No. 874,042. PATENTED DEC. 17, 1907.

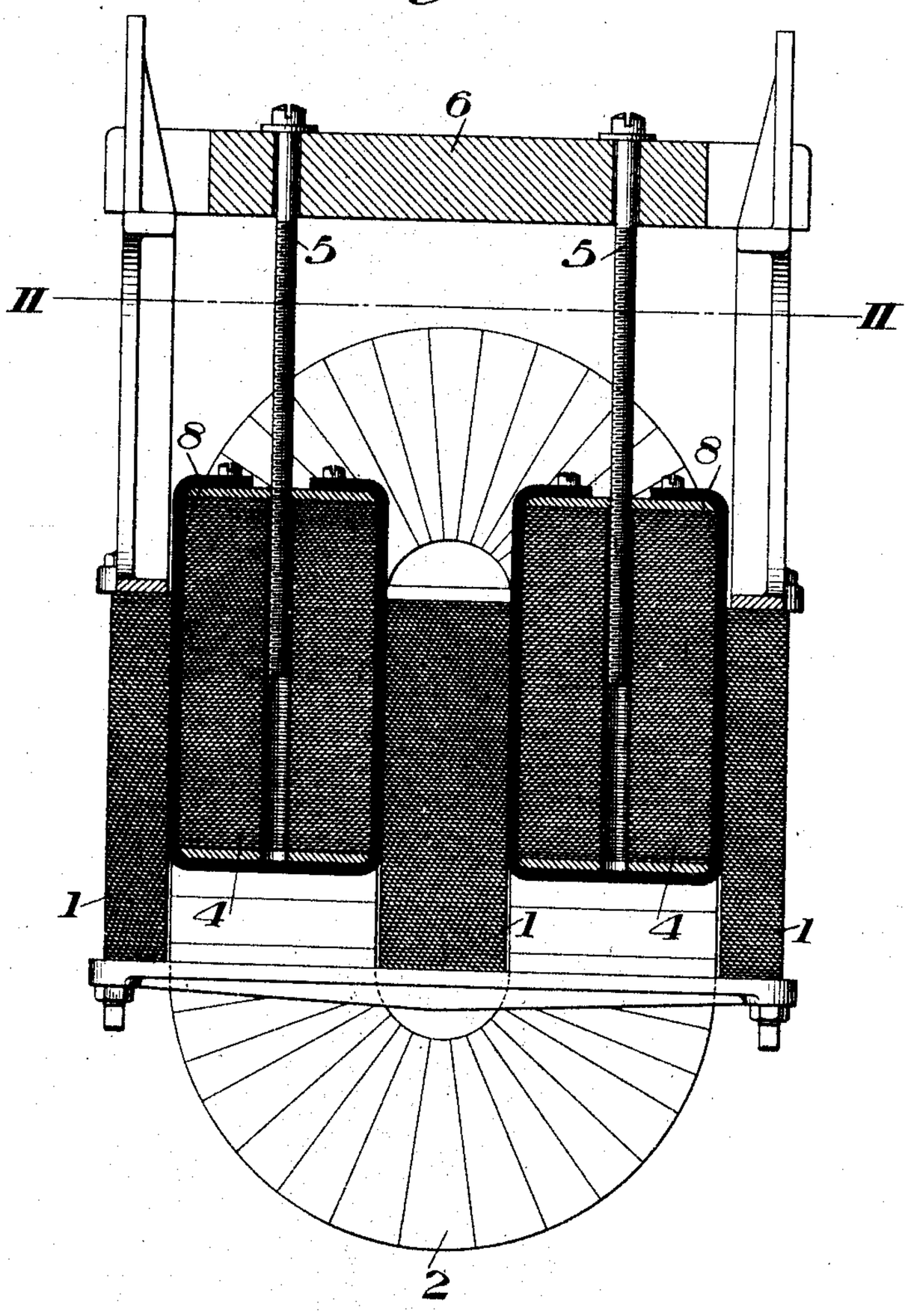
J. D. TAYLOR.

BLOCK SIGNALING APPARATUS.

APPLICATION FILED AUG. 24, 1907.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2.

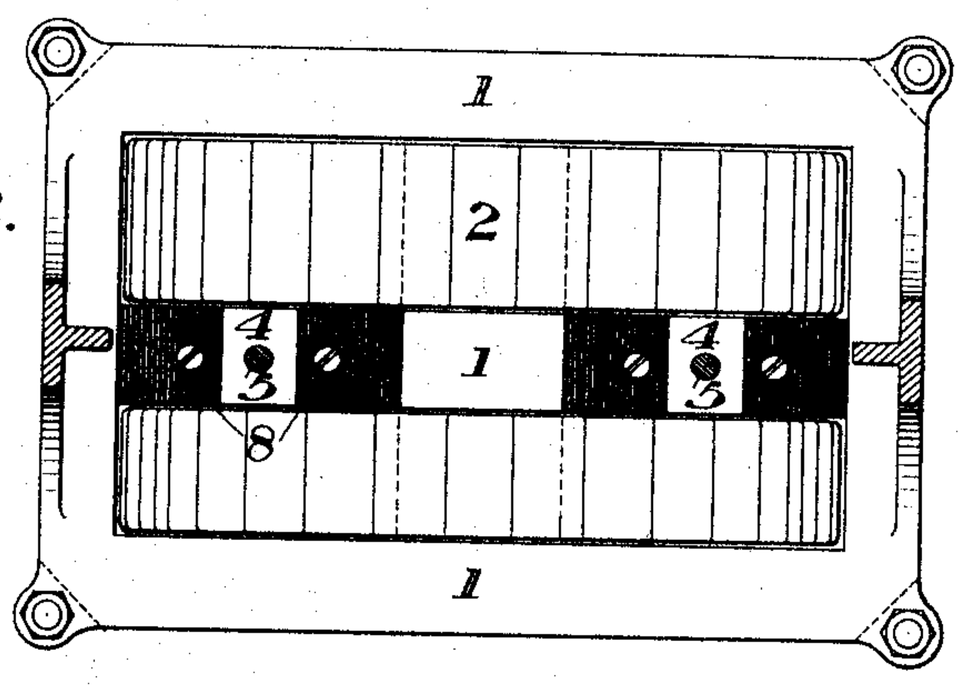
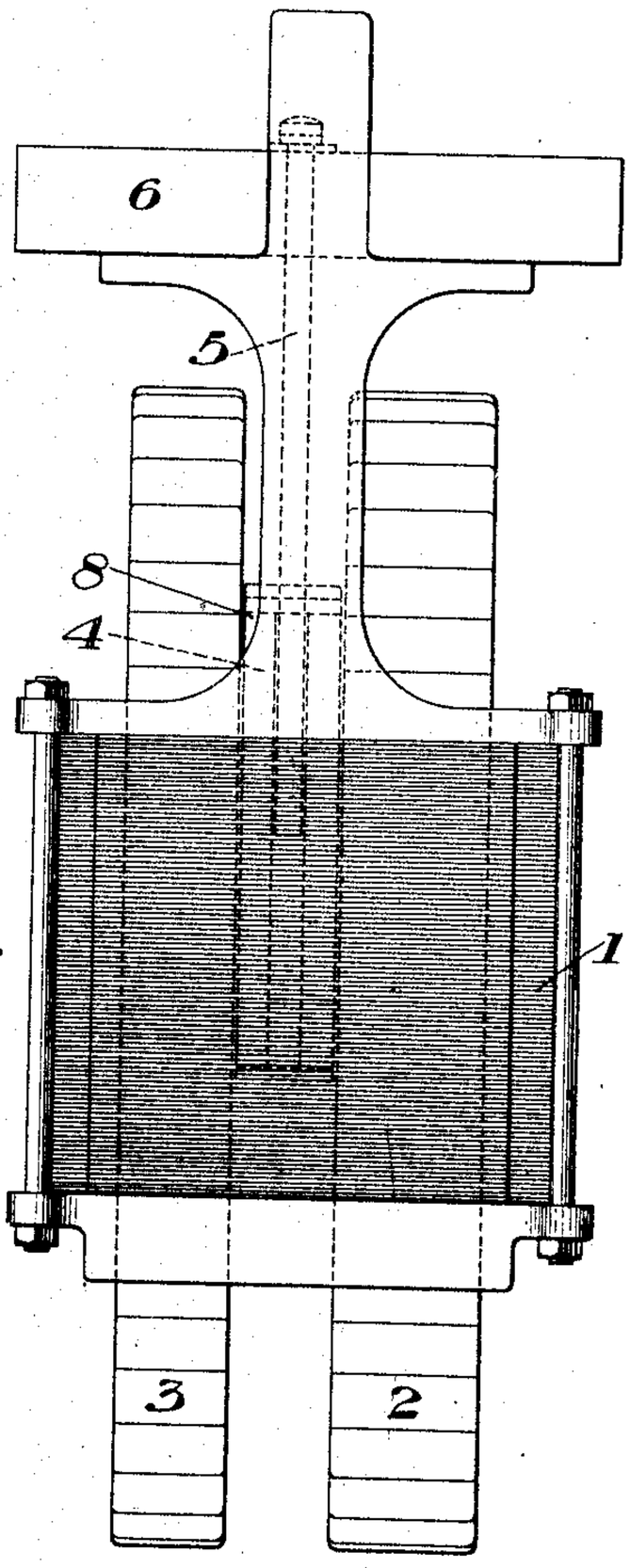


Fig. 3.



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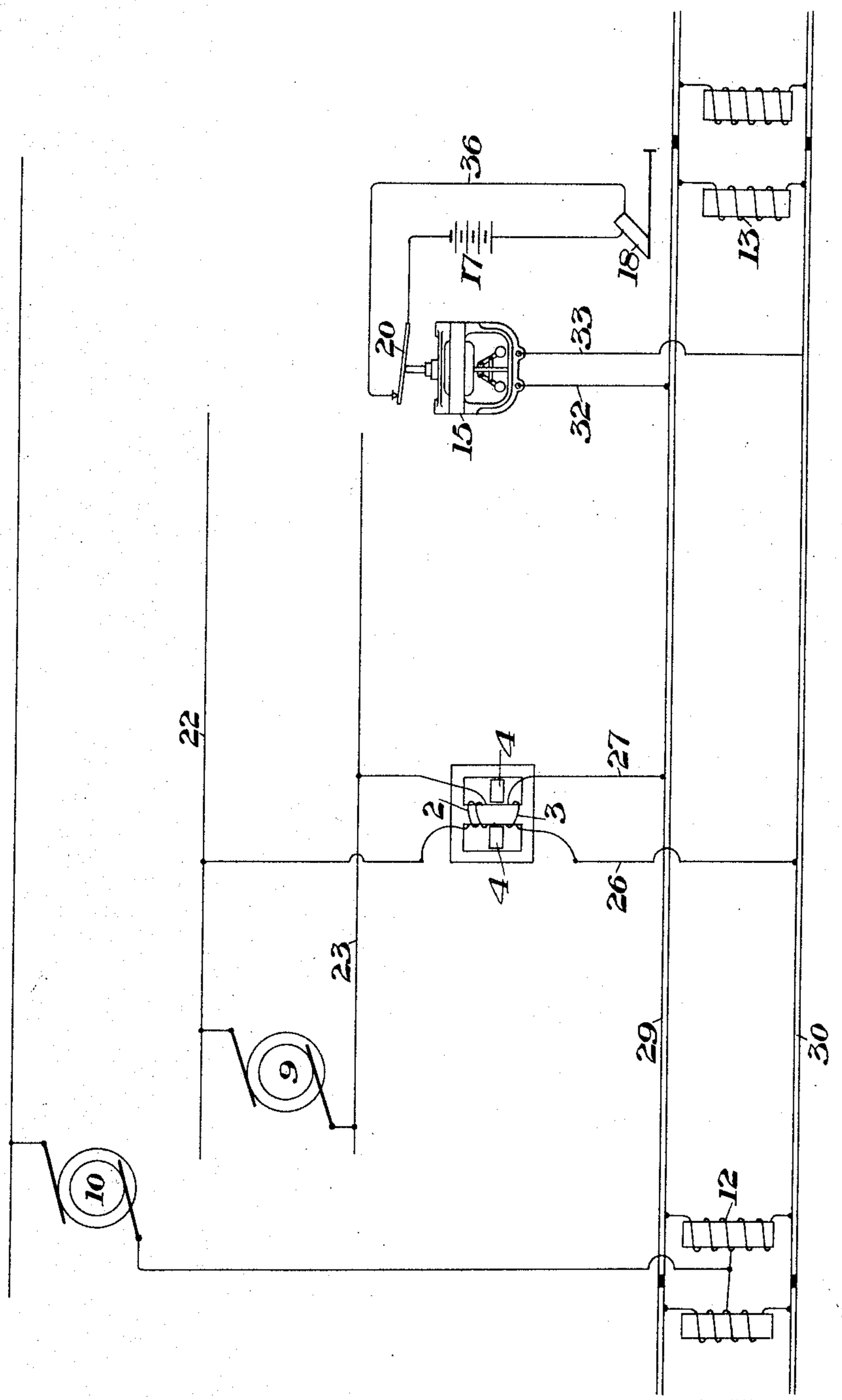
3 SHEETS—SHEET 3.

Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN D. TAYLOR, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BLOCK-SIGNALING APPARATUS.

No. 874,042. Specification of Letters Patent. Patented Dec. 17, 1907.

Application filed August 24, 1907. Serial No. 389,981.

To all whom it may concern:

Be it known that I, JOHN D. TAYLOR, of Edgewood Park, Allegheny county, Pennsylvania, have invented a new and useful Block-Signaling Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of the transformer used in connection with my invention; Fig. 2 is a horizontal section on the line II—II of Fig. 1; Fig. 3 is an end elevation; and Fig. 4 is a diagrammatic view illustrating the use of my improved transformer in a block signaling system, using alternating current electricity for propulsion purposes.

The object of my invention is to provide block signaling apparatus having a transformer especially designed for supplying alternating current to the track circuit of the system in a quantity to suit the requirements of the particular track section with which it is connected.

Heretofore it has been the practice to design transformers for this purpose without any capability for adjustment, and having a capacity greater than that required by the longest track section under the worst conditions, and to adapt such transformer to other track sections by means of external resistance inserted in the circuit between the transformer and the track. This, of course, results in a great waste of power, and causes a very large flow of current when the transformer is short-circuited by a train, making it more difficult to shunt the relay which controls the signals.

My invention provides a system having a transformer so constructed that it may be adjusted to regulate the current and voltage to suit any length or condition of track circuit.

The precise nature of my invention will be best understood by reference to the accompanying drawings, in which I have shown one embodiment thereof, it being premised, however, that various changes may be made therein without departing from my invention as defined in the claims.

In these drawings, 1 is the core of a transformer which is built up of superimposed laminations of thin sheet iron, in the usual manner.

2 is the primary coil, and 3 the secondary coil of the transformer. The central portion of the core 1 between the two coils is cut away to form pockets or openings for the two adjustable fillers 4, which are also composed of thin laminations of sheet iron, and which are adjustably suspended within the pockets or slots in the core 1 by means of the vertically movable screws 5 supported by the top plate 6 of the transformer frame.

The fillers 4 are sufficiently long to almost fill the spaces in the core 1, and thereby form an almost complete magnetic path between the primary and secondary coils. Small air-gaps are, however, provided between the fillers and the core of the transformer, which are occupied by strips 8 of fiber or other non-magnetic material, for preventing actual contact of the fillers with the core. These air-gaps are provided for the purpose of preventing the complete short-circuiting of the magnetic flux produced by one coil which would entirely prevent its passing through the other coil. The air-gaps cause sufficient drop in magnetic potential from one branch of the core to the other across the fillers, so that enough of the flux produced by the primary coil will be forced through the secondary coil to give the desired electro-motive force in the latter. Since the drop of magnetic potential is proportional to the reluctance of the path, and since the reluctance of an air gap is proportional to its length, and inversely proportional to its area, it will be readily seen that the magnetic potential across the shunt path formed by the fillers 4 can be varied at will by raising or lowering the fillers to thus decrease or increase the area of the air gaps between them and the transformer core.

When a current is sent through the primary coil 2, the core 1 is magnetized, part of the magnetic flux going through the fillers 4 and this encircling only the primary coil, while another part of it, due to the reluctance of the air gaps, passes through the secondary coil. If a current is drawn from the secondary coil, it tends to produce a flux counter to that produced by the primary coil, and re-

sults in decreasing the flux through the secondary coil and increasing that through the fillers 4. It will thus be seen that as the current in the secondary coil increases, the amount of flux through it, and therefore the electro-motive force induced in it, rapidly decreases. When the fillers 4 are fully inserted into the spaces in the core 1, the current that it is possible to draw from the secondary coil will be at a minimum. When the transformer is connected to any given track section, the fillers will be withdrawn until a point is reached where the amount of current taken from the secondary coil is sufficient to operate the relay at the other end of the section or block. If the section or block is long a greater electro-motive force will be required to overcome the resistance of the rails, and the fillers will therefore be required to be withdrawn to a greater extent than is necessary with a short section or block, in order to allow a greater amount of magnetic flux to pass through the secondary coil and thus raise the electro-motive force to the extent required by the long section.

Fig. 4 represents a system of circuits for a track section or block on a road using an electric current for propelling trains. The alternator 10 supplies currents to the rails 29 and 30 through a reactance bond 12. A similar bond 13 is connected across the rails at the other end of the block. The secondary coil 3 of the transformer is connected across the rails 29 and 30 near one end of the block by the conductors 26 and 27, the primary coils being connected across the conductors 22 and 23, supplied by an alternator 9. 15 designates a relay of any suitable character, which governs the signal 18 near the opposite end of the block. 32 and 33 are the conductors which connect the relay in the track circuit. 36 is the circuit for the signal 18 supplied by battery 17, and 20 is a circuit-controlling device operated by the relay to control the circuit 36.

When alternating current is used for propelling purposes the current supplied to the primary coil 2 of the transformer by the generator 9 should be of higher frequency than that supplied by the generator 10, so that the relay 15 may be made to operate only by the current supplied by the secondary coil 3 of the transformer; or the relay 15 must be of such character as to operate only by the current supplied by the transformer.

The advantages of my invention result from the provision of means for adjusting the transformer to suit the conditions of the particular track-sections to which it is connected; from the great saving of power required in the primary circuit supplying it; and from the completeness with which the relay is shunted out by the presence of a train in the block. The amount of power required by this transformer is only about one-third that required by the transformers heretofore used. The relay is much more easily and completely shunted out of the circuit by the train in the block by this transformer by reason of the fact that when the transformer is short-circuited by the wheels and axles of a train, the current is very little greater than the normal working current when the block is unoccupied, due to the fact that the voltage drops to almost zero when the transformer is short-circuited.

I do not desire to limit myself to the use of the transformer in the particular signaling system described, since it may obviously be used in other systems.

What I claim is:—

1. In a signaling system, a transformer having primary and secondary coils, a shunt magnetic path between said coils, and means for varying the reluctance of said magnetic path between the coils; substantially as described.

2. In a signaling system, a transformer having primary and secondary coils, and adjustable fillers forming a shunt magnetic path between said coils; substantially as described.

3. In a signal system, a transformer, primary and secondary coils connected respectively to the line and track circuits, a core therefor having a member extending between the coils, said member having portions which can be adjusted to vary the magnetic circuit thereof; substantially as described.

4. In a signaling system, a transformer, primary and secondary coils connected respectively to the line and track circuits, a core having a portion between said coils, said portion having adjustable fillers forming a shunt path for the magnetic potential through the core; substantially as described.

5. In a signaling system, a transformer, primary and secondary coils connected respectively to the line and track circuits, a core having a portion extending between said coils and formed with pockets or spaces therein, and fillers of magnetic material adjustably seated in said pockets or spaces and separated therefrom by air-gaps; substantially as described.

6. In a signaling system, a transformer having a core portion extending between its primary and secondary coils, said core portion having air-gaps or spaces therein, and means for varying said gaps or spaces; substantially as described.

7. In a signaling system, a normally closed track circuit, a relay connected across said circuit and controlling a signal, and a transformer supplying the track-circuit and hav-

ing an adjustable core portion for regulating the voltage and current supplied thereby; substantially as described.

8. In a block signaling system, a transformer for supplying the track-circuit, said transformer having a shunt magnetic path between its coils, and means for varying the reluctance of said path, whereby the voltage and current supplied thereby can be regulated to suit the length or condition of the particular track-circuit; substantially as described.

In testimony whereof, I have hereunto set my hand.

JOHN D. TAYLOR.

Witnesses:

GEO. B. BLEMING,

GEO. H. PARMELEE.