(No Model.)

G. T. WOODS.

RAILWAY TELEGRAPHY.

No. 388,803. Patented Aug. 28, 1888.

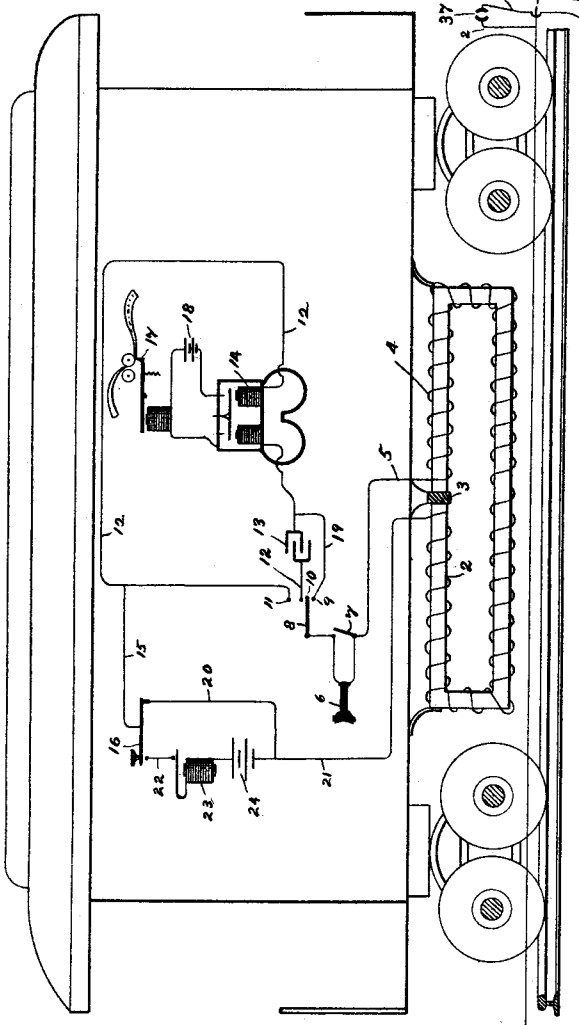

Fig. 1.

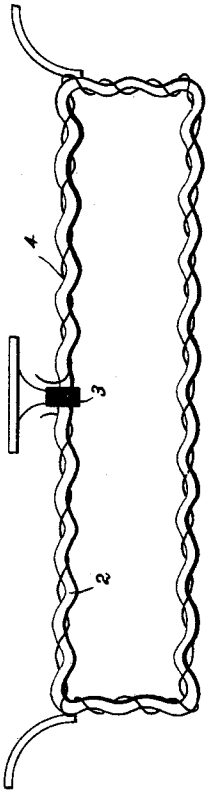

Fig. 2.

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UNITED STATES PATENT OFFICE.

GRANVILLE T. WOODS, OF CINCINNATI, OHIO.

RAILWAY-TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 388,803, dated August 28, 1888.

Application filed July 14, 1887. Serial No. 244,325. (No model.)

To all whom it may concern:

Be it known that I, GRANVILLE T. WOODS, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Railway-Telegraphy, of which the following is a specification.

My invention relates to induction-telegraphy, having reference to its use between moving vehicles, particularly on railways; and its object is to obtain increased effects from a given dynamic force with a single permanent conductor, thereby economizing in respect to the plant employed.

The nature and constructive details of my invention are more fully and at large set forth hereinafter, in connection with the illustrative drawings accompanying and forming part of this specification, to which reference is made by means of numerals designating the parts of the drawings.

Referring now more particularly to said drawings, Figure 1 is a general diagram elevation of a railway car, track, and conductor, showing in conventional form the station apparatus and that carried by the car. Fig. 2 is a detail of the induction-coil detached from the car, showing its construction.

In order to render clear one of the essential principles of my invention, I may remark that the dynamic impulses obtained by induction between a fixed line-conductor and an induction-coil moving parallel therewith are minute in effective force under ordinary conditions. With a view to economizing this force and obtain impulses of greater amplitude, I described in a former application a system of two parallel conductors constituted as an induction-coil with elongated spirals, between and above which moved a horizontal rectangular core simlarly wound and presenting its long sides parallel with the conductors, respectively, thereby doubling the inductive effect.

In my present invention I avoid the expense of a double conductor wound as an induction-coil and substitute a single line-conductor, 1, suitably protected and laid in or on the earth between or alongside of the railway-tracks, and employ as the moving element a wound bar of soft iron, preferably bent to a spiral or waved line, but preserving the general contour of a rectangle, as shown at 2. This bar is not continuous, but its meeting ends terminate at and are separated by a block, 3, of insulating material, near the center of the upper side of the rectangle, which is arranged in a vertical or approximately vertical plane, with its lower side in inductive proximity to the conductor 1. The coiling-wire 4 is wound upon the bar in a corresponding spiral, its two free ends being joined in circuit through the sending and receiving apparatus of the car.

The car-circuit with its apparatus is traced as follows: The induction-coil 4 being attached beneath the cars, its wire connects at one end with the wire 5, having a telephone, 6, in shunt by a switch, 7, and extends thence to a three-pointed hand-switch, 8, adjustable to contacts 9 10 11. From point 10 a line, 12, extends through a condenser, 13, to and through a relay, 14, and thence back to point 11. Midway in the line 12, between the relay 14 and the point 11, a branch wire, 15, extends to a make-and-break-circuit key, 16, whose connections will presently be explained. The relay 14 is preferably of the construction fully explained by me as the subject of Patent No. 366,192, and is employed to control a local circuit operating a printing or registering device, 17, by means of a battery, 18.

I do not here describe the registering device, as many of such devices are in use applicable to the present purpose.

From point 9 a short wire, 19, extends around the condenser 13 to wire 12, this connection being used to shunt the condenser when for any reason its effective action should become impaired. The key 16 is normally in contact with its back-stop, connecting the line 15 with wires 20 and 21 to the wire 4 by its free end, completing the circuit recapitulated as follows: Induction-coil wire 4, through wire 5, switches 7 8, wire 12, condenser 13, wire 12, relay 14, wires 12 15, key 16, wires 20 21, back to induction-coil wire 4. The front stop of the key 16 connects with a wire, 22, extending through a circuit-breaker, 23, and battery 24 to the line 21, used for sending purposes when required. The switch 8 rests normally against the stop 10. Thus the receiving-line upon the car is in normally-open circuit through the condenser 13. The switch 7 may be closed when the telephone-receiver 6 is disused; but when an operator is present the telephone may be used for receiving and the key for sending,

the switch 8 being placed upon the contact 11, thus short-circuiting through the wire 15 and cutting out the condenser relay and register.

The object of bending the bar 2 to spiral form is to bring the wire 4 into approximate parallelism with the conducting-wire 1 and to bring the spiral portions of the bar to approximate right angles with the fixed conductor, so that the ampèrean currents from both helix and core will approximate corresponding planes of action, whereby increased inductive effects are secured, based upon the well-known law of ampèrean currents as influencing magnetic action—that is to say, since the flow of a current of electricity through a conductor superinduces ampèrean or magnetic currents circulating in planes at right angles to the axis of the conductor, and, conversely, ampèrean or magnetic currents superinduce a current of electricity in an adjacent conductor, the constructive arrangement of the helix in the manner described brings the conducting-wire 4 of the helix into approximate parallelism with the conductor 1, whereas if the bar 2 were straight and the wire 4 coiled around it in the usual manner the latter would extend at right angles with the conductor 1. As a result of this construction, as will be evident, the ampèrean or magnetic currents of both conducting-wires approximately coincide in their respective planes of action and a stronger electrical impulse is induced by their action.

The function of the core 2, it will be understood, is merely to assist and strengthen the ampèrean or magnetic impulses, thereby strengthening the induced electrical currents.

The conductor 1 at the sending-station terminates at the key 25, which normally rests against its back stop, connecting with wire 26 to ground at g, in which line a telephone-receiver may be contained. The forward stop of the key 25 connects with a wire, 27, extending to an armature, 28, of a circuit-breaker, 32. The circuit-breaker is in local circuit with a battery, 39, by a wire, 30, terminating at one end at the contact-stop of the circuit-breaker and at the other by a short connection, 29, at the armature 28. The circuit-breaker is normally in operation to control a split battery, 33, having its armature in vibration between terminals of lines 31 34, extending to the split portions of the battery, said lines merging beyond the battery in a line, 35, grounding at g'. In this ground-line an indicating magnet and armature, 36, may be inserted as a means of indicating the due working of the apparatus.

The sending-circuit may be traced as follows: With the key 25 open, as shown in the drawings, the circuit is from ground at g through line 26, key 25, to line 1, thence to denote ground at g^2. Upon depressing the key 25, disconnecting with line 26 and connecting with line 27, the circuit is from ground g' through line 25, thence alternating through the two portions of split battery 33 by lines 31 and 34 to and through the armature 28, line 27, and key 25 to line 1, and remote ground g^2. The circuit-breaker 28 is thus a pole-changer in respect to the conducting-line 1, and the key-impulses sent to line, and thereby made up of a great number of current reversals. By this, also, I gain increased inductive power and keep the line cleared of static effects.

It will be understood that similar sending and receiving apparatus to that described is employed at the principal stations.

I also employ at convenient points, where necessary, ground-lines 38 to independent grounds g^3 with plug switches 37, for the purpose of dividing the conducting-line into sections, whereby when from any cause it is desirable to diminish the resistance an intermediate ground may be plugged in.

I claim and desire to secure by Letters Patent of the United States—

1. In a system of electric communication of the character described, in combination with a fixed line conductor arranged in or parallel with the path of the vehicle, a transmitting and receiving coil having its convolutions brought into planes approximately parallel with said conductor by winding upon a spiral or waved line core, substantially as set forth.

2. In a system of communication of the character described, a receiving and transmitting apparatus adapted to be carried by the car in inductive proximity to the line conductor, consisting of a metallic core in rectangular form, as shown, bent to a spiral or waved line in the direction of its axial length with disconnected ends, and having an insulated wire helix wound thereon in a spiral corresponding with the longitudinal contour of the bar and circuited through the signal receiving and transmitting instruments upon the car, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GRANVILLE T. WOODS.

Witnesses:
CHESTER W. MERRILL,
L. M. HOSEA.