H. VON KRAMER.

MEANS FOR THE REGULATION OR CONTROL OF RAILWAY AND LIKE TRAFFIC.

APPLICATION FILED APR. 11, 1914.

1,219,508.

Patented Mar. 20, 1917

2 SHEETS—SHEET 1.

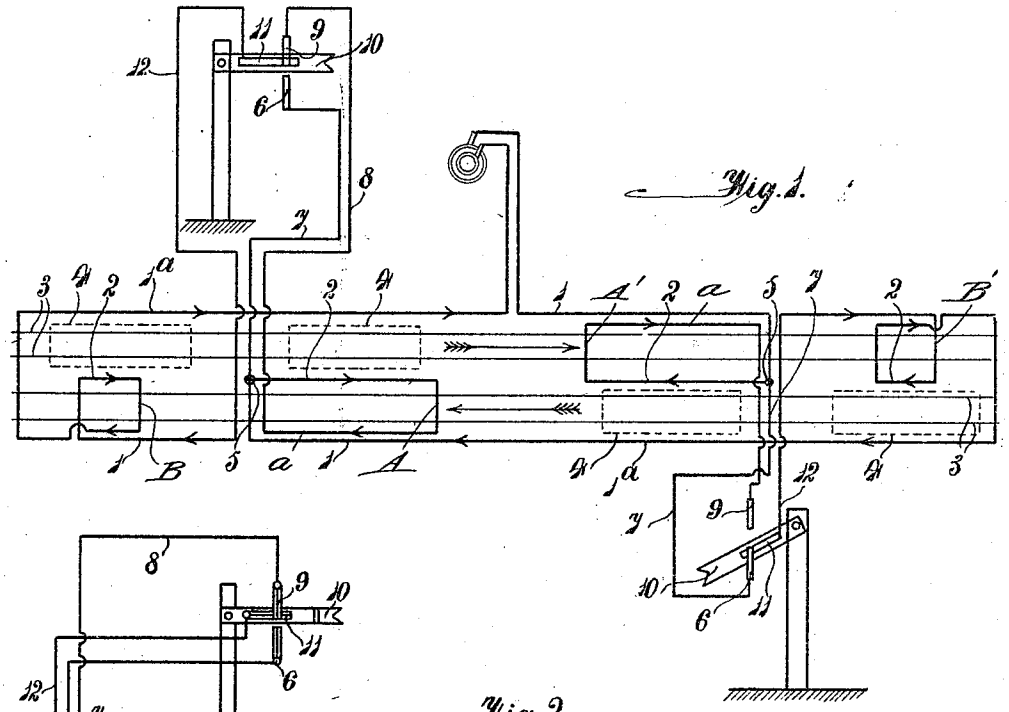


Fig. 1.

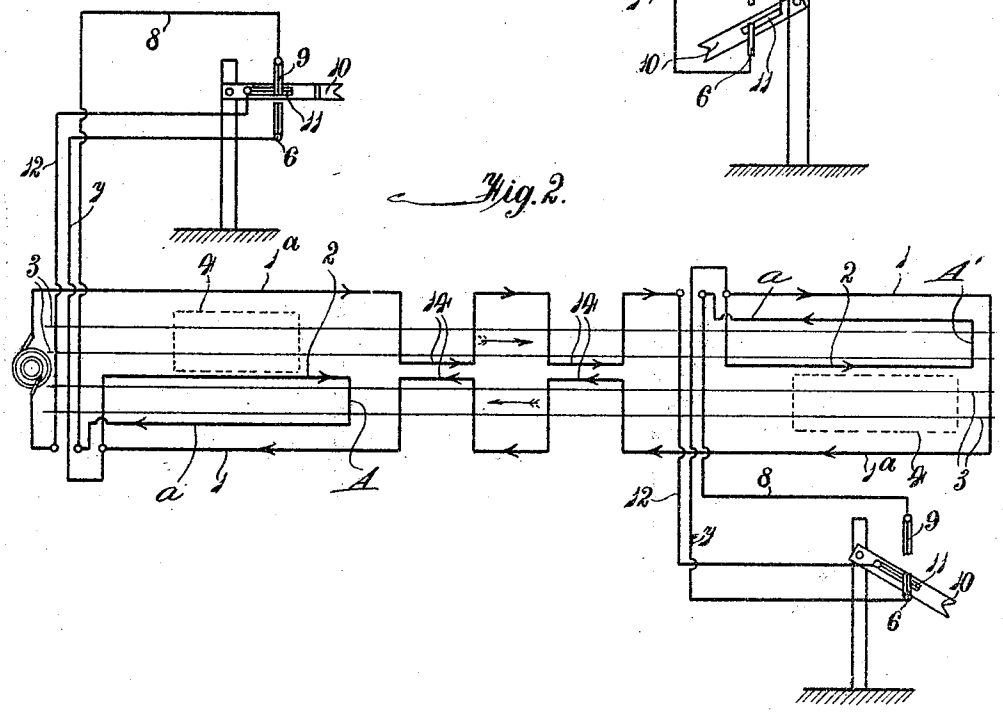


Fig. 2.

WITNESSES

Frank H. Logan

Alfred R. Anderson

INVENTOR

HANS VON KRAMER

BY Ivan Devereux

ATTORNEY

H. VON KRAMER.

MEANS FOR THE REGULATION OR CONTROL OF RAILWAY AND LIKE TRAFFIC.

APPLICATION FILED APR. 11, 1914.

1,219,508.

Patented Mar. 20, 1917.

2 SHEETS—SHEET 2.

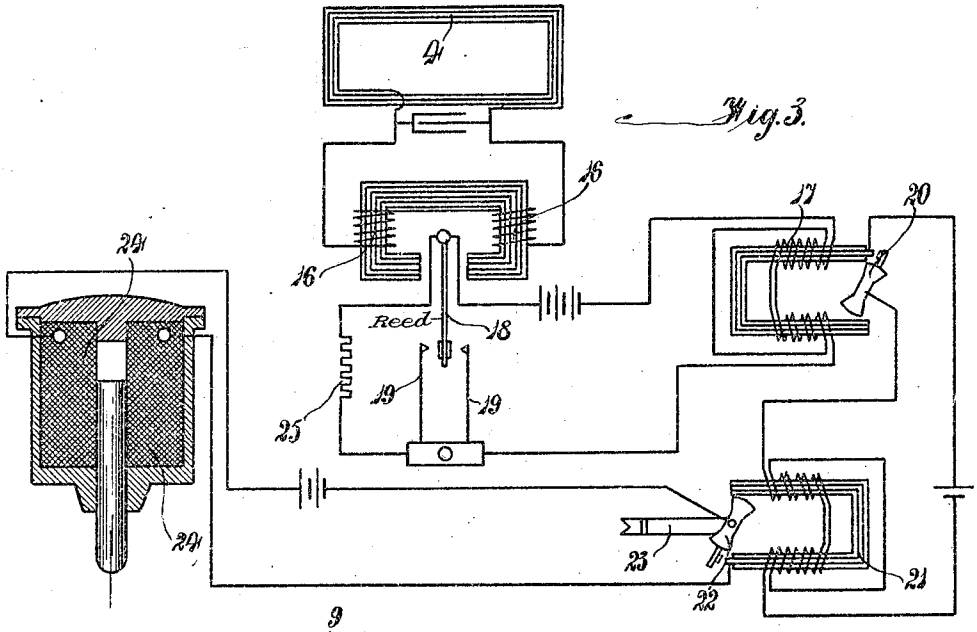


Fig. 3.

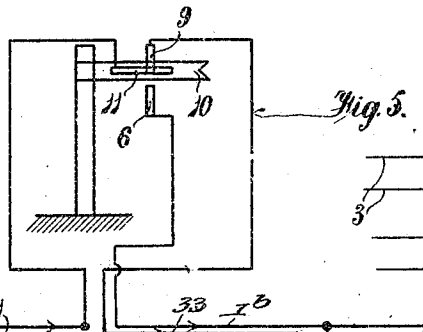


Fig. 5.

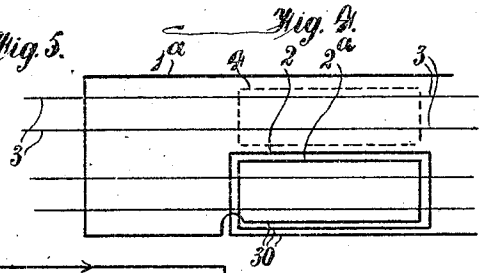
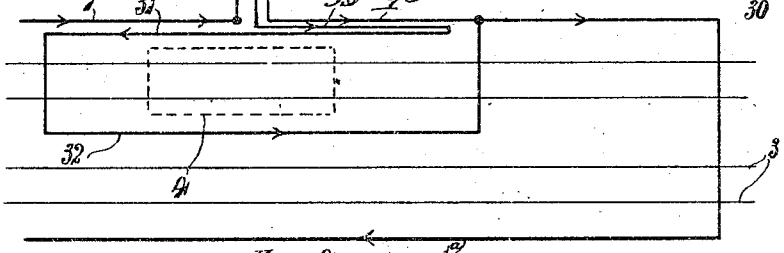


Fig. 4.



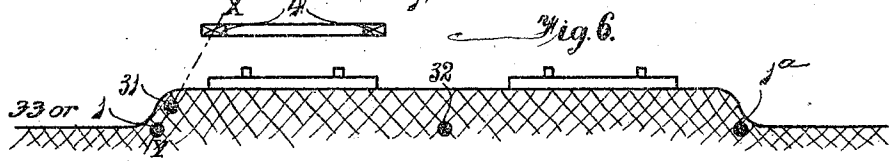


Fig. 6.

WITNESSES

Frank A. Logan

Alfred R. Anderson

INVENTOR

HANS VON KRAMER

BY Ivan Dedenmeel

ATTORNEY

UNITED STATES PATENT OFFICE.

HANS von KRAMER, OF EDGBASTON, BIRMINGHAM, ENGLAND.

MEANS FOR THE REGULATION OR CONTROL OF RAILWAY AND LIKE TRAFFIC.

1,219,508. Specification of Letters Patent. Patented Mar. 20, 1917.

Application filed April 11, 1914. Serial No. 831,250.

To all whom it may concern:

Be it known that I, HANS von KRAMER, a subject of the King of Great Britain, residing at Kramersruhe, Wheatsheaf Road, Edgbaston, Birmingham, in the county of Warwick, England, have invented a new and useful Improvement in Means for the Regulation or Control of Railway and like Traffic; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention comprises improvements in means for the regulation or control of railway and like traffic the said invention being an improvement in or modification of the invention described in my prior U. S. Patent 1,094,407, dated April 21, 1914.

According to the present invention only a single wire is employed laid entirely in proximity to the track so that if the wire breaks at any point the warning is given to the vehicle.

Referring to the drawings:—

Figure 1 is a diagrammatic view of one form of the invention in which the warning points are formed by laying the line wire in the form of loops.

Fig. 2 is a similar view of a modification in which the warning is given by laying the out and return portions in proximity to each other.

Fig. 3 illustrates a form of visible signaling device to be carried by the train.

Fig. 4 illustrates a modified form of the arrangement shown by Fig. 1.

Fig. 5 illustrates another modified form.

Fig. 6 is a sectional view of the track showing my signaling system applied thereto.

In carrying this invention into practice as illustrated upon the accompanying drawings at Fig. 1, and dealing with the left hand half of the diagram only, *i. e.*, the part to the left of the generator, at the point at which it is desired to give a warning to the train the line wire 1 at the side of the track remote from that on which the train is traveling is carried inwardly and then backwardly as 2 parallel with the second or return length marked 1^a of the main line wire, the parts 2 and 1^a being equidistant from the rails 3 on which the train to be warned is running.

The frame carried on the train is indicated by the dotted lines 4. The direction of the trains is indicated by the feathered arrows, while the direction of the current in the line wire is indicated by the small plain arrows. It will be seen from this that current is passing in the same longitudinal direction in the wire 2 and the wire 1^a so that when the frame on the vehicle passes between these two wires, current is induced in the longitudinal portions of the horizontal frame by the wires 2 and 1^a but these inductions being in the same longitudinal direction will oppose and neutralize each other in the coiled frame so that whenever the frame passes the point indicated by dotted lines in the drawings there will be absence of induced current therein.

As described in the prior patent the absence of induction actuates warning devices which may be either audible, optical or mechanical and may be arranged under certain circumstances to entirely stop the train as when the driver is approaching or overrunning a signal set at danger; in the forms illustrated at the extreme right and extreme left of Fig. 1 the loops B, B^1 are permanently arranged to give a warning of the approaching signal; the remaining loops A, A^1 are operative or inoperative according to the position of the signal arm.

The wire 1 is connected to a terminal 5 which is connected to a contact 6 by wire 7 and also to the part 2 of the signal-actuated loop and thence by wire 8 to a contact 9. The signal arm 10 carries a contact plate 11 connected by wire 12 with wire 1. When the signal is in the blocked position, as illustrated at the left of Fig. 1, the contact 6 being broken and the contact 9 completed, current will flow through the wire 2 and thus operate to warn or stop the train, while when the signal is down, as shown at the right hand side of the drawing, contact 9 is broken and contact 6 made when current will pass direct from the wire 1 to the signal contact to the continuation of the wire 1 where it passes to the loop B.

Similar references apply to the right hand portion of the diagram, but all the parts are reversed to operate upon trains coming in the opposite direction upon the second track as indicated in dotted lines and the signal arm is shown in the "clear" position.

A modified form of the invention is shown in Fig. 2 in which at particular points 14 the out and return wires are laid in proximity to each other so that they induce opposing

and neutralizing inductions in the frame of the vehicle which may be passing said points, and so give a warning or other signal.

The loops A A^1 which are controlled by the position of the signal are the same in Fig. 2 as in Fig. 1.

At Fig. 3 a modified form of the train equipment described in the prior specification is shown wherein the circuit controlled by the relay 16, which is according to the prior patent specification of Hans von Kramer and Dr. Gisbert Kapp, Patent No. 1067823, dated 22nd July, 1913, includes an electromagnet 17 which operates an armature switch which is energized when the reed 18 of the relay makes contact with the flanking contact springs 19 this contact being complete when current is induced in the frame 4. Even when the contact springs 19 are out of contact with the reed 18 and the circuit broken at this point, there is complete circuit through the non-inductive resistance 25 and the winding in the magnet 17 but the current passing is too feeble to attract the armature, owing to the presence of the resistance 25 in the circuit. In operation when current is induced in the frame 4, the engagement of the reed 18 and the contact spring 19 partially short circuits the resistance, allowing a stronger current to pass through the magnet winding. The magnet is thus energized and attracts the armature switch 20 which energizes a second magnet 21 controlling a second armature switch 22 carrying a visible signal 23. The attraction of the armature 22 completes another circuit which includes an electromagnet or solenoid 24 for controlling the brake, steam valve, or other means for arresting the movement of the engine, the brake or steam valve being operated when the solenoid 24 is de-energized. The use of the non-inductive resistance 25 allow the circuit to be always maintained complete, the relay thereby short circuiting the resistance, this arrangement avoiding or minimizing the sparking which would otherwise occur. Thus as long as current is being induced in the frame the contacts 18 and 19 are made; the armature switches 20 and 22 are attracted and the visible signal will show the line as being clear.

At Fig. 4 a modified form of the arrangement shown in Fig. 1 is illustrated. In the arrangement shown in Fig. 1 it is possible that the wire 1 with that portion *a* of the loop A which is adjacent and parallel thereto may also induce a current in the frame and thus upset the balanced and neutralized currents caused by the parts 1^a and 2. This defect may be cured by varying the distance between the wire 1^a and the frame and the distance between the wire 2 and the frame relatively to each other, so as to balance exactly with the inductions of the wire 1^a and adjacent wire *a* of the loop, as diagrammatically illustrated at Fig. 2, but the exact variations in distance are of course dependent upon various factors and must be determined for particular cases; in cases where it is impractical to vary the distance, more than one turn of wire may be employed as shown in Fig. 4 there being then one wire 1^a in proximity to the frame at one side and two wires 2 2^a in proximity to the opposite side of the frame, the second wire on one side being adapted to balance the disturbing inductions from the three wires marked 30 on the drawings which are much farther from the frame than the wire 2^a and induce opposing inductions to the wire 2^a, but obviously the manner in which the disturbing inductions may be neutralized depends largely upon the distance at which the disturbing influences are situated from the frame.

At Figs. 5 and 6 a further modified and the preferred form of the invention is shown in which the wire is brought back to the warning section in parallel relation as 31 and adjacent to the main wire 1, being returned in a central position as 32 between the rails, the whole of the warning loop being thus at the side of the track corresponding with the line on which the train is to be warned as distinguished from the forms of the invention previously described in which the loop is on the other track, the trains on which are not to be warned, thereby avoiding the necessity of carrying the wires right across the track. This form of the invention may be made perfectly to balance or induce neutralizing inductions by laying the various wire at suitable distances from the path of the frame.

When the signal is at "safety" the current passes through the wires 1, plate 11, contact 6, wire 1^b, and wire 1^a giving a similar induction to the main part of the line wire; but when the signal is at "danger" the part 1^b is out of circuit, the circuit then being wire 1, plate 11, contact 9, wire 33, wire 31, wire 32 and wire 1^a. Thus there are two wires, either 1 and 31, or 33 and 31 on one side of the frame 4, the wires 1 and 33 inducing opposing inductions in the frame to those of the wire 31 while on the opposite side of the frame 4 there are wires 32 and 1^a again inducing opposing inductions. By arranging these wires in suitable relation and at suitable distances from the frame, they may be so arranged that the sum total of all the E. M. F.'s induced by them in both limbs of the frame is substantially equal to zero when passing this portion of the track, if the signal be at danger; or so that there is insufficient resultant induction to actuate the relay.

In choosing the distances mentioned above, the following is to be noted:

When two or more wires carrying con-

tact are in inductive relationship with two or more wires or limbs of a coil in series, the current induced in such coil or wires is proportional to the log. of the product of the quotients of the distances of each of the wires carrying the current from the two limbs of the coil.

Expressed as a formula:—

where—

i=current induced

K=constant

a_1=distance from wire 1 to limb a of coil

b_1= " " " 1 " " b " "

a_2= " " " 2 " " a " "

b_2= " " " 2 " " b " "

Then, taking into account the directions of the currents in the two wires,

$$i = \mathrm{K} \log. \left\{ \frac{b_1}{a_1} \times \frac{a_2}{b_2} \right\}.$$

It will be immediately clear that the condition for i=zero, will be attained, quite apart from the value of K, when the product within the bracket=1, giving the result

$$i = \mathrm{K} \log. 1$$
$$= 0$$

It will be understood that the warning loop may be of a considerable length say half a mile in order to insure that the warning devices or motion arresting devices will come into operation when the train is passing at a high speed.

The warning devices are clearly applicable to warning the driver when approaching a "curve" or dangerous part of the track such as level crossing, gates or barriers.

It will be obvious from the explanation given that in the event of failure of the current the whole of the system would become non-inductive so that the effect of an electrical breakdown would only be to stop the trains there being no risk of accidents as in the form of inductive signaling wherein the transmission of the signal depends upon the presence of the induction.

What I claim then is:—

1. In apparatus for the regulation or control of railway or like traffic, the combination of a line wire laid parallel to the track of the vehicle; means for continuously passing periodic electric current through said line wire; a wire frame carried by the vehicle in inductive relation with the line wire; a signal-receiving device carried by the vehicle inoperative while current is induced into the frame from the line wire, but operative when the induced current ceases, a loop formed by a part of said main line wire, and in series relationship therewith the two wires of said loop inducing opposing inductions in the frame of the vehicle, so as to render ineffective the induction between the main wire and the frame at the places where said additional series wire is located without interrupting the current passing in the line wire, so that when the vehicle is passing said places the wire frame will operate to convey signals, while when the vehicle is passing over the inductive lengths the signal-receiving device will be inoperative.

2. In apparatus for the regulation and control of railway or like traffic, the combination of a line wire laid parallel to the track of the vehicle; means for continuously passing periodic electric current through said line wire; a wire frame carried by the vehicle in inductive relation with the line wire; a signal-receiving device carried by the vehicle inoperative while current is induced into the frame from the line wire, but operative when the induced current ceases; a loop formed by a part of said main line wire, and in series relationship therewith, the two wires of said loop inducing opposing inductions in the frame of the vehicle so as to neutralize the induction between the main wire and the frame at the places where said additional series wire is located without interrupting the current passing in the line wire, while when the vehicle is passing over the inductive lengths the signal-receiving device will be inoperative.

3. In combination, a track for vehicles; a line wire adjacent to said track; means for passing periodic current through said line wire; and an additional wire in series with said line wire and having part of its length physically parallel thereto and approximately equidistant from said track and part of its length at a considerable distance therefrom.

4. In combination, a track for vehicles; a vehicle thereon; an inductive frame carried by the vehicle; a line wire adjacent to said track; means for passing periodic current through said line wire; and an additional wire in series with said line wire and having part of its length physically parallel thereto and approximately equidistant from said track and part of its length at a considerable distance from said track.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

HANS VON KRAMER.

Witnesses:

HAROLD J. C. FORRESTER,

HERBERT F. O. BARTON.