(No Model.) 2 Sheets—Sheet 1.

P. H. VANDER WEYDE.

PRODUCING AND UTILIZING INDUCED CURRENTS.

No. 302,176. Patented July 15, 1884.

Fig. 1.

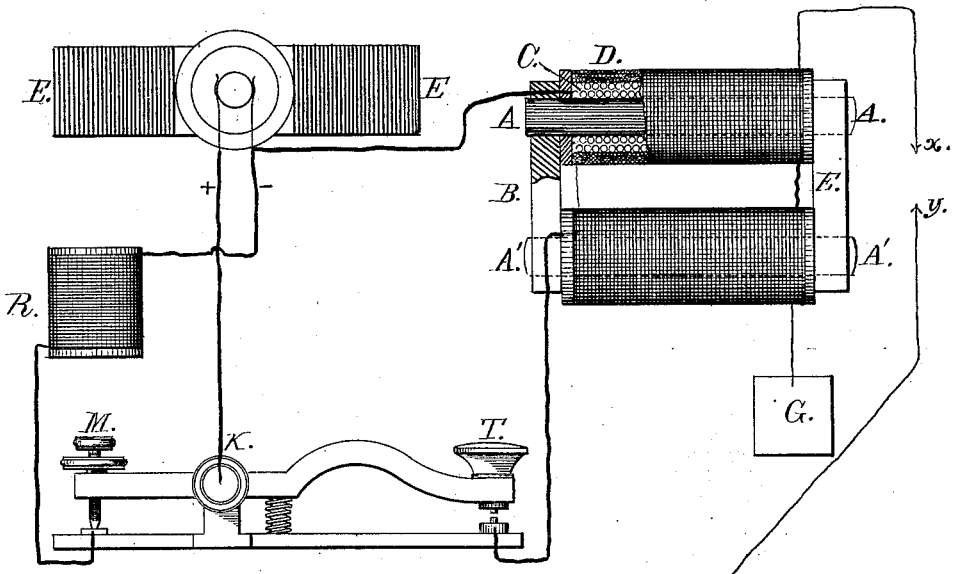
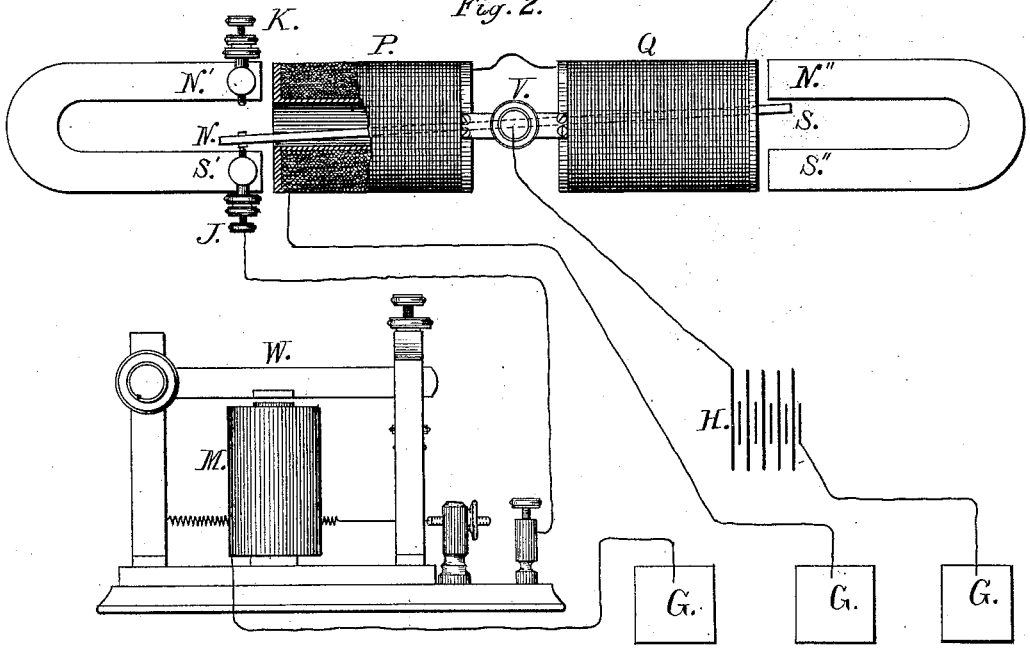


Fig. 2.



Witnesses.

A. W. Steiger.
G. H. Spencer

Inventor.

Peter H. VanderWeyde
By David A. Burr
Attorney.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

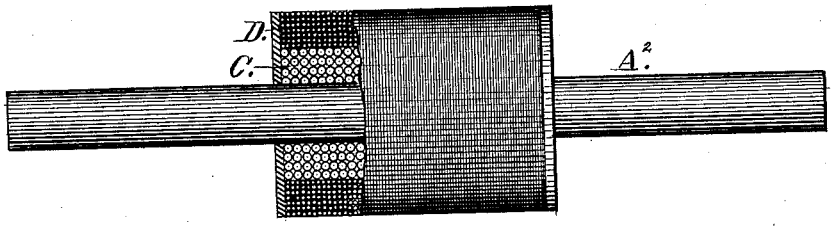


Fig. 4.

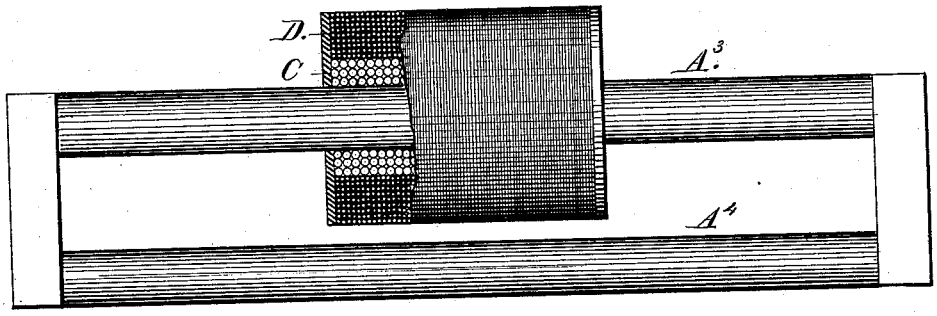
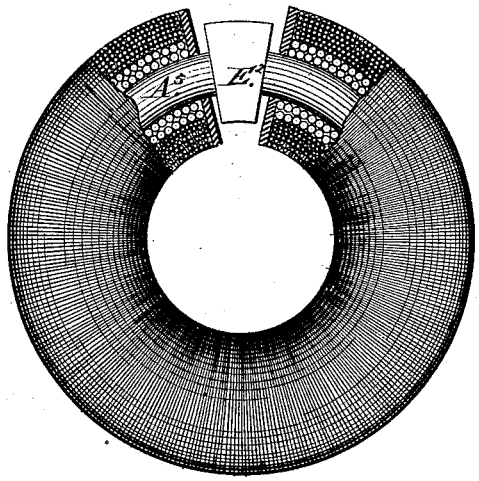


Fig. 5.



Witnesses.

Alf Steiger

G. H. Spencer.

Inventor.

Peter H. Vanderweyde

By David A. Burr

Attorney.

UNITED STATES PATENT OFFICE.

PETER H. VANDER WEYDE, OF BROOKLYN, NEW YORK.

PRODUCING AND UTILIZING INDUCED CURRENTS.

SPECIFICATION forming part of Letters Patent No. 302,176, 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 new and useful Improvements in Method of and Apparatus for Producing and Utilizing Induced Electrical 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.

I have discovered that by an elongation of the iron core of an induction-coil so that it shall project largely beyond the ends of the primary coil to restrain the free magnetism of the core, or by connecting the poles of the core to form a magnetic circuit for the same purpose, an increase in the quantity of the current is obtained, (as is proved by the capacity of the current in such case to charge longer lines of wire,) and this at the expense of intensity, the reduction in intensity having the advantage of reducing the tendency to loss of current by leakage, as well as of removing many objections heretofore found in the use of secondary currents due to their intensity.

My present invention relates, therefore, to a novel method of producing induced currents of increased quantity and diminished intensity by means of an induction-coil, having a core so lengthened or otherwise extended or enlarged as that the manifestation of free magnetism therein is prevented; and it relates likewise to apparatus for accomplishing the same and for utilizing the induced current so produced, as is hereinafter fully described. The use of a short iron core, by virtue of the free action upon the coils of the strong magnetism quickly developed at its ends, causes an increase of intensity in the secondary current, because of the rapidity with which the core becomes magnetized, while the binding down or confinement of the free magnetism by an elongation of the core or the connection of its opposite poles by an armature has the contrary effect, because of the comparative slowness with which the magnetism of the bar, and consequently its action upon the secondary coil, is effected. To obtain the maximum effect by a slow development and restraint of the free magnetism, I preferably take an ordinary horseshoe electro-magnet provided with a pair of coils for primary current, surrounded by a second pair of finer coils for secondary currents, and I connect the poles of the magnet by a well-fitting armature pressed forcibly against them. I find that the more closely this armature fits against the cores the more effectively this arrangement will operate; or I may take an ordinary induction-coil and use therewith a very long soft-iron core, with its ends projecting out far beyond the coils.

In the accompanying drawings, Figure 1 is a diagram of my improved apparatus for producing secondary currents of increased quantity and low intensity, the telegraph-key and the inductorium being illustrated in elevation, the latter partly in section. Fig. 2 is a similar diagram of my improved receiving apparatus adapted for use with the secondary current produced by my invention. Figs. 3, 4, and 5 illustrate modified forms of my improved induction-coil.

A B A′, Fig. 1, represent a horseshoe-magnet. Its iron cores A A′ are best made each of a bundle of wire. The cores are connected at one end by a soft-iron bar or cross-piece, B, and are encircled by a primary coil, C, of coarse wire, overlaid by a secondary coil, D, of fine wire, in the usual manner. The opposite ends of the cores A A′ are also connected by a second cross-piece, E, of soft iron, and both cross-pieces B and E are preferably perforated at each end, to allow the ends of the iron cores to pass completely through them, so as to insure intimate contact.

E is the electric generator, which may be either a dynamo or a galvanic battery, and which is made to send a contact-current to a telegraphic key, T K M. This key is constructed with double contacts T and M, so that when the key is up the current from the dynamo will be returned through the back contact, M, to the generator F, a resistance-coil, R, being inserted in the circuit; but when the key is pressed down this circuit will be broken at M, and the current be passed through the front contact, T, and the primary wire C of the induction-coil back to the generator E. The resistance in the coil R is made to equal that in the primary wire C of the induction-

coil, or nearly so, so as to equalize constantly the charge of the dynamo. When a galvanic battery is used, this coil R and the double contact-key are unnecessary. Each time the primary circuit from the generator is closed through the primary coil C of the magnet a secondary current running in a direction opposite to that of the primary current is created in the secondary coil D, and each time said primary circuit is broken a current running in the same direction as that of the primary current is generated in the secondary coil. As these currents are instantaneous they can produce only a temporary charge of the electro-magnet of the receiving-instrument, which may be included in the secondary circuit; hence they are only adapted for the transmission of the dots of the telegraphic code, and cannot produce the dashes, which require for their production a current of some appreciable duration. To produce dashes with the instantaneous induced currents, I take advantage of the alternate change in direction of said currents in connection with an improved polarized relay located at the receiving-station.

This improved relay is represented in Fig. 2 of the drawings. It consists of two spools, P Q, placed in line, end to end, with an open space between them, within which, midway between the spools, is pivoted a soft-iron needle, N S, whose ends extend through the spools. The spools are wound each with a coil of fine wire. The central longitudinal opening in each is made wide enough to permit the free oscillation therein of the needle as it vibrates upon the pivot between the spools. The two ends of the needle, passing through the spools on either side, are made to project out therefrom each between the poles N′ S′ or N″ S″ of a permanent steel horseshoe-magnet. One of these magnets is provided with adjusting-screws K K, fitted upon the ends of its poles, so that the end N of the needle vibrating between said poles may come into contact with the screws. A local battery, G, is connected with the needle through its pivot, and one of the screws, J, is connected with a sounder, M, so that the current of the battery entering the needle at its pivot G will be closed through the sounder by the contact of the end N of the needle with the adjusting-screw J. The coils upon the spools P Q are connected with each other, and are placed in a line-circuit including the secondary coil D of the induction-coil A B C D.

The operation of the apparatus thus constructed and arranged is as follows: When the telegraphic key T K M, Fig. 1, at the transmitting-station is depressed and the contact T is closed, the primary current sent thereby through the induction-coil C will generate an instantaneous secondary current in the exterior coil, D, of which one end is connected with the line and the other end with the ground, as represented in Fig. 1. This current passing over the line will arrive at the receiving-station, Fig. 2, and, passing through the coils upon the two spools P Q, will for an instant magnetize the coils N S, whose opposite ends will thereupon each be attracted by the poles of unequal name and repelled by those of equal name. The needle thus made to adopt the position indicated in positive lines, Fig. 2, will, by contact of its end N with the screw J, close the circuit of the local battery G and sounder M, and although the current which moved the needle was instantaneous, the needle, when moved thereby, will remain in the position to which it was thrown until a reverse current is passed through the coils P Q. Hence the local current will remain closed and the armature W of the local sounder will remain attracted until the reversed current induced in the coil C, by the lifting of the key T K M at the transmitting-station, reverses the poles of the needle N S. This reversal of the polarity of the needle N S, instantly produced by the reversal of the current, will cause the needle to swing out of contact with the screw J, and so break the circuit of the local battery and release the armature W of the sounder. The needle thus serves in fact as a key, repeating the motions of the key K T M of the transmitting-station.

The value and importance of my discovery in regard to the property and use of an induction-coil with a core having no free magnetism may be tested by removing the iron piece E, Fig. 1, so as to set the magnetic polarity of the cores A free, and by inserting in the line connected with the receiving-instrument, Fig. 2, a coil of such resistance—say, two thousand ohms—as that the induced current will refuse to work the relay through it. If, now, an additional resistance-coil—of, say, another one thousand ohms—be placed in the line, and the armature or connecting-piece E be replaced in close contact with the cores of the coil, the induced current will, upon the replacement of said piece, at once become sufficiently strong to move the relay and transmit the signals, proving thereby that a large increase of the induced current is obtained by the influence of the closed magnetic circuit and the confinement of the free magnetism in the cores, and that a reduction of current intensity is secured with a corresponding gain in quantity.

I contemplate the practical development of my secondary current of maximum quantity and minimum intensity by a restraint of evident magnetism in the inducing-core, through an increase of its length or of its magnetic capacity in any manner—as, for example, by the use of a long straight core, A^3, placed within the induction-coil, as illustrated in Fig. 3; or by means of a rectangular core, $A^3 A^4$, having primary and secondary coils C D wound upon its central portion, as shown in Fig. 4; or, by means of an annular core, A^5, upon which are wound the primary and secondary coils, as illustrated in Fig. 5, the core being divided

to facilitate wrapping, and then closed by means of a key, E, the core in each case being preferably constructed of a bundle of iron wire instead of a solid iron bar.

I claim as my invention—

1. The combination, with a primary circuit from an electric generator, and with a telegraphic key or contact-breaker included in said circuit to open and close the same, of a soft-iron core provided with two sets of coils, one of low resistance included in said primary circuit, and one of high resistance connected with a line-circuit for telegraphic and other purposes, and whose poles are connected together, or so far extended beyond the coils as to bind the free magnetism in the core, substantially in the manner and for the purpose herein set forth.

2. The combination, with the secondary coil in an inductorium whose primary coil is included in the circuit from an electric generator, and the poles of whose soft-iron core are connected together or extended so far beyond the coils as to bind the free magnetism in the core, of a key or contact-breaker included in the primary circuit, and a polarized relay included in the secondary circuit, and adapted by the movement of its needle to open and close a local circuit, all 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:
DAVID A. BURR,
A. W. STEIGER.