductor being arranged intermediate the extremities of the sections of the other conductor, inclined roller-contacts mounted on the train and engaging the said conductors respectively, the contacts being connected to form a continuous conductor, a normally open local circuit mounted on the train, signaling mechanism included in the circuit, a source of current for the main circuit, and a magnet in the main circuit, the local circuit having a movable part actuated by the magnet to close the local circuit for the purpose set forth.

2. In electrical signaling apparatus for railways, the combination of overhead conductors divided into sections or blocks, a local circuit mounted on the train, signaling mechanism included in said circuit, inclined roller-contacts mounted on the train and engaging the overhead conductors, and suitable connections between the roller-contacts and the local circuit for closing the latter and operating the signaling mechanism, substantially as described.

3. The combination of a pair of overhead conductors divided into sections or blocks, a normally open circuit mounted on the train, signaling mechanism located in said circuit, a source of current mounted on the train, a magnet connected with the current source, and inclined roller-contacts mounted exteriorly on the train and engaging the external conductors, for closing the main circuit through the magnet when two trains are in the same block or section, the local circuit having a part acted on by the magnet to close the said circuit, substantially as described.

4. The combination of overhead conductors divided into blocks or sections whose divisions are alternately arranged, external roller-contacts mounted on the train and engaging said conductors, the said contacts occupying an inclined position and being of sufficient length to maintain a perfect electrical contact with the conductors regardless of the swaying of the train, a doubled source of current mounted on the train and electrically connected with the contacts, the two members of the current source having their opposite poles grounded, a pole-changer connected with the two members of the current source, a magnet located in the main circuit and provided with a pivoted arm forming its armature, a normally open local circuit, and signaling mechanism located in said circuit, the open circuit having a movable part acted on by the arm of the magnet of the main circuit, for closing the local circuit, substantially as described.

5. In electrical signaling mechanism for railways, the combination of overhead conductors arranged in blocks or sections, inclined roller-contacts mounted on the train and engaging said conductors, a main circuit mounted on the train and connected with the said roller-contacts, a magnet in said circuit, a movable part acted on by the magnet when the main circuit is closed, a normally open local circuit, the signaling mechanism located in said circuit, a magnet also forming a part of said circuit, an armature located in suitable proximity to said magnet and also forming a part of the local circuit, the pivoted arm of the one magnet acting on the armature of the other magnet to close the local circuit when the main-circuit magnet is energized, substantially as described.

6. In electrical signaling apparatus for railways, the combination of an overhead conductor, a local circuit mounted on the train, signaling mechanism included in said circuit, an inclined roller-contact mounted on the train and engaging the overhead conductor, the said contact being cylindrical whereby the conductor is free to change its position thereon as circumstances may require, and suitable connections between the roller-contact and the local circuit for closing the latter, substantially as described.

7. In electrical signaling apparatus for railways, the combination of a conductor, a local circuit mounted on the train, signaling mechanism included in said circuit, an inclined roller-contact mounted on the train and engaging the conductor, the said contact being cylindrical whereby the conductor is free to change its position thereon as circumstances may require, and suitable connections between the roller-contact and the local circuit for closing the latter, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

BENJAMIN F. WOODING.

Witnesses:
DENA NELSON,
A. J. O'BRIEN.