No. 774,922. PATENTED NOV. 15, 1904.

D. W. TROY.

APPARATUS FOR RECEIVING ELECTRICAL IMPULSES.

APPLICATION FILED APR. 11, 1904.

NO MODEL.

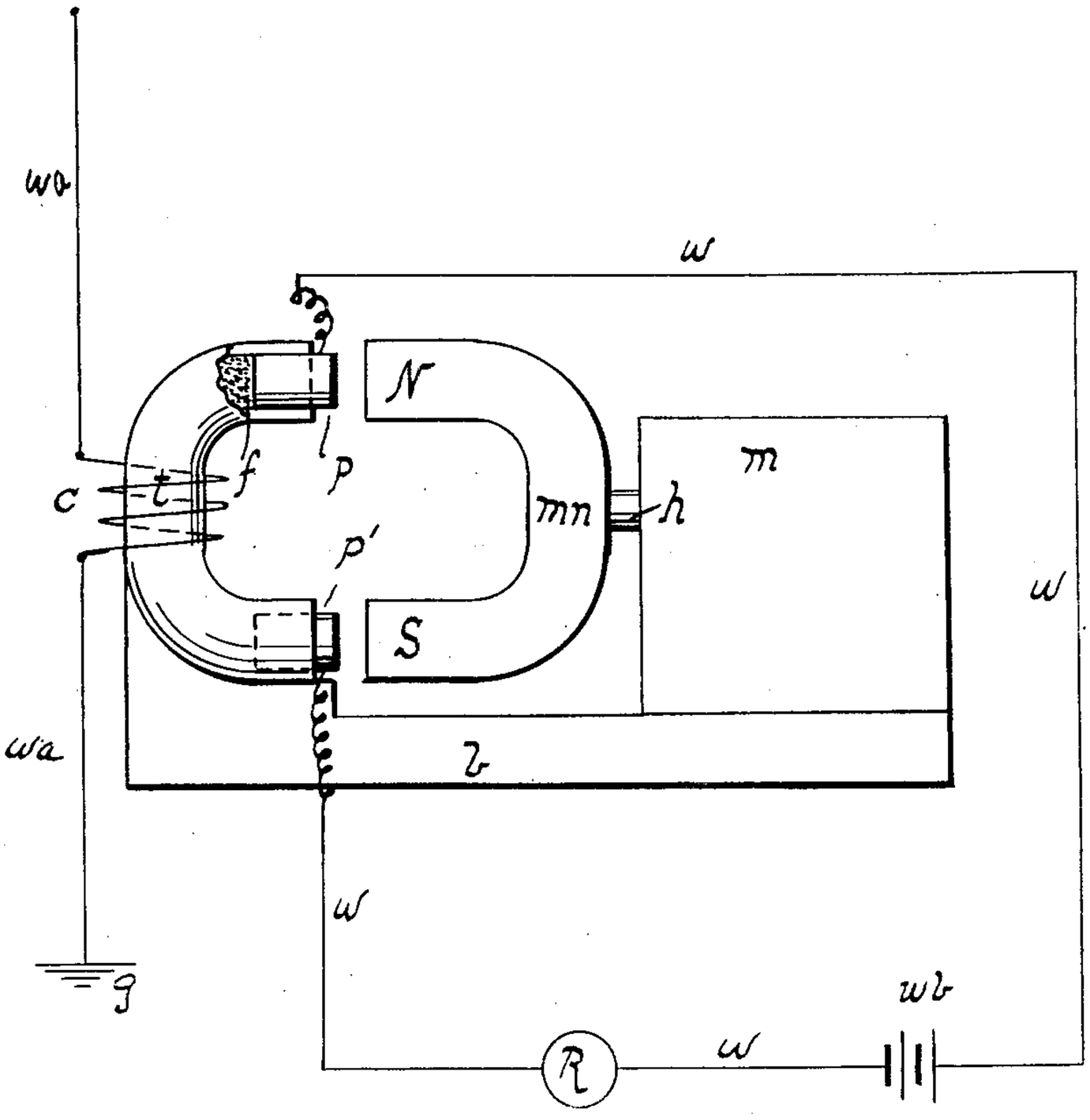

fig.1.

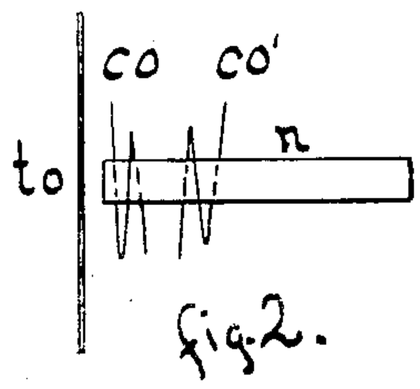

fig.2.

Witnesses
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UNITED STATES PATENT OFFICE.

DANIEL WATTS TROY, OF NEW YORK, N. Y.

APPARATUS FOR RECEIVING ELECTRICAL IMPULSES.

SPECIFICATION forming part of Letters Patent No. 774,922, dated November 15, 1904.

Application filed April 11, 1904. Serial No. 202,569. (No model.)

To all whom it may concern:

Be it known that I, DANIEL WATTS TROY, a citizen of the United States of America, residing in the city, county, and State of New York, (and having a post-office address at 32 Broadway, in said city,) have invented certain new and useful Improvements in Apparatus for Receiving Electrical Impulses, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

The object of my invention is primarily to provide an efficient receiver for such electrical impulses as are made use of in wireless or "space" telegraphy, to which art my invention primarily relates, although it is obvious that the invention may be used to advantage in other uses, such as telegraphy by means of wires or cables and in control of apparatus at a distance, either without connecting-wires or otherwise.

My invention is, in effect, an electromagnetic coherer in that the coherence of the particles forming a portion of a local circuit is produced principally by the electromagnetic action of wave-produced currents, as in wireless telegraphy and the like, and by the electromagnetic effect of the impulses in other applications.

In the drawings, Figure 1 represents the apparatus; Fig. 2, a diagram of a differentially-wound telephone-receiver used in one application as a local "sounder."

In Fig. 1 on a base *b* is an approximately horseshoe-shaped tube *t*, of glass or other insulating material. The shape of the tube is not, of course, material, that selected offering merely a better path for the magnetic circuit. The tube *t*, part of which is shown in section, is filled with a mixture of filings or small particles of magnetic material—such as iron, steel, or nickel, &c.—mixed, preferably, with small particles or dust of carbon. The ends of the tube are fitted with plugs or poles *p p'*, of iron or other metal of magnetic permeability, preferably soft iron. A local circuit *w w w w*, containing a receiving instrument—as a telephone, relay, or sounder of well-known type—and a battery or other source of electrical energy *wb*, is closed through the plugs *p p'* and the contents of the tube *t f*. A motor *m* is adapted to rotate a permanent magnet *mn*, having poles N and S upon an axis *h*, whereby the magnetic flux through the particles in the tube *t* is alternated with every revolution of the shaft *h*. The receiving-conductor is carried in a coil around *t*, as shown in the figure, where *wa wa* represents a vertical, such as is used generally in space telegraphy, and *c* the winding or coil around *t*.

g represents a ground.

As is well known, the passage around a body capable of transmitting magnetic lines of force of alternating currents of high frequency has the effect of increasing the permeability of the body. This feature is taken advantage of by Fessenden in his receiver shown in United States Patent No. 715,043, issued December 2, 1902. Any increase of permeability of the contents of the tube T will result in a greater strength of magnetic flux therein, and hence a greater mutual attraction of the magnetic particles and a consequent lowering of the resistance of the "coherer." As the inducing-magnet revolves the direction of the flux is constantly being changed, and therefore the resistance of the local circuit is likewise constantly changed.

An arrangement like Fig. 1 would allow a constant series of indications in the receiver R due to the changes of the flux direction. Upon an increase of the permeability of the contents of *t* these indications would become much louder (in case a telephone-receiver were used) or more powerful, and in this way the received impulses would be recognized. If a relay were used, (supposing the rate of revolution of the magnet *mn* comparatively slow,) its back spring could be so adjusted as not to allow movement of the armature until the current strength of the local circuit was increased by the lowering of resistance in the coherer. The action of the received impulses upon the magnetic particles in the tube *t* acts directly to decrease the lag upon the change in direction of the magnetic flux due to the perma-

nent magnet, and hence has the effect of directly increasing the permeability of the contents of *t*.

It is obvious that if two such devices as are shown in Fig. 1 be used, one having a coil, as at *c*, embraced in the direct receiving-circuit (or, as is usual in practice, in a circuit derived from the receiving-circuit) and the other without such coil, a differentially-wound receiver would be inoperative if its respective windings were energized by separate local currents through the different coherer-tubes. Upon any increase in the permeability of one of the receiver coherer-tubes the differentially-wound instrument would be operated. Such an application is so obvious that it is not specifically shown in the drawing. Fig. 2 merely shows a diagram of such a differentially-wound telephone, where *to* is the diaphragm, *n* the magnet, and *co* and *co'* the windings.

It is further obvious that various modifications can be had of the specific construction shown and described.

I am aware that high-frequency oscillations or impulses have been used heretofore to vary the permeability of a mass of magnetic particles embraced in a local circuit and subjected to an alternating magnetic flux by directly passing the high-frequency oscillations through the mass of particles. This seems to have been the result, or one result, in the detector shown in the British patent to Brown, No. 19,710, of 1899, although the purpose of the alternating magnetic flux in that device seems to have been intended merely for decohering. So far as I know, the alteration of the permeability of the mass of magnetic particles, subject to a normally alternating magnetic flux, by means of high-frequency oscillations in a coil surrounding the mass, is entirely novel. The advantages of the coil are manifest, as it is apparent that the alterations in permeability must be entirely due to the rapidly-alternating lines of force developed by the high-frequency oscillations, and by causing these lines of force to take up a common direction with reference to the mass greatly superior results can be had.

Having described my invention, what I claim is—

1. In apparatus of the class described, a local circuit having a portion thereof formed of comminuted magnetic particles in relatively loose contact, a normally alternating magnetic flux through such particles, and a winding around said particles adapted to be energized by received impulses, substantially as set forth.

2. In apparatus of the class described, a conductor of relatively high resistance composed of a mass of comminuted magnetic particles in relatively loose contact, means for setting up a normally varying magnetic flux therethrough, and a winding around said mass adapted to be energized by high-frequency oscillations, substantially as set forth.

3. In apparatus of the class described a variable resistance adapted to vary with intensity of magnetic flux therethrough, a normally varying magnetic flux therethrough, and a winding for conveying high-frequency impulses and adapted to vary the rate of change of such normal magnetic flux, substantially as set forth.

4. In apparatus of the class described a mass of comminuted material permeable to magnetic lines of force, means for setting up a normally varying magnetic flux therethrough, a local circuit embracing such mass, and a winding around such mass adapted to be energized by high-frequency impulses, substantially as set forth.

5. As a coherer, a mass of magnetic particles in relatively loose contact, means for setting up a varying magnetic flux therethrough, and means for varying the magnetic permeability of such mass consisting in a winding around such mass adapted to be energized by received impulses, substantially as set forth.

6. In apparatus of the class described contact of variable resistance having its members of magnetic material, a normally varying magnetic flux therethrough, and a winding around said members adapted to be energized by high-frequency impulses, substantially as set forth.

7. In apparatus of the class described a variable-resistance contact composed of members of magnetic material, a normally alternating magnetic flux therethrough, and means for altering the permeability of such members by means of a winding adapted to be energized by high-frequency impulses, substantially as set forth.

8. In apparatus of the class described a resistance variable in some function of the intensity of a magnetic field therethrough, a normally varying magnetic field therethrough, and a high-frequency winding adapted to vary the normal rate of change of such magnetic field, substantially as set forth.

9. In apparatus of the class described a resistance variable in a function of the intensity of magnetic flux therethrough, a normally varying magnetic flux therethrough, and a winding for received impulses adapted when energized to vary the normal rate of change of such magnetic flux, substantially as set forth.

10. As a coherer, a mass of comminuted particles embracing magnetic material, a normally varying magnetic flux therethrough, a local circuit embracing such mass as a resistance, and a winding around such mass energized by received impulses, substantially as set forth.

11. As a coherer, a mass of comminuted par-

ticles embracing magnetic material, and forming part of a local circuit, a normally varying magnetic flux therethrough, and a winding around such mass energized by received impulses, substantially as set forth.

12. A variable contact composed of members permeable to magnetic lines of force, a normally varying magnetic flux therethrough, and a winding energized by high-frequency impulses and adapted to vary the permeability of such members, substantially as set forth.

In witness whereof I have hereto set my hand, at New York, N. Y., this 12th day of March, 1904.

DANIEL WATTS TROY.

Witnesses:

EDWARD S. HULL,

WILLIAM L. PATTERSON.