P. UTNE.

SIGNALING SYSTEM FOR RAILWAYS.

APPLICATION FILED SEPT. 28, 1908.

953,243.

Patented Mar. 29, 1910.

2 SHEETS—SHEET 1.

Fig. 1

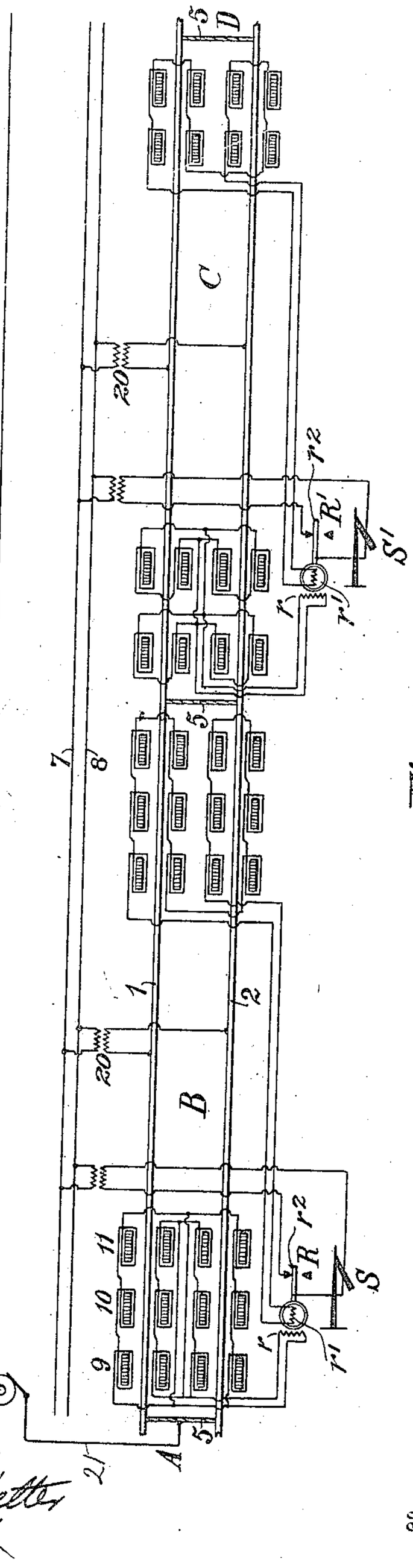
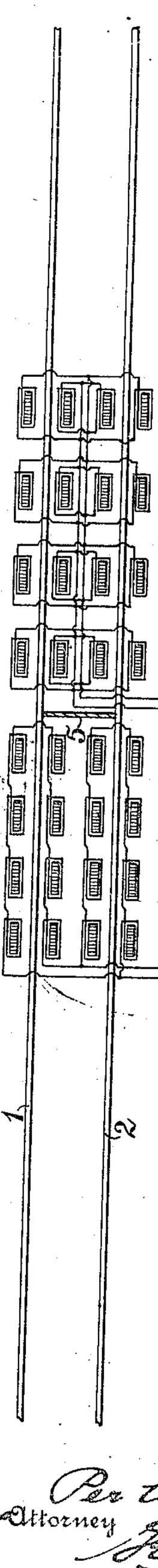


Fig. 2



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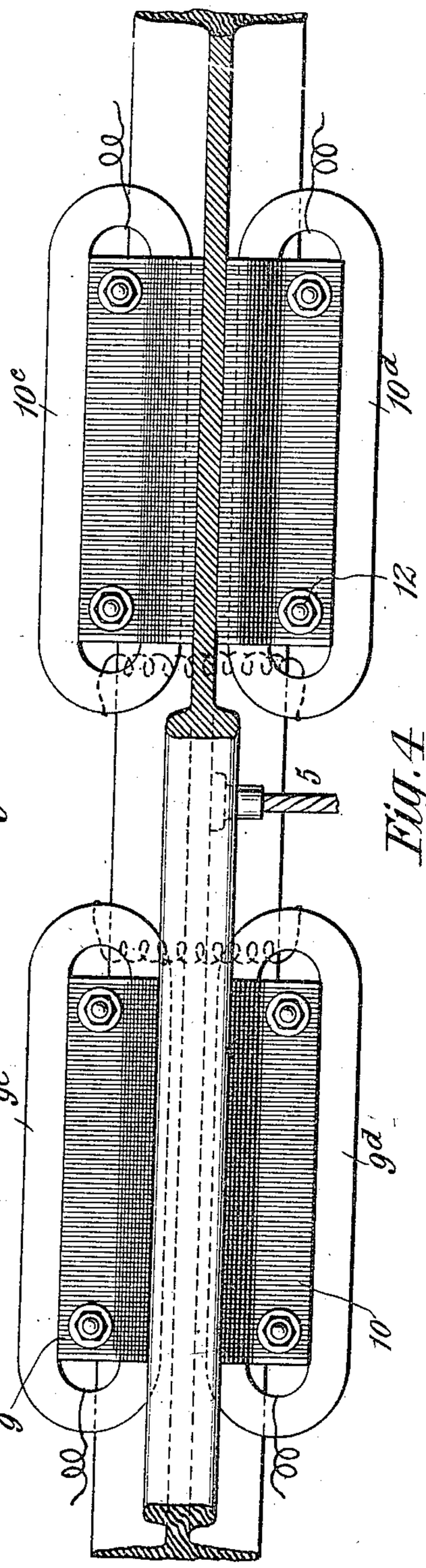

Fig. 3

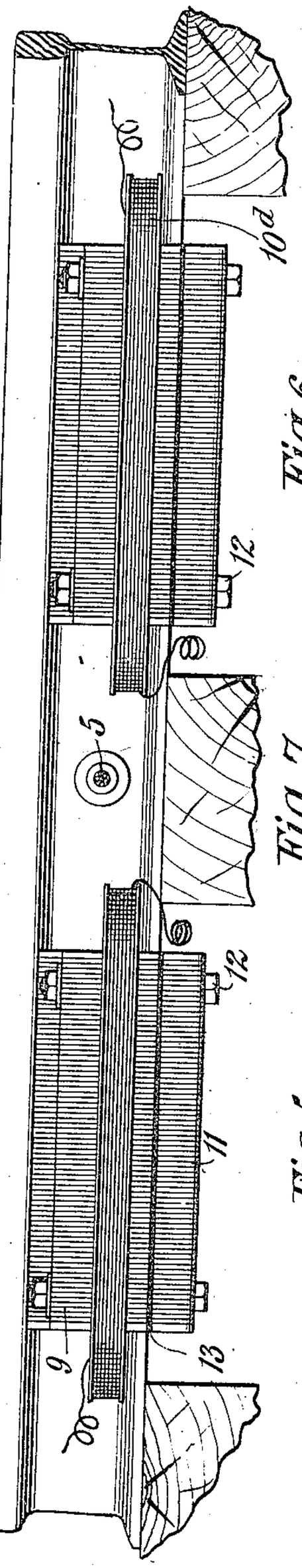

Fig. 4

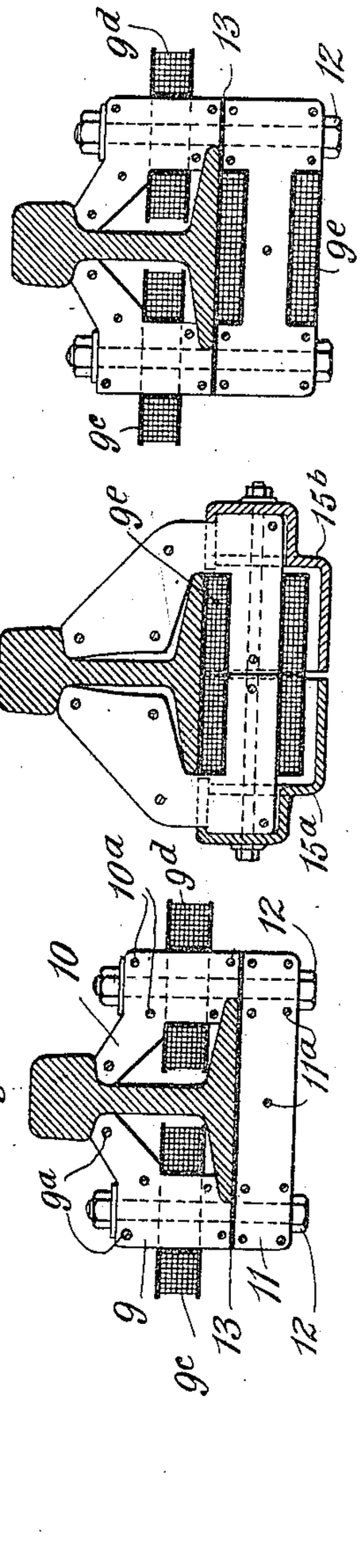

Fig. 6

Fig. 7

Fig. 5

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UNITED STATES PATENT OFFICE.

PER UTNE, OF NEW YORK, N. Y., ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

SIGNALING SYSTEM FOR RAILWAYS.

953,243. Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed September 28, 1908. Serial No. 455,037.

To all whom it may concern:

Be it known that I, PER UTNE, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Signaling Systems for Railways, of which the following is a specification.

My invention relates to signaling systems for railways and especially to signaling systems for electric railways.

In signaling systems to which my invention relates, signaling currents are employed on defined limits of the track rails to control signaling devices. When no car or train is on a defined limit of the track rails, the signaling current therein is employed to control a signaling device and have it give one indication to an approaching car or train, and when a car or train is within such defined limits the wheels and axles thereof act as a short circuit for the signaling current, and the signaling device is controlled to give another indication to an approaching car or train. In some signaling systems for electric railways the limits for the signaling current in the track rails are defined by bonds of low resistance and impedance which are placed between the track rails and joined to them. Such bonds in connection with adjacent sections of the track rails, form paths in which the signaling currents flow, and alongside the track rails, at about the points where the bonds are located, a closed conductor is arranged in which a current flows, induced therein by the signaling current flowing in the track rails.

My invention relates to improvements in the type of signaling system hereinbefore generally described whereby the efficiency of such arrangements is greatly increased.

I will describe a signaling system embodying my invention and then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a portion of an electric railway both track rails of which are electrically continuous throughout their length and having applied thereto a signaling system embodying my invention. Fig. 2 is a view similar to Fig. 1 but showing a modification in the trackway. Fig. 3 is a detail plan view drawn to a larger scale of a portion of one of the track rails of Fig. 1 showing two adjacent coils connected therewith. Fig. 4 is a side elevation of Fig. 3. Figs. 5, 6 and 7 are detail views in partly transverse section and end elevation of modifications.

Similar characters of reference designate corresponding parts in all of the figures.

Referring now to Fig. 1: 1, 2 designate the two track rails of an electric railway which are electrically continuous throughout their length so that they may form conductors for electric currents as well as support rails for the cars or trains. Motor cars are propelled along the railway by an electric current which may be alternating or direct, supplied from a suitable generator 3, one pole of which is suitably connected with a trolley or third rail 4 and the other of which is suitably connected with both of the track rails 1, 2, by means of a conductor 21 and bond 5.

At suitable points along the railway, signaling devices S, S^1, etc., are provided, and they may be of any desired construction or arrangement to give the proper indications to the drivers of the cars or trains traveling along the railway. Preferably they will be of the automatic semaphore type which are well known in the art and will not be described in detail here. For the purposes of this specification it need be stated only that they comprise a blade, a counterweight for the blade in the form of a spectacle, a light for use in connection with the spectacle and an operating mechanism for the blade. The railway signals S, S^1, etc., are generally located at the entrance end of a block section, the block section generally extending from one railway signal (generally a home signal) to the next adjacent signal. In the drawings I have shown two complete block sections B, C, and portions of two others A, D. Each railway signal is controlled as to one or more of its indications by a signaling current flowing in the track rails of the block sections which the railway signal controls. The signaling currents are confined to certain defined limits of the track rails, generally to the length of track rails included in a block section, and in this invention this is accomplished by means of cross bonds 5 which are placed between the track rails 1, 2 and electrically connected therewith. These bonds are of low ohmic resistance and low impedance and have a conducting capacity for both propulsion and signaling currents. These bonds, as has

been stated, act to confine the signaling currents within certain limits and in this respect they have the same function as the insulated joints used in signaling systems on steam roads. They also serve to equalize any difference of car propulsion current existing in the rails at their points of location, but in this respect they act the same as the cross bonding usually employed between the tracks of electric railways.

The signaling current for the track circuits is supplied from a generator or transformer from which extend distributing mains, 7, 8. Transformers 20, one for each track circuit, are fed from the mains 7, 8, and each transformer is located at a point about midway of the ends of its track circuit. The signaling current for each track circuit will flow from one terminal of the secondary winding of its transformer along one rail to a bond 5, at one end of the track circuit through the bond 5 to the opposite rail and along it to the other terminal of the transformer. The signaling current will also flow from the first terminal to the rail to which it is connected and along it to the cross bond 5 at the other end of the track circuit, through that bond to the other rail and along it to the other terminal of the secondary winding of its transformer. Each bond 5 it will be seen is common to two adjacent block sections. The circuit just traced is a closed circuit, and signaling current flowing therein is availed of to induce a secondary current in an adjacent circuit.

Adjacnt the cross bonds at the ends of each track circuit, I secure to both of the rails at intervals a number of laminations arranged in units to form cores.

9, 10, 11, etc., designate units of laminations, the laminations in each set being suitably clamped together by bolts 9^a 10^a, 11^a, etc. The laminations in Figs. 3 to 6 inclusive are shown as being in three parts or sections while those in Fig. 7 are shown as being in two parts or sections. The laminations are provided along the sides of the rails, and under the base of the rails. The sections of laminations under the rails in Figs. 3 to 6 are secured to the other section by bolts 12, and between the laminations at the sides and bottom of the rail is insulating material 13. The thickness of this insulating material may vary according to the desired air gap, to prevent magnetic saturation of the core by the propulsion current flowing in the rails. These laminated iron cores are so proportioned and arranged about the web and base of the rail as to take up and provide a path for the maximum magnetic flux which is set up at these points by the signaling current flowing in the rails. Each rail 1, 2, may be provided with as many cores as desired, depending upon the amount of current it is desired to have flow in the secondary circuit. The secondary circuit is formed by a series of coils connected together.

In Figs. 3, 4 and 5 I have shown each set of laminations as being provided with two coils 9^c, 9^d, 10^c, 10^d, while in Fig. 6 I have shown each core as being provided with three coils 9^c, 9^d, 9^e. In Fig. 7 I have shown the cores as being provided with only one coil 9^e arranged at the bottom of the rail and inclosed in a suitable two-part casing 15^a, 15^b. The core is also shown as being in two parts instead of three as in Figs. 5 and 6.

In those cases where each core is provided with a plurality of coils, they are preferably connected in series with each other. The several groups of coils located at the ends of the track circuit may be connected together in any desired manner. For example in Fig. 1 the groups of coils at the left-hand end of block section B are connected; four groups in parallel, each group having three coils in series. The coils at the right-hand end of block section B are connected all 12 in series.

At the left-hand end of block section C, four groups of coils are connected in parallel, each group having two coils in series. At the right hand end of the same section all eight coils are shown connected in series. Fig. 2 shows to the left two groups in parallel each group having 8 coils connected in series. To the right in Fig. 2 a group of 16 coils is shown with all connected in parallel.

However the coils are connected together, they are in circuit with suitable relays R, R^1. In the drawings I have shown the relays R, R^1 as comprising two coils, one a field coil r and the other an armature coil r^1, which actuates a contact arm r^2 included in the "local" or signal circuit. One coil is connected with the coils or windings on the laminations at one end of the track circuit and the other winding is connected with the coils or windings on the cores at the other end of the track circuit. When current is flowing in both coils of the relays the armature coil r^1 will move the contact arm to close the "local" or signal circuit and thus have the signal mechanism operate the signal device to give a "clear" or "proceed" indication. If, however, current is shunted from either or both of the coils the armature coil r^1 is moved in a reverse direction under the influence of gravity to open the "local" or signal circuit and thus have the signal mechanism operate and the signal device give a "danger" or "stop" indication.

Instead of only one relay having two coils, two relays of any desired construction designed to be operated only by the signaling current for each end of the block may be employed.

Having thus described my invention what

I claim as new and desire to secure by Letters Patent is:

1. In a railway signaling system, conductively continuous rails, bonds of low impedance connected with the rails at intervals, sources of signaling currents connected to the track rails intermediate the bonds, laminations associated with the track rails at intervals and affording a path for the magnetic flux produced by the signaling current flowing in the track rails and windings around said laminations in which a current is induced, and relay devices energized by said induced currents to control railway signals.

2. A track circuit for signaling systems comprising opposite portions of track rails, a source of signaling current connected therewith, sets of laminations secured to the opposite track rails at intervals and affording a path for the magnetic flux produced by the signaling current flowing in the track rails, a winding for each set of laminations in which a current is induced by the magnetic flux set up in the said laminations and relay devices energized from the induced currents in said windings.

3. A track circuit for signaling systems comprising opposite portions of track rails, a source of signaling current connected therewith, sets of laminations secured to the opposite track rails at intervals and embracing the webs and flanges thereof and affording a path for the magnetic flux produced by the signaling current flowing in the track rails, a winding for each set of laminations in which a current is induced by the magnetic flux flowing in the said laminations and relay devices energized from the induced currents in said windings.

4. A track circuit for signaling systems comprising opposite portions of track rails, a bond of low impedance connected with the track rails at each end of the track circuit, a set of laminations secured to each of the opposite track rails adjacent the bonds and affording a path for the magnetic flux produced by the signaling current flowing in the track rails and bonds, a winding for each set of laminations in which a current is induced by the magnetic flux flowing in the laminations for controlling the operation of a railway signaling device.

5. A track circuit for signaling systems comprising opposite portions of track rails, a source of signaling current connected therewith, a set of laminations secured to [illegible] of the track rails and affording a path for the magnetic flux produced by the flow of signaling current in the said track rails, and a winding for each set of laminations in which a current is induced by the magnetic flux flowing in the laminations for controlling the operation of a railway signaling device.

6. A track circuit for signaling systems, comprising opposite portions of track rails along which a car travels, a source of alternating signaling current therefor, a set of laminations associated with each track rail and affording a path for magnetic flux produced by the flow of signaling current in the said portions of the track rails, a winding for each set of laminations in which an induced current flows, and a signal controlling device included in said winding.

7. A signaling transformer comprising a track-rail, an iron core adjacent to said rail and laminated in a direction parallel to lines of force set up by current flowing in said rail, and a winding around said core in a direction at right angles to the laminations.

8. A signaling transformer comprising a track rail, an iron core adjacent to and partially surrounding said rail and laminated at right angles to the length of the rail and a winding around said core in a direction at right angles to the laminations, whereby the rail acts as primary conductor when traversed by alternating currents to induce secondary currents in said winding.

In testimony whereof I have signed my name to this specification in the presence of two subscribed witnesses.

PER UTNE.

Witnesses:
H. A. HAMILTON,
M. S. KIRKLAND.