C. P. NACHOD.

SIGNALING SYSTEM.

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979,081.

Patented Dec. 20, 1910.

Fig. 2

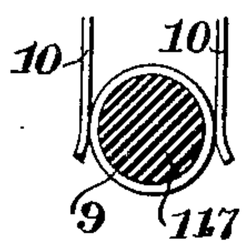


Fig. 3

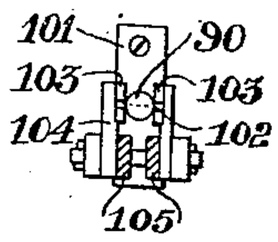
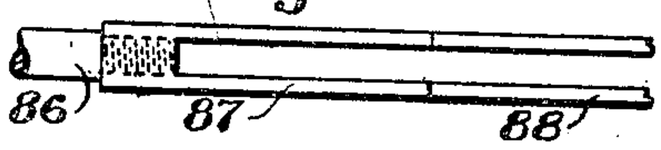


Fig. 1

Fig. 4



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SIGNALING SYSTEM.

979,081. Specification of Letters Patent. **Patented Dec. 20, 1910.**

Original application filed October 13, 1908, Serial No. 457,520. Divided and this application filed March 2, 1910. Serial No. 546,792.

To all whom it may concern:

Be it known that I, CARL P. NACHOD, a citizen of the United States, residing in the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Signaling System, of which the following is a specification.

My invention relates to a signaling system, and more particularly to a signaling system or apparatus to be employed in connection with a railway system in which the motive power is electric current, the signaling current being derived from the power circuit or system.

In electric railway systems, which are generally constant potential systems, the voltage or potential nevertheless varies through wide limits, in some cases even falling to only one-half or less of normal voltage.

It is the object of my invention to provide signaling apparatus which will, in spite of such great variations in voltage on the power circuit, nevertheless operate with certainty and fidelity to give the usual signal indications for controlling traffic on the electric railway system. To this end I provide the signaling apparatus with an inclosing casing or tank containing insulating oil, in virtue of which construction the signal controlling or operating magnets will, at the minimum voltage on the system, have sufficient ampere turns to perform their functions with fidelity and certainty and yet at the normal or higher voltages on the system the magnets will be insured against destruction, and since at such higher voltages the ampere turns are greatly increased over what they are at the low voltages the oil serves also to prevent jar and sudden impact in the more delicate signal apparatus.

The employment of my construction involving oil has other advantages hereinafter pointed out.

My invention resides in the features hereinafter described and claimed.

For an illustration of one of the forms my invention may take, reference is to be had to the accompanying drawing, in which:

Figure 1 is a front elevational view, parts in section, of the signaling apparatus. Fig. 2 is a fragmentary end elevational view, part in section, of a detail of the apparatus. Fig. 3 is an end elevational view of a further detail of the apparatus. Fig. 4 is a top plan view of a further detail.

Referring to the drawing, the magnets or solenoids C, D, E, and F, are shown in longitudinal vertical section. The housings or jackets 72 of the magnets C and D are provided with ears or lugs 73 by which they are secured to the under side of a wooden board or plate of insulating material 74 which, in turn, is secured by bolts 75 to the cast iron or other suitable casing 76. Upon the board or plate 74 are mounted a plurality of binding posts 77 extending above and below the plate 74, the lower terminals being adapted to receive the connecting wires from the various magnets and contacts below, while the upper terminals are adapted to contact with opposed contacts 78 secured to the insulating board or plate 79 supported by internal ears 80 on the casing 76, such contacts 78 being connected with corresponding binding posts 81 upon the top of the plate or board 79, to these binding posts 81 being led the outside conductors and connections, the case 76 being suitably secured upon any post or pole or other support along the line of the railway and visible to the motorman. And the housings or jackets 72 of the magnets E and F are secured, as by screws, to the under sides of the jackets or housings 72 of the magnets C and D. The housings of the magnets C and D are tied together by the ties 82 cast integral with them and these magnets and the magnets E and F form a mechanical unit which is supported from the under side of the plate 74.

The magnet C has the movable core or armature 83 which, upon the energization of the magnet C, is attracted toward the right, in opposition to the spring 84, being guided through the core member 85 by the rod 86 which on its right end carries a member 87 which, as shown in Fig. 4 abuts endwise against a similar member 88 carried by the core or armature 89 of the magnet D, the latter being guided in its movements by the rod 90 acted upon by the spring 91 which tends to hold the core or armature 89 toward the left. Upon the member 87 is pivoted at 92 a pawl 93, under the control of the spring 94 and adapted to engage the ratchet wheel 95. Upon the member 88 is pivoted a similar pawl 96 also adapted to

engage the ratchet wheel 95, a second spring 94 controlling pawl 96. Upon the energization of the magnet C its core or armature 83 is attracted toward the right causing the pawl 93 to engage the ratchet wheel 95 and rotate it the space of one notch. Such movement of the core 83, however, is accompanied by a pushing over of the core 89 of the magnet D against the opposition of the spring 91. Upon deënergization of the magnet C the spring 84 returns the core 83 to the left, and upon the deënergization of the magnet D the spring 91 pushes the core 89 toward the left causing the pawl 96 to engage the ratchet wheel 95 to step it in opposite direction the space of one notch.

At the left end of the core or armature 83 of the magnet C is carried a contact, insulated from the core 83, with which engage the brushes or contacts 14, one being directly behind the other, such brushes or contacts being supported by the block of insulating material 97 supported upon the head 98 of the magnet C. Approximate the right hand end of the member 87 is disposed the contact pin 45, insulated from such member 87, and engaged upon the front and rear by the contacts or brushes 46. On the left end of the member 88 is carried the contact pin 48, insulated from the member 88, and adapted, upon the movement of the core member 89 toward the right, to come between and engage the brushes 49, one in front and the other in the rear, these brushes 46 and 49 being supported upon the block of insulating material 99 carried by the tie 82. On the head 100 of the magnet D is a plate 101 through a perforation in which extends the rod 90 carrying the transversely extending pin 102 disposed in the path of lug 103, upon the bell crank lever 104 having the crank arm 105 to which is pivoted the arm 106 extending upwardly through the plate 74 and the plate 79 to engage the under side of the counter weight 107 upon the rod or arm 108 pivoted at 109 and carrying at its outer end the white semaphore disk 110. The pin 102 and lug 103 are shown in elevational view in Fig. 3.

The movable core or armature 111 of the magnet E is adapted to be attracted toward the left, in opposition to the spring 112 acting upon the rod 113 which, similarly to the rod 90, carries at its outer end a transversely extending pin adapted to engage with the wings 103, of the bell crank lever 104 having the crank arm 105 on which is pivoted the upwardly extending rod 106 which passes through the plates 74 and 79 and engages the under side of the counter weight 107 upon the rod 114 pivoted at 115, the rod 114 carrying at its outer end the red semaphore 116. On the right of the core or armature 111 is supported the rod of fiber or other insulating material 117 which carries the contact rings 9 and 41 adapted to engage respectively the pair of brushes 10 and the pair of brushes 40, the brushes of each pair being disposed one behind the other, these brushes being supported by the insulating member 99. By the core or armature 118, of the magnet F, is carried a rod of fiber or other insulating material 119 carrying the contact rings 30 and 60 with which engage respectively the pairs of brushes or contacts 29 59, the brushes or contacts of each pair being disposed one behind the other, these brushes also being supported by the insulating member 99.

As seen in Fig. 2, the brushes 10, 10 are one back of the other in contact with the member 9. And the brushes 14, 40, 29, 59, 46, and 49 are similarly disposed one back of the other, as illustrated in Fig. 2, and cooperate respectively with a contact like contact 9, or the equivalent thereof.

When the magnet F is energized the core 118 is attracted to the right, and guided by the rod 120 which passes through the hollow core member 121 forming part of the head 122. Carried by the rod 120 and fitting within the bore of the core member 121 is the dash pot piston 123. In the chamber to the left of the piston 123 is a valve 125 surrounding the rod 120 and pressing against the inner wall of the core member 121 under the influence of the spring 126, the opening through the core member 121 around the rod 120 being considerably larger than said rod. When the core member 118 is attracted toward the right it carries the piston 123 toward the right end of the chamber and the valve 125 leaves its seat and permits oil to enter into the chamber to the left of the piston 123. When the magnet F is deënergized the spring 124 presses the parts toward the left and the valve 125 comes up to its seat trapping the oil in the chamber to the left, thus retarding the movement of the parts toward their normal position.

The tank 127, of cast iron or other suitable material, surrounds the magnets C, D, E, F and G, and other apparatus and is supported to the upper casing 76 by suitable bolts 128, gaskets or seals 129 intervening. Within the tank 127 is contained suitable insulating oil rising to a level above the magnets and all moving contacts as, for example, to a level indicated by the line X—X. This oil is admitted within the magnet housings and is the oil which serves for dash pot purposes in connection with magnet F. Additional purposes of the oil, however, are as follows: Current operating the magnets and passing through the contacts being of considerable voltage, generally five or six hundred volts, or more, the oil serves to extinguish any sparks or arcs forming at the contacts, allowing such contacts to be placed closer than in open air, thus reducing the

dimensions of the signaling apparatus. The oil also serves to carry off the heat from the various parts generated by the current in the magnet windings and other conductors. Perhaps the most important function of the oil in its relation to the signal control and actuating apparatus when used in connection with an electric railway, is the fact that it permits the use of magnets of relatively small dimensions to accomplish the work although the voltage fluctuation on the system may be great and extend between wide limits.

It is a matter of common experience in electric railway practice that the voltage upon the supply conductors or upon the contact conductors or trolley wires may fall far below the normal voltage, indeed may fall a hundred or two hundred volts, or even 50% below the normal potential. The signals, however, are required to operate upon the low potential as well as upon the normal potential. The magnets, therefore, must be so constructed that with the lowest voltage sufficient current will pass through their windings to give positive response and actuation. This means that at the normal or higher voltages more than enough current passes through for the purpose and tends to greatly overheat the magnet windings. The surrounding oil, however, quickly carries off the developed heat with the result that on a system where the line voltage varies between wide limits the signal control and operating mechanism is nevertheless positive and has minimum mechanical dimensions.

In the front of the casing 76 are three circular openings 131, 132 and 133. Through the upper opening 131 are visible the white or red semaphores 110 and 116. Back of the opening 132 is disposed the white electric light W and behind the opening 133 is disposed the red light R.

When the magnet D is energized the rod 90 carries the pin 102 to the right out of the way of the wings 103 upon the bell crank lever 104 allowing the counter weight 107 to descend and thereby lift the white semaphore 110 to the dotted line position at the opening 131. Upon the deënergization of the magnet D the spring 91 presses the rod 90 toward the left causing the wings 92 to engage the bell crank lever 104, thus raising the rod 106 and raising the counter weight 107 causing the white semaphore 110 to return to the full line position. By this construction, the semaphore is lifted to indicating position by the counter weight; and thus the parts are relieved of any blows or too sudden actuation which might otherwise result from the energization of the magnet D.

When the magnet E is energized the core member 111 is attracted toward the left in opposition to spring 112 causing the transverse pin upon the rod 113 to be moved out of the way of the wings 103 of the bell crank lever 104, thus allowing the counter weight 107 upon the rod 114 to raise the red semaphore 116 up to the opening 131 to be visible through such opening. Upon deënergization of the magnet E the spring 112 causes the pin on the rod 113 to engage the wings on the bell crank lever 104 to raise the rod 106 and the counter weight 107 and returning the semaphore 116 to the full line position. The white semaphore 110, when in full line position intervenes between the white light W and the opening 132; and similarly, the semaphore 116 intervenes between the red light R and the opening 133, so that when either semaphore is in normal position it prevents any light coming through the opening intended for either of the electric lights.

1 represents the trolley or other contact conductor of an electric railway system extending between signal stations, there being turnout conductors 2 and 3 at each station.

6 is a trolley switch contact adapted to be engaged by the trolley wheel or other sliding contact which connects by conductor 7 with suitable part of the signal apparatus. Similarly, the trolley switch contact 55 connects by conductor 6 with a proper part of the apparatus; and by conductor 25 the trolley feeder conductor is properly connected with the apparatus.

34 is the signal conductor which extends from one station to the other, and conductor 20^a connects from the signal apparatus to earth or other return conductor 20 of the electric railway system. It is in virtue of the wide fluctuations of voltage between conductor 1 and return conductor 20 that I employ my invention as hereinafter claimed.

The circuit arrangements and detailed mode of operation of the apparatus herein described is shown in my application Serial No. 457,520, from which this application is a division.

What I claim is:

1. The combination with the supply and return conductors of an electric railway system subject to great fluctuations of voltage, of signaling apparatus, said signaling apparatus comprising an electro-magnet having a winding for sufficiently energizing said magnet at a fluctuation of voltage upon said system far below normal, and a bath of oil for said magnet winding, whereby at normal or highest voltages upon said system said winding is preserved against excessive heating.

2. The combination with the supply and return conductors of an electric railway system subject to great fluctuations of voltage, of signaling apparatus comprising a signal and electro-magnetic controlling means therefor, said electro-magnetic means being subjected to the effects of voltage fluctua-

tions on said line, and a bath of oil submerging said electro-magnetic controlling means.

3. In an electric railway system subjected to great fluctuations of voltage, signaling apparatus comprising the combination with a signal, of a casing inclosing the same, electro-magnetic signal controlling apparatus suspended from the bottom of said casing, said electro-magnetic apparatus being subjected to great fluctuations of voltage, a tank secured to said casing and surrounding said controlling apparatus, and oil in said tank submerging said controlling apparatus.

4. In signaling apparatus, the combination with a signal, of a casing inclosing the same, signal controlling apparatus assembled as a unit and secured to said casing, a tank secured to said casing and surrounding said signal controlling apparatus, and oil in said tank submerging said signal controlling apparatus.

In testimony whereof I have hereunto affixed my signature in the presence of the two subscribing witnesses.

CARL P. NACHOD.

Witnesses:
ANNA E. STEINBOCK,
ELEANOR T. MCCALL.