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F. TOWNSEND.

SYSTEM OF AUTOMATIC SIGNALING FOR ELECTRIC RAILWAYS.

APPLICATION FILED AUG. 1, 1905.

FIG. 1.

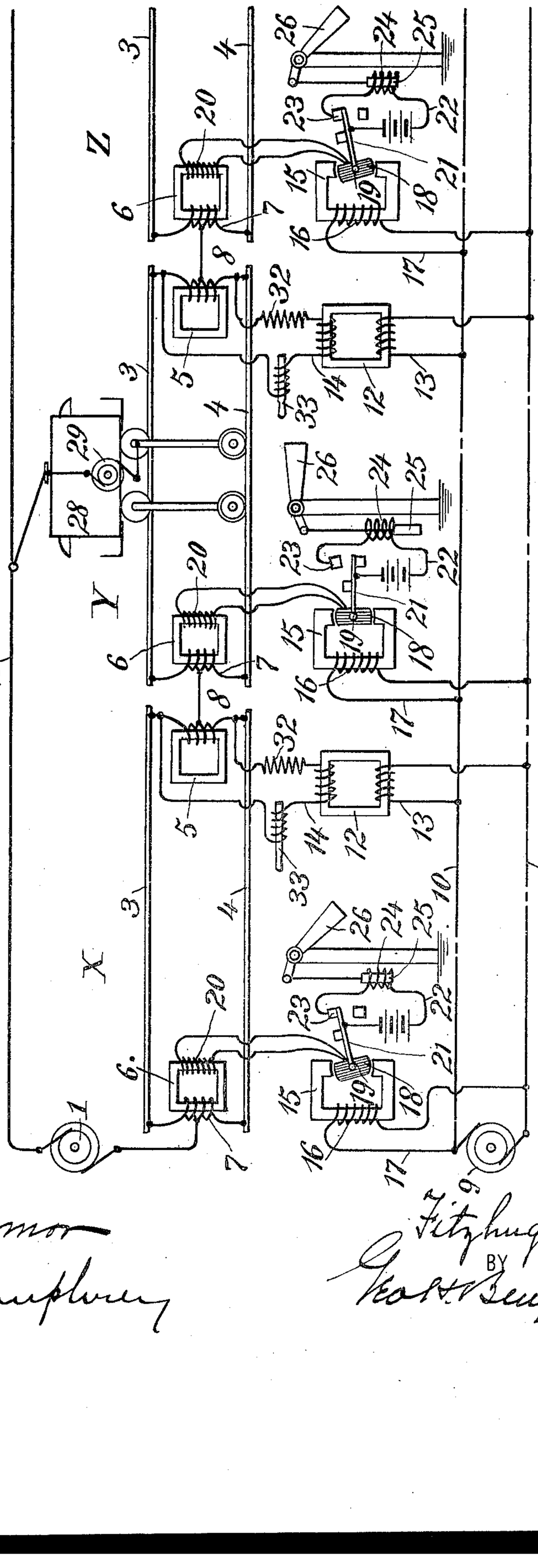
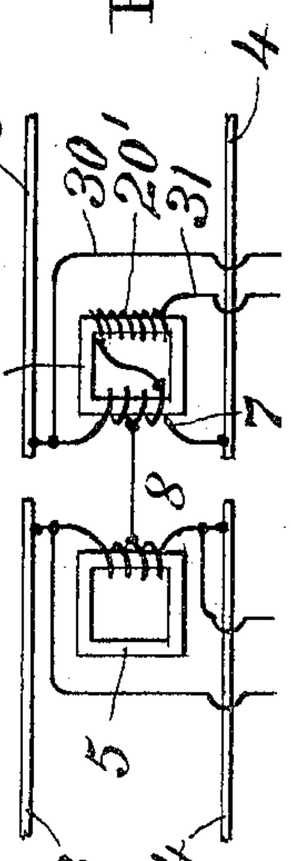


FIG. 2.



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SYSTEM OF AUTOMATIC SIGNALING FOR ELECTRIC RAILWAYS.

No. 804,176. Specification of Letters Patent. Patented Nov. 7, 1905.

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To all whom it may concern:

Be it known that I, FITZHUGH TOWNSEND, a citizen of the United States, residing at New York city, county and State of New York, have invented a System of Automatic Signaling for Electric Railways, of which the following is a specification.

My invention is applicable to automatic block-signaling systems for electric railways where the track-rails are divided into blocks and connected by reactance-bonds to freely permit the passage of the power-current, but to prevent the passage of the signaling-current from block to block.

My invention, broadly stated, consists in employing means in each block-section which will increase the voltage of the current sent through the signal-controlling relays above that maintained by the source of signaling-current across the terminals of the bond at the receiving end of the block.

It is important in the operation of block-signaling systems of the type described to employ a low signaling voltage between the track-rails, both at the receiving end of the block where the signaling-current is fed into the block and at the delivery end of the block where the signaling-current is fed to the controlling-relay, as the blocks may be made longer, much smaller reactance-bonds than is usual employed, and the leakage of current through the ties and ground diminished. It is also important to insure positive action of the controlling-relay to employ as high a voltage as possible through one member of the controlling-relay, as the moving torque of the movable member is proportional to the voltage.

To effect the increase in voltage necessary to obtain the best results, I provide means in each block for stepping up the voltage applied to the controlling-relay. This can be conveniently accomplished by providing the reactance-bond at the delivery end of a block with a second coil and connecting this coil to the moving member of the controlling-relay, the reactance-bond in such case serving the purpose of a bond and of a step-up transformer. I wish it understood, however, that I do not limit myself to the specific means shown for stepping-up the voltage sent through the controlling-relay, as other well known means may be employed for that purpose.

The accompanying diagram will serve to illustrate my invention.

Figure 1 is a diagram of the system as a whole, and Fig. 2 shows a modified form of a step-up cross-bond.

In the diagram, 1 indicates a source of power-current which may be either a direct or alternating current; 2, a contact-conductor leading therefrom; 3 4, traffic-rails which are shown as divided into three blocks X Y Z by insulating the ends of the respective rails.

In order to provide that the rails 3 4 shall both serve as returns for the power-current to the source of energy 1, there is located at each end of a block a reactance-bond 5. Each bond consists of a magnetic core 6, around which is wound a coil 7, connected across the traffic-rails 3 4. In order that these coils 7 shall not magnetize the core 6, the coil 7 at the left of block X is connected to the source of power-current at its middle point and the coils 7 of adjacent blocks—as, for instance, X Y—at their middle point through a conductor 8.

9 indicates a source of signaling-current, which is an alternating current. In cases where the power-current is also an alternating current the power and signaling-currents should differ in phase.

10 11 are conductors connected to the source of signaling-current.

12 indicates transformers having their primaries 13 connected across the conductors 10 11 and their secondaries 14 connected across the traffic-rails 3 4 of the respective blocks.

15 indicates the controlling-relays, each of which consists of a core 16, having its field-coil 17 connected across the conductors 10 11, and an armature or movable member 18, having its coil 19 connected across the coil 20, wound on the core 6 of the reactance-bond 5, as shown in Fig. 1.

Another method of obtaining the result is shown in Fig. 2, where the coil 19 has one of its terminals 30 connected to the traffic-rail 3, while the other terminal 31 of the coil 19 is connected to one terminal of the coil 20′, the other terminal of which is connected to the rail 4. The result of this manner of connecting the coil 20′ is that its electromotive force is added to that existing across the terminal of the coil 7, thereby increasing the ratio of transformation.

32 is a non-inductive resistance, and 33 is an inductive resistance, both of which are connected in series with the secondary 14 of the transformer 12. The object of these elements is to adjust the phase of the currents supplied to the traffic-rails. It is obvious, of course, that this result may be attained in a variety of well-known ways and the amount by which it is necessary to displace the phase may be different, depending upon the length of the block-section, the resistance of the rails, and other circumstances.

21 indicates an arm mounted on movable member 18 of the controlling-relay 15, connected at one end to a local circuit 22 and adapted to make contact with a block 23, connected to the other end of the local circuit.

24 indicates a solenoid in the local circuit 22, and 25 a movable core therefor connected to the short arm of a semaphore-signal 26.

28 indicates a motor-car, on which is a motor 29.

The operation of my improved system is as follows: The power-current flows out through conductor 2, thence through motor 29 to the wheels of a car, thence through the rails 3 4 and reactance-bonds 5, back to the source of power-current. It will be observed that the power-current transmitted through rails 3 4 will flow in opposite direction through the halves of the coils 7 on core 6 of the reactance-bonds 5, and hence no magnetization of the cores will result. The signaling-current flows through the primaries 13 of the transformers 12 and the current from the secondaries of such transformers through the whole length of the coils 7 on reactance-bonds 5. The coils 7 therefore serve as primary coils, while the coils 20, which are of finer wire or have more turns, act as secondary coils and deliver a current to the controlling-relays of higher voltage than that existing between the traffic-rails. It is plain that raising the voltage of the relay-terminal is not the only funtion performed by the secondary winding 20; also, in the case of Fig. 1 it will be seen that direct current is completely prevented from traversing the armature-coil 19. Under normal conditions—that is, when no car is on a block, as indicated in blocks X and Z—the current from the coils 20 being synchronous and in phase with that traversing the field-coils 17 of the relays produces a turning movement of the members 18, thereby causing each arm 21 to make contact with a block 23, and thus close a local circuit through a solenoid 24, which attracts its core 25 and lifts a semaphore 26 to clear position. When a car moves into a block, its wheels short-circuit the secondary 14 of the transformers 12, as also the coil 19 of the controlling-relay. At such times the member 18 of the relay automatically moves to the position shown in block Y, the local circuit 22 is broken, and the semaphore-arm 26, by reason of the weight of the core 25, moves to the danger position, where it remains so long as a car is in the block Y.

Having thus described my invention, I claim—

1. In a block-signaling system, transforming means in each block adapted to increase the voltage of the current sent through the signal-controlling relays above that sent to the blocks from the source of signaling-current.

2. In a block-signaling system, the combination with the rails of a block, means for exciting an alternating difference of potential between the rails, means for increasing said difference of potential, and a controlling-relay adapted to have one member fed from the current with such increased difference of potential.

3. In a block-signaling system, the combination with the rails of a block, a source of alternating signaling-current, a transformer fed therefrom and having its secondary connected across the rails, a second transformer having its primary connected across the rails, and a relay having one member connected across the secondary of the second transformer and its other member across the source of signaling-current.

4. An automatic block-signaling system for electric railways, comprising a source of power-current, a source of signaling-current, a trackway divided into blocks, reactance-bonds located between the blocks, a signaling device in each block, and means interposed between the trackway and the signaling device for stepping up the voltage of the current delivered to the signaling device above that delivered to the trackway.

5. In an automatic system of block-signaling, a reactance-bond having a coil thereon adapted to step-up the alternating voltage delivered to said bond.

6. In an automatic system of block-signaling, a reactance-bond comprising a core having two coils, one connected across the rails of a block and the other across the terminals of the movable member of a signal-controlling relay.

7. In an automatic block-signaling system and in combination with a closed track-circuit including a source of alternating-current energy and a relay, means for stepping up the voltage of the current from the source of energy before it is delivered to the relay.

8. As a means for stepping up the voltage of the signaling-current at the end of the block opposite to where received, a reactance-transformer bond having one coil across the rails and a step-up coil across the signal-controlling relay.

9. In an automatic block-signaling system, a reactance-bond in each block, comprising a core, a coil thereon adapted to be connected

across the track-rails, and at its center to the center of the coil on an adjacent bond, and a step-up coil adapted to be connected across the terminals of a signal-controlling relay.

10. In an automatic system of block-signaling, means connected to one end of the block for creating an alternating difference of potential between the rails, means at the other end of the block for stepping up such alternating difference of potential, and a signal-controlling relay connected across said rails.

11. In an automatic system of block-signaling, means at one end of the block for creating an alternating difference of potential between the rails, a reactance-bond at both ends of the block, one of said bonds provided with a step-up coil and a closed magnetic core, and a signal-controlling device connected across said step-up coil.

12. In an automatic system of block-signaling, comprising traffic-rails divided into blocks, means in each block for exciting an alternating difference of potential between the rails, said difference of potential being higher at the delivery or signal end than at the receiving end of the block, and a signal-controlling device connected across the rails of the block.

13. An automatic system of block-signaling, involving the employment of means in each block for altering the potential of the signaling-current fed to the block prior to its delivery to the signaling apparatus.

14. In an automatic block-signaling system, a reactance-bond in each block comprising a core, a bonding-coil thereon adapted to be connected across the track-rails and at its center to the center of the coil on an adjacent bond, and a secondary coil, one terminal of which is connected to a terminal of the bonding-coil, while its other terminal is connected to one terminal of a track-relay in such a way that the track-relay is supplied with a greater voltage than that existing across the terminals of the bonding-coil.

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

FITZHUGH TOWNSEND.

Witnesses:
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