July 14, 1931. A. BECQ 1,814,465

SIGNALING AND INDICATING APPARATUS

Filed Feb. 27, 1930

Fig. 1.

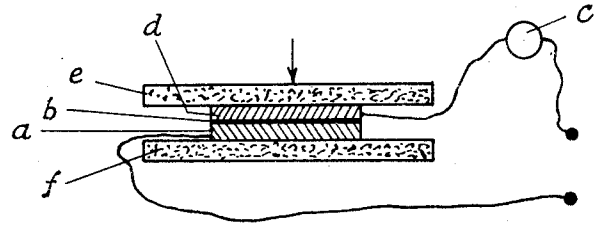


Fig. 2.

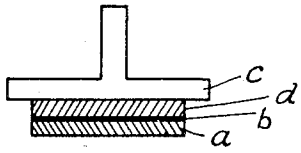
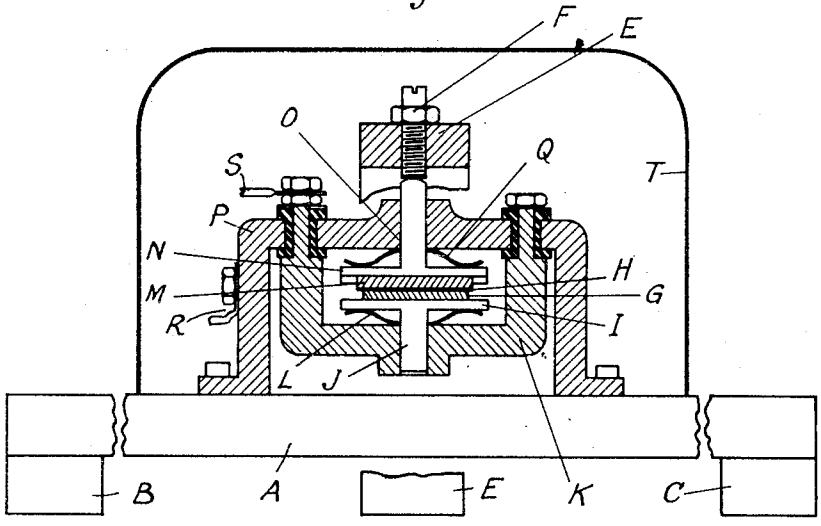


Fig. 3.



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UNITED STATES PATENT OFFICE

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SIGNALING AND INDICATING APPARATUS

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The invention relates to a railway signaling or indicating device and more particularly to a pedal device or its equivalent adapted to be associated with a railway track so as automatically to control the passage of trains or vehicles at a given point on the track; the pedal device is arranged to be operated by the bending of the rail at this point during the passage of a wheel and is caused to control an electric circuit or circuits and in order to obtain this result, the present invention utilizes directly the slight bending movement of the rail on a contact system constituted in the following manner: In considering a copper disc on the surface of which a very thin coating of copper oxide has been formed and the passage of the electric current normally to the surface of separation of the copper and the oxide, it will be seen that the electrical resistance of the whole is less in the direction oxide-copper than in the direction copper-oxide; the ratio of these two resistances varies according to the pressure applied, but is always greater than 1000; this known arrangement is utilized for rectifying alternating currents; in these apparatus the contact is generally made by means of washers adapted to be pressed heavily made of malleable metal.

The invention is illustrated by way of example in the accompanying drawings, in which Fig. 1 is a diagrammatic view of the contact element employed; Fig. 2 is a similar view showing the means for applying the pressure to said element, and Fig. 3 is a sectional view of one form of the device embodying the invention.

Figure 1 of the accompanying drawings represents one of the elements generally in use; the copper disc *a* has on its upper surface a coating of oxide *b*; the source *c* of alternating current to be rectified is connected as shown in the figure; *d* is a washer of malleable metal, usually lead, adapted to be pressed heavily on the copper washer by two insulating members *e* and *f*.

It will be seen that the efficiency of the apparatus increases considerably if the pressure is relatively great, the resistance in the direction oxide-copper, or forward direction decreasing more rapidly than the resistance in the reverse direction; it is this action of the pressure that the present invention utilizes in the pedal. For this purpose, as shown in the Figure 2, there is placed on a copper disc *a* provided on its upper face with a coating of oxide *b*, a washer made of lead or of a relatively malleable metal *d* integral with a rigid metal portion *c* so that the pressure on the oxide coating *b* may have a sufficiently low suitably selected value. If in these circumstances the bending movement of the rail of slight amplitude is transmitted to the member *d*, the disc *a* being rigid, there will result at each bending movement, a variation in pressure and a considerable variation in the resistance of the element in the forward direction. When at rest, the position of equilibrium of the member *d* may moreover be selected so that a very thin layer of air is interposed between the lead washer *c* and the coating of oxide; in this case as soon as pressure is applied, for a surface of oxide of predetermined dimensions, the resistance in the forward direction will pass from a very high value to a much lower value which will be equivalent to an actual electrical contact in the electric circuit considered; the coating of oxide being partially insulating, it should be noted that the current will be established without a spark which would deteriorate the coating of oxide.

On the other hand, if the pressure of the member *d* on the washer *a* is very high in the normal position, and if the bending movement of the rail has the effect of raising the member *d* and thus reducing the pressure, the resistance in the forward direction will pass from a very small value to a very high value, causing an actual breaking of the electrical circuit.

The following description, which is given by way of example only, of a pedal device constructed according to the invention, describes clearly its chief features:

Figure 3 shows this pedal device in elevation, the contact device being shown in section in a vertical plane through its axis.

A rigid frame A is provided at its ends with sleepers B and C which pass under the

rail foot and are secured thereto by means of members fastened by bolts, not shown; a member E, also secured below the rail foot by members transmits to the contact device the sinking movement of the centre part of the rail relative to the parts B and C, under the pressure of the wheels. This part E is provided with an adjustable member F acting directly on the contact system which is constituted as follows: A copper disc G of suitable dimensions, provided on its upper face with a coating of oxide H, is secured on a metallic member I; this member guided by its cylindrical portion J sliding in the member K is capable of vertical movement and is supported by a spring L carried by the member K, as shown; a disc M made of lead is secured in the member N provided with a cylindrical portion O.

The part N is also capable of vertical movement and is guided in the member P; it is moreover acted on by a spring Q so that the lead disc with which the part N cooperates rests lightly on the layer of oxide; the part K which supports the copper disc is secured to the part P by bolts and screws, as shown, but insulated electrically from this latter by insulating tubes and washers. The member E is secured by bolts to the frame and is in electrical contact therewith; the corresponding wires of the signaling circuit to be controlled are connected to the terminals R and S respectively; a casing T secured to the frame protects the apparatus and allows free displacement of the part E.

In these circumstances, when at rest, the member F screwed in the part E, is adjusted so as to come in contact with the part O; at each bending of the rail, the lead disc M, which previously rested lightly on the layer of oxide, presses thereon; it is obvious that the pressure now exerted on the layer of oxide will correspond to the pressure of the spring L, which should be suitably selected; at each bending of the rail the resistance of the copper-oxide element in the forward direction, passes from a very high value to a very low value and the current now passing will have a sufficiently high value for actuating the relay to be controlled.

It will readily be understood that the position of equilibrium of the discs of copper and lead may be selected so that when at rest, these latter are pressed heavily against one another; in the normal position for a current in the direction oxide-copper, the resistance of the element has a very small value; if the depression of the member F, caused by the bending of the rail, is transmitted to the member I which carries the copper disc and effects a decrease of pressure, the resistance assumes a very high value and acts as a break in the circuit to be controlled.

The source of current feeding the circuit to be controlled may be either direct or alternating; in the first case, the polarity should evidently be selected so that the useful current flows in the direction oxide-copper, which alone corresponds to a relatively great variation in resistance.

In the case of alternating current, there will be at the same time as variation in resistance, rectification of the current; in the case in which it is necessary to retain the alternating current, it will be necessary to operate simultaneously two separate elements connected electrically in opposition; the intensity of the current which may be carried without deterioration of a given surface of oxide layer being limited, it will be necessary to select the surface according to the current to be controlled, either by utilizing an element of suitable section or by utilizing several elements actuated simultaneously and connected in parallel.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A railway signaling or indicating device comprising a pedal device or its equivalent and adapted to be associated with the track and actuated by the bending movement of the rail during the passage of a wheel, in which a contact device utilizing directly the small amplitude of this movement is provided, this device being constituted substantially by a copper disc provided with a coating of oxide, such as those utilized in the known rectifying devices, a movable metallic plate being located on the coating of oxide and the pressure that it exerts on the coating of oxide being controlled by the movements of relatively small amplitude transmitted by the rail, the variations of pressure which result causing considerable variations in the electrical resistance of the contact device in the direction oxide-copper, which variations serve to control the electrical signaling circuits.

2. In a railway signaling apparatus, the combination with a track rail, of a contact element, consisting of a metal body having a compound of the same metal formed on its surface, associated with said rail, means for transmitting pressure to said element, and means operable by the passage of a vehicle wheel over said rail for varying said pressure.

In testimony whereof I have affixed my signature.

ANDRÉ BECQ.