(No Model.)

P. H. VANDER WEYDE.

METHOD OF AND MEANS FOR GENERATING CURRENTS FOR TELEGRAPHIC PURPOSES.

No. 302,175. Patented July 15, 1884.

Fig. 1

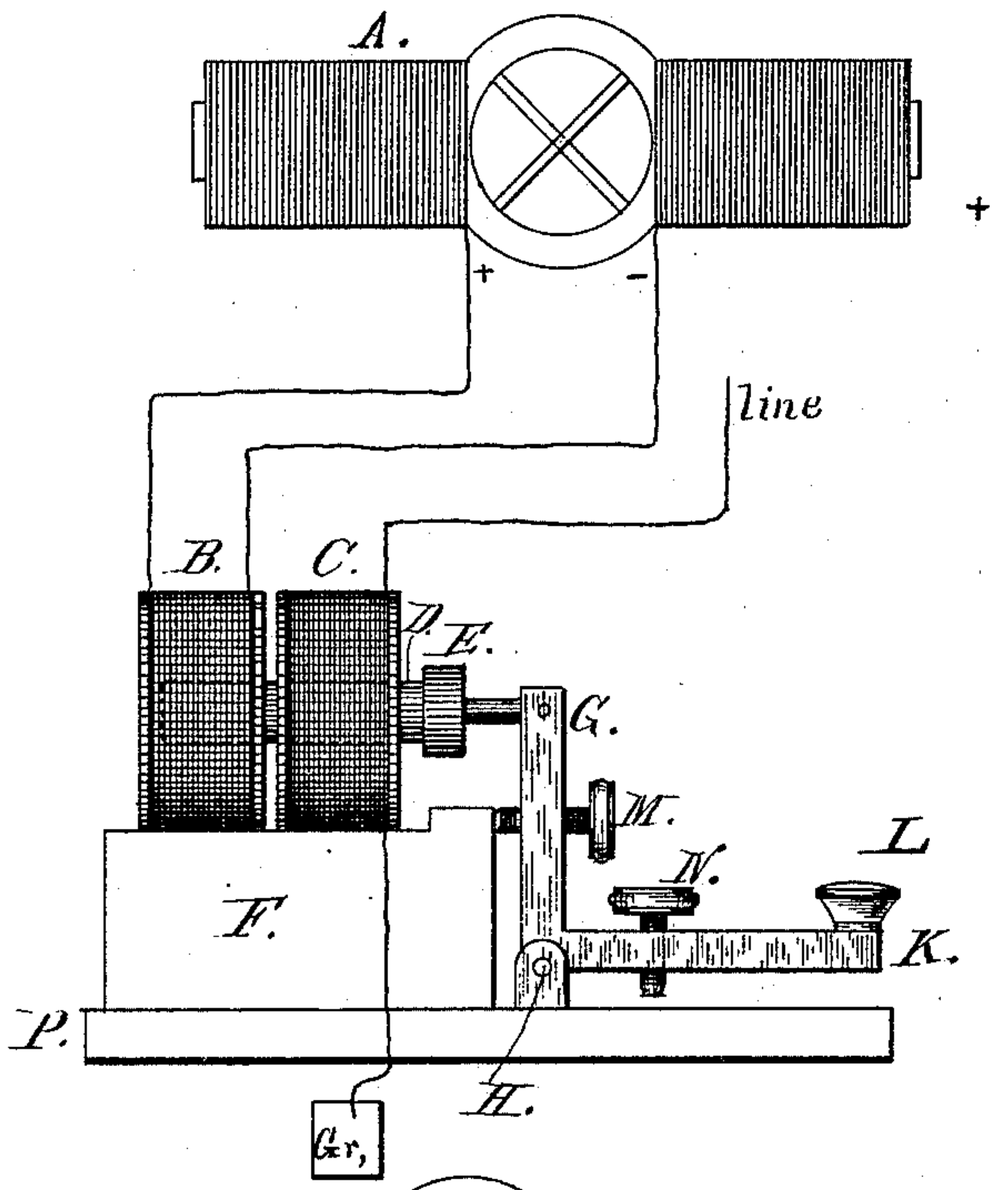


Fig. 2.

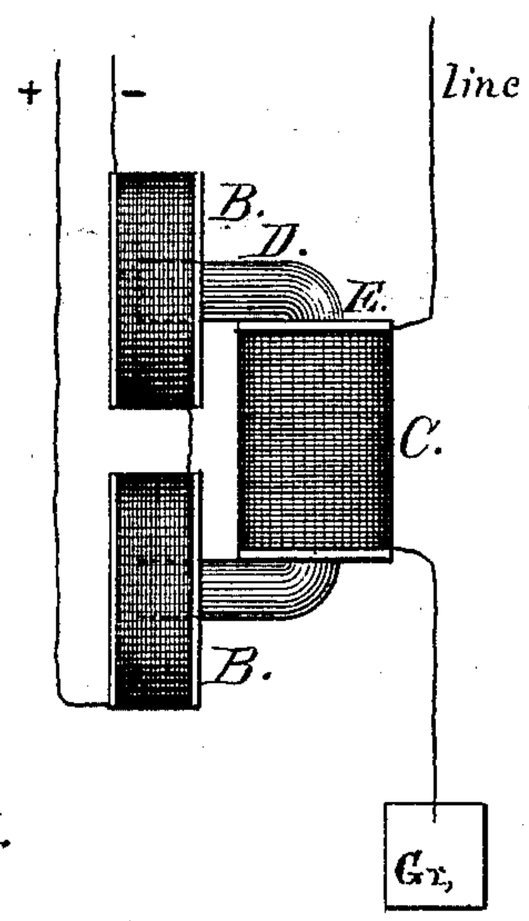
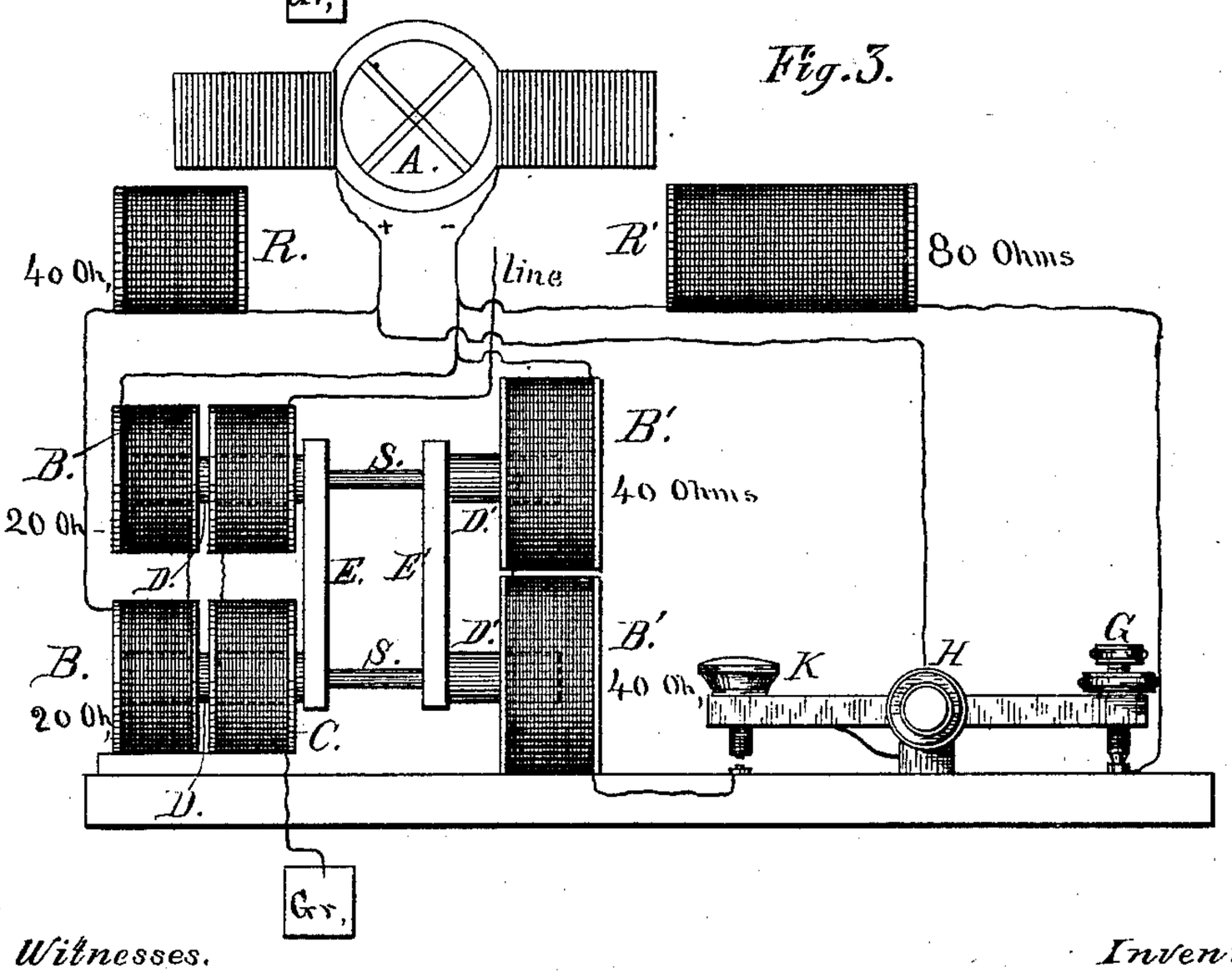


Fig. 3.



Witnesses.

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METHOD OF AND MEANS FOR GENERATING CURRENTS FOR TELEGRAPHIC PURPOSES.

SPECIFICATION forming part of Letters Patent No. 302,175, dated July 15, 1884.

Application filed June 25, 1883. (No model.)

To all whom it may concern:

Be it known that I, PETER H. VANDER WEYDE, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Method and Apparatus for Generating Inductionless Electric Currents; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My invention relates to a novel method of producing an induced electric current for telegraphic purposes, which, when transmitted over a telegraph-wire, shall exert no inductive action upon neighboring lines, and which may be transmitted for telegraphic purposes over a telephone-wire without disturbing or affecting the use or operation of the telephone-instruments, and to the apparatus for accomplishing this end.

Heretofore attempts to prevent induction in telegraph-lines have been confined to devices for protecting the wires and instruments against the inductive influences of outside currents. I have sought to solve the problem by modifying the character or nature of the current itself.

It is well known that the strength of induced currents, such as are generated by the making and breaking of a primary circuit, depends upon the sudden forcible making and breaking of a primary current, and that when the latter is very gradually interrupted and re-established its power of producing induced currents in neighboring wires is greatly diminished, if not wholly destroyed. As in the present system of electric telegraphy all the transmitted currents are created by sudden contacts and interruptions, the telegraphic wires exert powerful inductive influences, causing secondary currents in all wires running parallel thereto. It is also well known that the electric undulations or waves produced by speaking in front of a telephonic transmitter will not affect a telegraphic sounder, relay, or transmitter in such a way as to give the ordinary signals, from the fact that these waves cannot charge the electro-magnets, which are the active agents in these telegraph-instruments. It is also well known that in order to produce audible sounds by means of undulations the latter should possess a velocity exceeding at the very least ten to sixteen intermissions per second; hence an electric current whose undulations amount to but two or three such waves per second cannot produce an audible sound, provided the closing or breaking of the circuit by which the current is generated is not suddenly and sharply made, as is the case in the working of the ordinary key in a telegraphic apparatus, and such a current may therefore be passed through the receiving-coils of a telephone without producing sound therein.

The object of my invention is to provide an apparatus capable of making and breaking electric circuits in a gradual manner comparable to the production of a gentle wave, ascending gradually to the full potential of the current, and descending as gradually to the ordinate, which represents the zero-point, the ordinary method of electric telegraphy by sudden makes and breaks of contact being illustrated by a perpendicular ascent forming with the zero-line an angle of ninety degrees, reaching at once the full potential of the current, and possessing, for this reason, the greatest power of induction, and of obtaining thereby an electric current whose undulations are so slow as that, if permitted to act upon the diaphragm of a telephone, they can excite no audible sound, but each of which will last long enough to be capable of insuring the attraction of the armature of a telephone-instrument. My first experiment in this direction was the use of keys of which the contact possessed brush-like appendages, so arranged as that the contact, beginning with fine platina wire of great resistance, gradually presented an increasing conducting-surface until the key was wholly depressed. I found this method impracticable for two reasons: first, the play of the key had to be so large—say one inch up and down—as that no practical telegrapher would be satisfied with its use; second, the fine brush-like platinum wires were soon destroyed by the sparks of the currents. My second attempts were made by plunging conductive cylinders into

liquids of semi-conductive capacities. These were not satisfactory; and I then invented the methods hereinafter described, which satisfied all requirements, and which are eminently adapted for use in connection with the dynamo-electric machine. By means thereof I am enabled to send currents over the line, which, instead of being induced by the sudden closing and breaking of the primary current, are generated without breaking the primary current, and this I accomplish by making use of the property of induction-coils of producing much stronger induced currents when an iron core is present in the coil than when it is not. It is evident that if a powerful current be kept constantly passing through a primary coil and an iron core therein be drawn entirely out of the same and be returned again without interrupting said primary current, a secondary current will be obtained equivalent to the difference between the current induced with the coils and iron core and that induced without the core by the simple action of the coils upon one another. As the withdrawal of the iron core cannot possibly be as sudden as the break of contact, it will not produce a sudden induced current, but an induced current which will so gradually increase in the potential as to be powerless to produce tertiary currents in parallel wires within the radius of its influence, or to produce sound-vibrations in a telephonic receiving-instrument. This gradually increasing and diminishing wave will, notwithstanding it is deprived of its inductive influence, actuate the ordinary polarized relays as effectually as do the ordinary induced currents, and will prove even better for this purpose, because the ordinary currents are so quick as that they sometimes fail to act upon electro-magnets, while the gradual waves of my improved currents give ample time for the development of the polarization of the electro-magnets at the receiving-station.

In the accompanying drawings, Figure 1 is a representation of my improved apparatus based upon the principles thus far explained. Fig. 2 is a modification of the electro-magnet employed, and Fig. 3 illustrates the invention in complete form as adapted to be worked with an ordinary telegraph-key.

A represents the dynamo-electric machine, by which an uninterrupted current is kept up through the primary coil B. A single dynamo may be employed to send a current over as many primary coils as there are telegraph-lines to be worked, and the coils may be connected in single series or in multiple arc, according to requirements.

C represents a separate secondary coil, and D an iron core, which is led through the secondary coil, and to pass into and out of the primary coil. It is most advantageous to use the primary and secondary coils in pairs, and to connect the cores in each pair by a cross-piece, E, Fig. 3, so as to obtain the ordinary horseshoe form of electro-magnets; but in all cases the secondary coils are detached from and independent of the primary coils instead of being superimposed thereon.

In the form of apparatus shown in Fig. 1 the iron core is arranged to be itself drawn out from the primary coil, leaving the primary and secondary coil *in situ*. In Fig. 2 the secondary coil is wound around the cross-piece connecting the two cores, so as to be carried therewith to and from the primary coil as they enter the same or are withdrawn therefrom.

As it has been proved by experiment and theory that the magnetizing influence of a primary current upon an iron core is greatest when the primary coil is wound around the poles of the core, while the inductive capacity is greatest when the secondary coil is wound around its vertical center, it is evident that this last arrangement must work to the best advantage for the purpose intended.

In order to withdraw the iron core from the primary coil a bent lever, K H G, Fig. 1, may be employed as a key. This lever is pivoted at its angle H to a suitable base, P, and is fitted with a thumb-piece, L, at the extremity of its horizontal arm, and connected at the extremity of its vertical arm G to the iron core D of an electro-magnet raised to a proper height upon a block, F. The position and movement of the key is regulated by thumb-screws M N. This key is, however, not a practical device. It has too much play and offers too much resistance to the efforts of the operator because of the strong attraction of the primary coil. It is introduced in this connection merely to facilitate an illustration of the principle involved in my invention so far as described.

The method of working my device by means of the ordinary telegraph-key is illustrated in Fig. 3. The current from the dynamo-machine at A runs not only through the primary coil B, but also through the coils B′ B′ of an electro-magnet, whose armature, consisting of the two iron cores D′ D′, united by the cross-piece E, is connected by non-magnetic rods S S to the cores D D of the primary induction-coil B. In order to make the attraction of the primary induction-coils B′ B′ upon the armature D′ D′ overcome the attraction of the coils B B upon the cores D D inserted therein, the coils B′ B′ of the electro-magnet are made to contain a larger number of windings than the primary coils B B of the induction—say double—so that if the cores B B have a total resistance of, say, forty ohms each, those of the coils B′ B′ have a resistance of eighty ohms by reason of a proportionally greater number of windings. In order to secure the equal distribution of the current of the dynamo-machine through these unequal resistances, an extra resistance-coil, R, (say of forty ohms,) is added to the circuit passing over the coils B B, so as to make it equal to that of the coils B′ B′. To secure, moreover, an equal action or balance of the currents discharged by the dynamo-machine, whether the key K H G is up or down,

an additional coil, R′, is provided, the resistance of which is equal to that of both of the coils B′ B′, while the key is so connected as that when up the current passes through the resistance-coil R′ by the back contact at G; but when the key is depressed at K the contact at G is interrupted and the circuit closed through the coils B′ B′ by the front contact at K. The operation of the latter arrangement is therefore this: When at rest, the electric current received at A is divided into equal portions, one half passing permanently through the primary coils B B and the resistance-coil R back to the generator at A, and the other half by the contact of the key at G through the key and the resistance-coil R′. When the key is depressed, the latter current is thrown through the coils B′ B′ of the electro-magnet, and attracting them its armature D′ D′ E′ withdraws the cores D D from the coils B B, through which a powerful current from the dynamo A is constantly passing. The gradual withdrawal of the cores from the primary coils will produce an induced current in the coils C C, which is thrown over the line, the other end of said coils C C being connected with the ground G *r*, or with a return wire or cable; but this induced current, because of its gradual increase in power, cannot operate to produce induced currents in adjacent lines or audible sound in telephones. When the key is raised at K, the current in B′ B′ ceases, the armature D′ D′ E is no longer attracted, and the constant current in the coils B B is allowed to draw back the cores D D into them, whereupon a current in an opposite direction is gradually generated as before in the coils C C and in the line. In order to utilize these two opposite slowly-undulating currents made by the up-and-down motion of the key-lever, I use a polarized relay in which the motion of the magnetized armature to the right and left makes and breaks the current of a local battery, and so transforms these contrary currents into the intermittent currents required to transmit the ordinary Morse alphabet, as fully described in the specification accompanying a separate application herewith filed for a patent for an improvement in producing and utilizing induced currents.

I claim as my invention—

1. An iron rod extended through a secondary coil included in a telegraphic circuit, and adapted to move into and out of a separate detached primary coil, through which the current from an electric generator is constant, for the purpose of generating an induced current for telegraphic purposes, substantially in manner as herein described.

2. The improved telegraphic apparatus consisting of a primary coil included in the circuit of an electrical generator, a separate secondary coil included in a telegraphic circuit, an iron core encircled by the secondary coil and adapted to move into and out of the primary coil, and a telegraphic key adapted to actuate said reciprocating rod and cause its movement, as aforesaid, substantially in the manner and for the purpose herein set forth.

3. The combination, with a dynamo-machine, a primary coil included uninterruptedly in its primary circuit, a separate secondary coil in a telegraphic circuit, and an iron core encircled by the secondary coil and adapted to play in and out of the primary coil, of an auxiliary electro-magnet whose armature is united to the reciprocating core of the inductorium by interposed non-magnetic connections, so that the two shall move in unison, and whose helix is included in a circuit from the dynamo adapted to be opened or closed by means of a telegraphic key, substantially in the manner and for the purpose herein set forth.

4. The combination, with a dynamo-machine, a primary coil included uninterruptedly in its primary circuit, a separate secondary coil included in a telegraphic circuit, an iron core encircled by said secondary coil, and adapted to play in and out of the primary coil, and an auxiliary electro-magnet whose armature is united to the reciprocating core of the inductorium by non-magnetic connections, and whose helix is included in a circuit from the dynamo adapted to be opened and closed by the movement of a telegraphic key, of equalizing resistance-coils interposed, the one in the circuit of the primary coil and the other in an independent circuit from the dynamo, which is closed when the circuit through the helix of the electro-magnet is broken, and vice versa, substantially in the manner and for the purpose herein set forth.

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

P. H. VANDER WEYDE.

Witnesses:

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