

Feb. 19, 1929.

R. H. EWING ET AL
SIGNAL CONTROL APPARATUS

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4 Sheets-Sheet 1

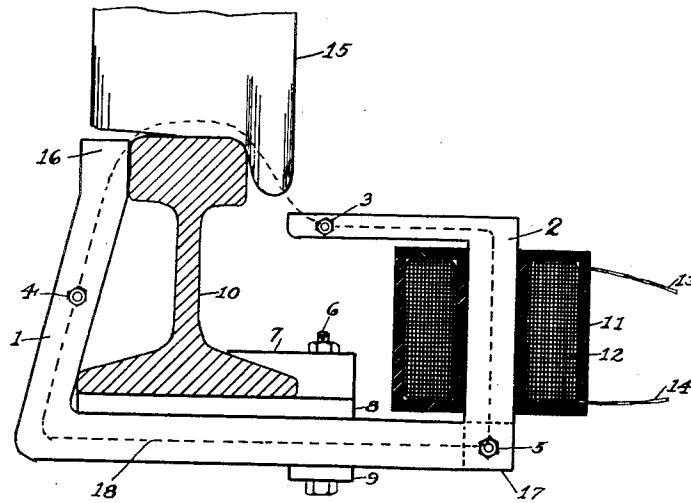


Fig. 1.

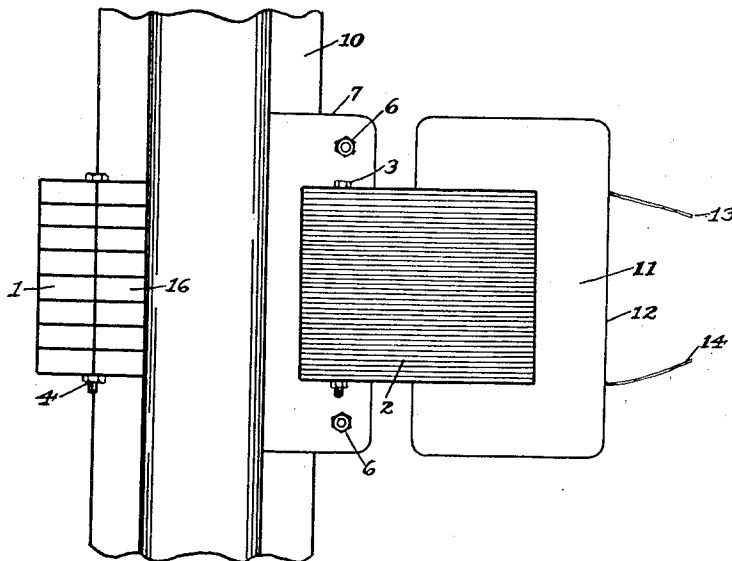


Fig. 2.

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4 Sheets-Sheet 2

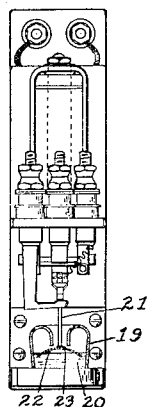


Fig. 3.

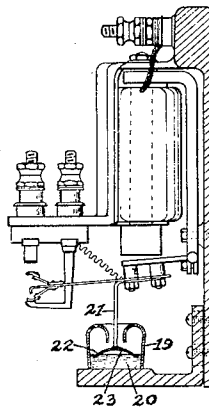


Fig. 4.

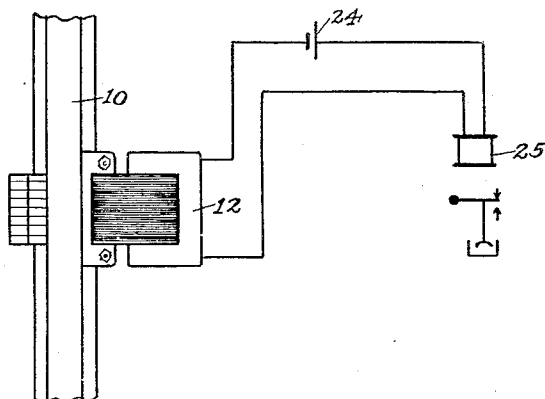


Fig. 5.

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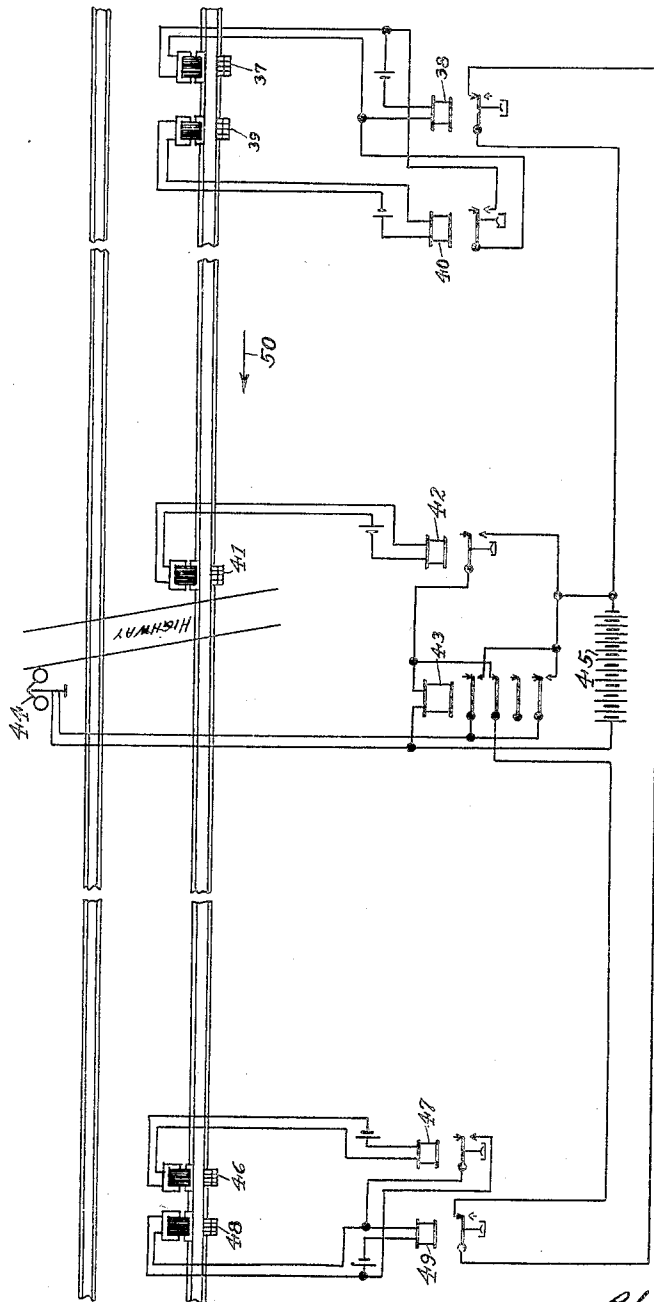
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

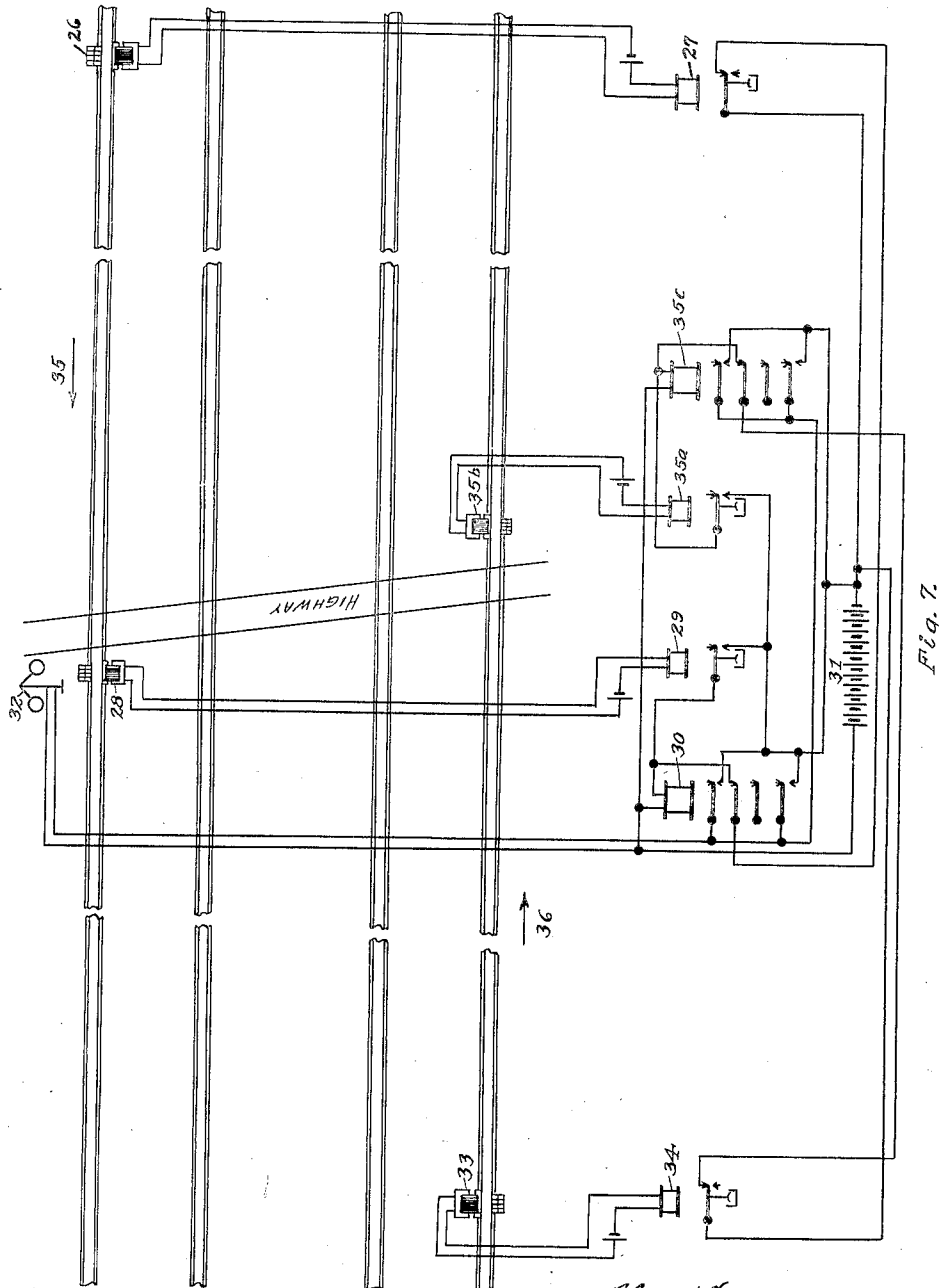


Fig. 7.

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SIGNAL-CONTROL APPARATUS.

Application filed February 23, 1928. Serial No. 256,395.

This invention relates to a control system for signals on railways employing single or multiple tracks, and more particularly to apparatus for converting the influences of moving railway vehicles upon a trackway device, without physical contact with the apparatus, to operate signals.

The systems of automatic signals, and train control devices now used on railroads employ track circuits as a continuous controlling medium and it is often undesirable to break the continuity of these circuits to obtain an indication from train movements for the purpose of operating signals such as highway crossing signals, annunciators and the like.

The object of this invention is to provide a signal system so designed that it shall operate independently of any other signal system or in any way interfere with the operation of such signal systems usually employed with railways.

Another object of this invention is to provide an electric signal system employing a closed circuit in which a signal device connected therein shall be actuated by electrical influences caused by the passage of a railway vehicle.

A further object of the invention is to provide apparatus of the character designated in which the operative mechanism shall be stationary and located in close proximity to the track right of way.

A further object of this invention is to provide apparatus of the character designated in which a constantly energized railway track device is adapted to provide an air gap and means for changing the magnetic force in the track device whereby a variation of the magnetic reluctance of the air gap causes a cycle of induced electro-motive-force in the circuit controlling the signal devices.

Another object of this invention is to provide apparatus of the character designated which shall take care of clearances of railway vehicles, parts of which, such as the tread of the wheel, wear, and therefore change in dimensions causing a variation of such clearances which must be duly taken care of, as well as the proper clearance between wheel flanges and gauge of the rails due to variation on curved tracks.

Another object of the invention is to pro-

vide a signal controlling device which shall be located on the fixed right of way near the railway rail, so that the passage of a vehicle shall influence the same and cause the desired operation of the signal. This object is accomplished by connecting a battery in series with a coil on the track device and a relay for operating the signal. These are connected in a constantly energized closed circuit and when a vehicle passes the track device there is induced in the circuit a cycle of A. C. current which opposes the constant battery current during a portion of the cycle and this diminution of current causes the actuation of the relay which initiates the operation of the signal.

Another object of the invention is to so arrange the signaling controlling devices that directional operation of the signaling control apparatus shall be secured.

These and other objects will be more manifest from the following specification and drawings and specifically set forth in the claims.

In the drawings:

Figure 1 is a sectional view of a rail device;

Figure 2 is a top view of the rail device shown in Figure 1;

Figure 3 is a front view of a relay with a device for securing a slow attraction of the armature;

Figure 4 is the side view of the relay shown in Figure 3;

Figure 5 is a diagrammatic view of a control circuit;

Figure 6 is a diagrammatic view of the application of this invention to a single track railway which is used for traffic in both directions;

Figure 7 is a diagrammatic view of the application of this invention to a multiple track railway where movements on each track are in but one direction.

Similar reference numerals represent similar parts in the different views.

Referring the drawings, there is shown in Figure 1 apparatus constructed in accordance with this invention in which a group of permanent magnets 1 are held together by bolts 4. These magnets are connected to a laminated soft iron core 2 by a bolt 5 at one end, said laminations being held together by a

bolt 3 at the other end. These parts are attached to a railway rail 10 by a clamp 7 having plates 8 and 9 secured by bolts 6. Around the laminated core is mounted a coil of insulated magnet wire 12 with terminals 13 and 14, housed in a weather-proof covering 11. A portion of the railway vehicle wheel 15 is shown on rail 10 directly over rail device.

10 The relay shown in Figure 3 and Figure 4 may be of any suitable type in which the pick up action is retarded. As shown, this action is accomplished by providing a chamber 19 partly filled with mercury 20 in which is inserted a metallic segment of a sphere 22 with a vent hole 23 in same. The segment is supported by a rod 21 attached to the armature of the the relay.

Referring to Figure 5, the normal condition of the device is as follows: Battery 24 energizes relay 25 in series with winding 12 of the rail device, the system operating on a closed circuit principle. When the wheel 15 of a railway vehicle is moving on rail 10 over the rail device the functioning of the device is as follows: The metallic mass of the flange and tread of the wheel passing through the air gap of a magnetic circuit indicated by the dotted line 18, causes the magnetic reluctance of this circuit to decrease and increase, thereby causing the magnetic flux in the laminated soft iron core 2 to vary accordingly and inducing a cycle of current in coil 12. The current thus induced flows through the coil of the relay 25, one-half of the cycle of the current opposing the direction of flow of the battery current and thereby weakening the flow of current through the relay coil. The relay armature is then released and contacts supported thereby are opened. The reattraction of the armature is then retarded by the retarding device, which prevents the armature from being lifted from the lower contact and thereby preventing the chattering of relay to take place when the following wheels of a moving railway vehicle cause half cycle impulses while passing the track device.

In Figure 7 four rail devices and relays, of the character described in a preceding paragraph, are shown arranged in a manner to control the operation of a highway crossing signal on a double track railway as follows: A railway vehicle moving in the direction of arrow 35 causes rail device 26 and relay 27 connected in circuit therewith to function and cause stick relay 30 to operate and start the operation of highway crossing signal 32 connected in circuit therewith and energized by battery 31. This signal thus given continues to operate until the railway vehicle passes over rail device 28 at the highway crossing, thereby causing relay 29 to function and restore stick relay 30. This action opens the operating circuit of the signal and causes the signal to cease to indicate.

The movement of vehicles on the other track in the direction indicated by the arrow 36 operates the signals in a similar manner.

In Figure 6 five rail devices and relays of the character designated are shown in a manner to control the operation of a highway crossing signal on a single track railway so that the signal shall operate only when the railway vehicle is approaching a highway crossing. A railway vehicle moving in the direction indicated by arrow 50 causes rail device 37 and relay 38 to be energized and drop stick relay 43 thereby starting operation of highway crossing signal 44 which is energized by a battery 45 connected in circuit therewith. The railway vehicle in passing over rail device 39 causes relay 40 to function but same has no effect on the operation of the highway crossing signal as the stick relay 43 cannot be energized until released by device 41. The railway vehicle in passing over rail device 41 at the highway crossing causes relay 42 to operate and thereby energizing stick relay 43 which discontinues the operation of the highway crossing signal. The railway vehicle in passing over rail device 46 causes relay 47 to operate and thus causing a short circuit on rail device 48 and thereby preventing the latter device from operating relay 49 and opening the signal control circuit. In this manner the directional effect is secured and operation of the signal only occurs when a vehicle approaches the highway. When a movement of a vehicle is in the opposite direction from that of arrow 50, the sequence of relay operation is reversed and the same desired operation of the signal obtained.

While there have been shown and described signal systems embodying applications of the invention as applied to railways, it is obvious that various modifications may be made therein without departing from the scope of the invention as set forth in the claims.

We claim:

1. In an electric signal system, a railway track device including means for forming a magnetic circuit provided with an air gap, means for connecting a portion of said track device in a constantly energized electric circuit, whereby the passage of a vehicle causes a variation of the magnetic reluctance of the air gap and produces a cycle of induced E. M. F. in said circuit, a trackway signalling device associated with said circuit and set in continuous operation by one-half of said cycle, and a second track device and circuit associated with said signalling device to stop the operation thereof when said vehicle passes said second track device.

2. In an electric signal system, a railway track device including means for forming a magnetic circuit provided with an air gap, means for connecting a portion of said track device in a constantly energized electric circuit, whereby the passage of a vehicle causes

a variation of the magnetic reluctance of the air gap and produces a cycle of induced E. M. F. in said circuit, a trackway signalling device associated with said circuit and set 5 in continuous operation by one-half of said cycle, means for rendering ineffective the other half of said cycle, and a second track device and circuit associated with said signalling device to stop the operation thereof when said vehicle passes said second track 10 device.

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