June 24, 1930. W. F. CLEAVER 1,768,524

TRACK SIGNALING DEVICE

Filed April 8, 1929

Fig-1.

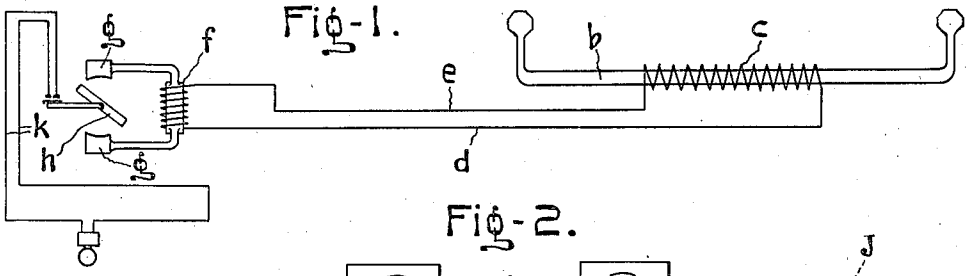


Fig-2.

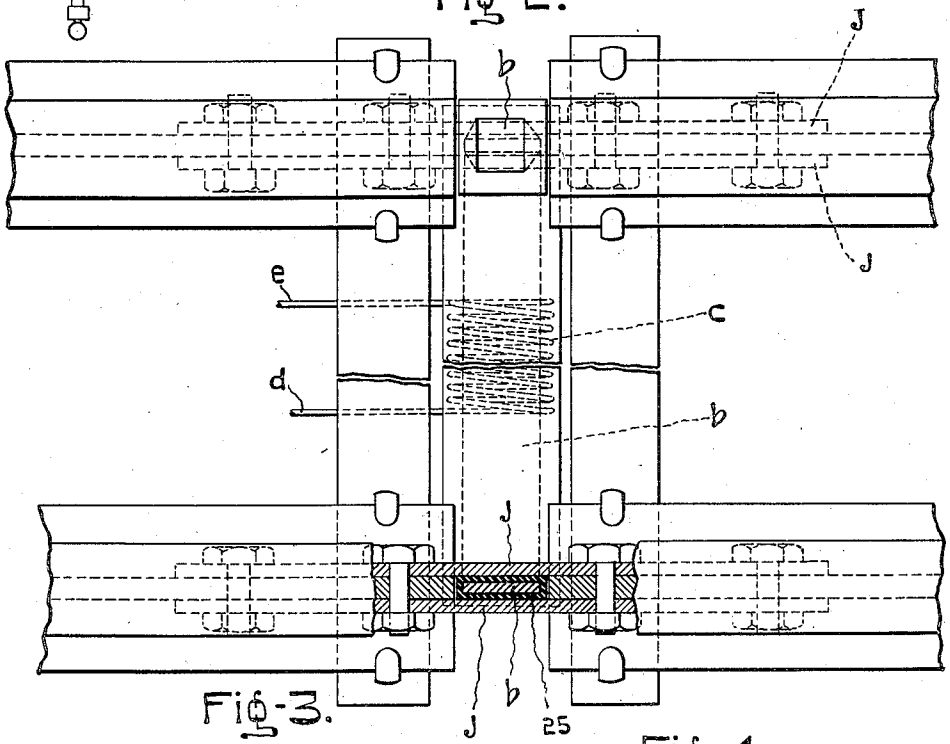


Fig-3.

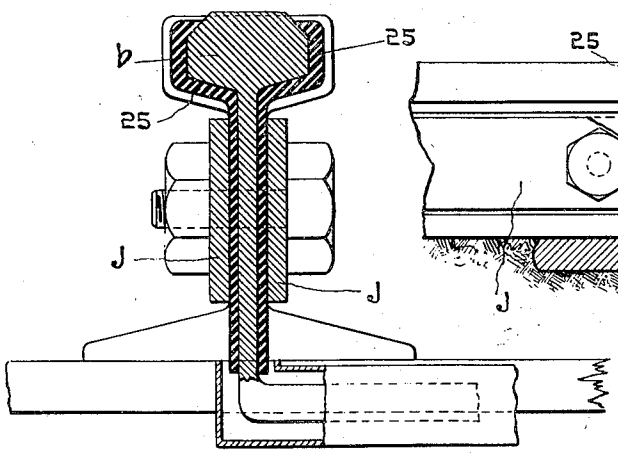
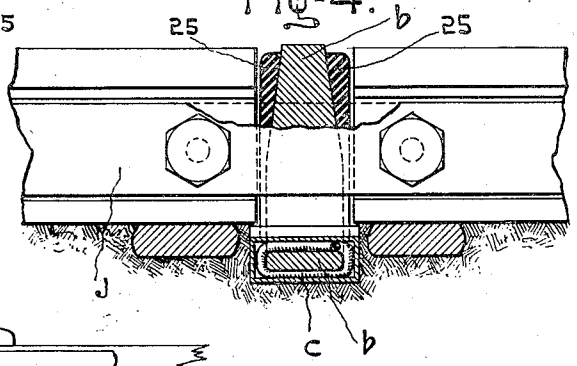


Fig-4.



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UNITED STATES PATENT OFFICE

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TRACK SIGNALING DEVICE

Application filed April 8, 1929. Serial No. 353,573.

My invention relates particularly to the transmission of magnetic impulses for signaling and other purposes. More specifically stated my invention consists of a permanent magnet bar wound with a coil of insulated wire.

The invention consists briefly of a permanently magnetized bar uniting the rails of a track, such rails being preferably divided, and the ends of the bar are situated between the separated ends of the divided rails and magnetically insulated therefrom by a jacket of insulating substance, bronze for instance. The bar is surrounded by a coil of insulated wire, the insulation being preferably such as is usually employed for telephone and other wires. The ends of the coil are connected to a magnetic device controlling a permanently magnetized armature pivoted between a pair of terminals which are included in a circuit to be operated to energize a device such as a signal, or to raise and lower railway gates or do anything else required in railway work.

The ends of the magnet bar are formed into pole pieces. These pole pieces are surrounded by a magnetic insulating material such as manganese bronze. In the circuit which forms part of the above mentioned coil, is placed the electric magnet of the signal relay. This relay is composed of a common soft iron horseshoe shaped electromagnet, between the poles of which is pivoted a small permanent magnet, which is held in a predetermined position under the tension of a spring.

When this small permanent magnet commences to oscillate through the influence of the surrounding electromagnetic field, it strikes against a flexible conductor, which forms part of a local battery circuit.

For full comprehension, however, of my invention reference must be had to the accompanying drawings in which similar reference characters indicate the same parts and wherein:

Figure 1 is a diagrammatic view of my improved track signaling device;

Figure 2 is a plan view partly in section of one of the rails of a track and illustrating particularly the connection of the permanent magnetic bar to the rail;

Figure 3 is a detail view of one end of the permanent magnetic bar which is connected to one of the rails; and

Figure 4 is an enlarged detail view of the rail through which the magnetic impulses of my signaling devices are transmitted to the mechanism to be operated by my improved track signaling device.

The disposition and working of the device is as follows: The permanent magnet bar, with a suitable pole piece at each extremity is placed at right angles to a railway track, with the said pole pieces placed between, but magnetically insulated from the ends of the rail by the above mentioned shroud of manganese bronze.

It is desirous, that the ends of the pole pieces come in actual contact with the wheels of the train. The working of the device is figured out according to the well known laws of magnetic induction.

When there is no train near the bar magnet, the influence of same on the coil of wire is nil, as the magnetism can be imagined to be in a state of perfect even tension without agitation, and in this state will not set up an E. M. F. in the coil, as there are no lines of force in motion, but upon the approach of a train, the above tension will be violently agitated, and in so doing will be forced to pass through the coil, thus causing a fluctuating E. M. F. to be generated in the coil; this may be considered as an alternating current, the one half of the cycle being formed by the wheels affecting, or coming in contact with the pole pieces of the magnet bar, and the second half cycle being formed by the recession or the passing of the wheels from contact with the pole pieces of the magnetic bar.

Thus the current passing through the electromagnetic member of the relay, will produce an oscillating magnetic field, which in turn will attract, and repel the small permanent magnet armature, and cause it to oscillate.

The main magnetized bar is indicated at *b*, the coil surrounding it at *c*, the conducting

wires at *d* and *e*. The magnet for operating the device is indicated at *f* and its terminals at *g*. The pivoted armature shown at *h* is permanently magnetized and is influenced by the magnetic impulses from the bar *b* when a piece of rolling stock such as a train or an individual locomotive passes over said bar.

The divided parts of the rail are united by fish plates *j* bolted or otherwise fastened to, and connecting rigidly together, the divided ends of each rail.

The ends of the bar *b* are reduced in section to concentrate the magnetic force. The ends are insulated as at 25 from the rail and fish plates by a non-magnetic substance, such as bronze for instance, non-magnetic steel or other non-magnetic metal. The magnetic impulses flow continually from one end of the bar *b* to the other without energizing the armature *h*. As soon as a train or locomotive crosses the rails a positive connection is established between the bar *b* and the magnet *f*, thus swinging the armature into line with the magnetic pole pieces *g*. The passage of a train over the permanent magnet *b*, causes the induction of one cycle of alternating current into the circuit of C, for each pair of wheels and axles presented, by said train, to *b*. Since *h* is permanently magnetized, it is obvious that *h* must oscillate, under the influence of the respective cycles of A. C., since the polarities of the respective half-cycles are, respectively, opposites. Hence armature *h* will oscillate towards, and away from, circuit closing position, respectively, and the bell, or other signal, will be activated intermittently, during the passage of the train over *b*. In this manner the circuit *k* is energized and operates the mechanism actuated by the current *k*.

The magnetic field flowing between the ends of the bar *b* is continuous until interrupted by the passing of a train or individual locomotive. Then the laws of magnetic induction come into effect and produce an electric current in the coil *c* which is transmitted to the magnet *f*, thus deflecting armature *h* and closing the local circuit *k*. In this manner the machanism actuated by the circuit *k* is operated.

What I claim is as follows:

1. A magnetic signaling system consisting of a permanent magnetic bar encircled by a coil embracing the middle portion thereof, in combination with the rails of a railway track, the said rails being divided and having the ends of the permanent magnetic bar connected thereto between the divided parts thereof, a magnetic device within the circuit of the coil around the bar, and means whereby the energizing of the magnetic device energizes a separate operating circuit.

2. A magnetic signaling system having a permanent magnetic bar, the ends of the permanent magnetic bar being reduced in bulk and surrounded by an insulating substance, the ends being embedded between divided ends of the rails.

3. A magnetic signaling system consisting of a permanent magnetic bar below the level of two rails of a track; a coil of wire encircling the bar; each rail being divided and receiving between the divided ends the opposite ends of the bar; means for insulating the ends of the bar from the divided rail ends by a separate insulating substance; a relay for operating a railway mechanism; an electrical connection between the coil encircling the magnetic bar and a coil within the relay; an angular bar within the coil in the relay and forming therewith an electro-magnet, the ends of the bar serving as pole pieces; an armature pivoted between the pole pieces; a circuit for operating a railway mechanism upon the armature being swung into line with the pole pieces.

4. A magnetic signaling system having a permanent magnetic bar, the ends of the permanent magnetic bar being reduced in area and supplemented by insulating substance such as bronze.

In testimony whereof I have signed my name to this specification.

WILLIAM FREDERICK CLEAVER.