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D. W. TROY.

RECEIVER FOR TELEPHONES OR THE LIKE.

APPLICATION FILED JUNE 24, 1904.

NO MODEL.

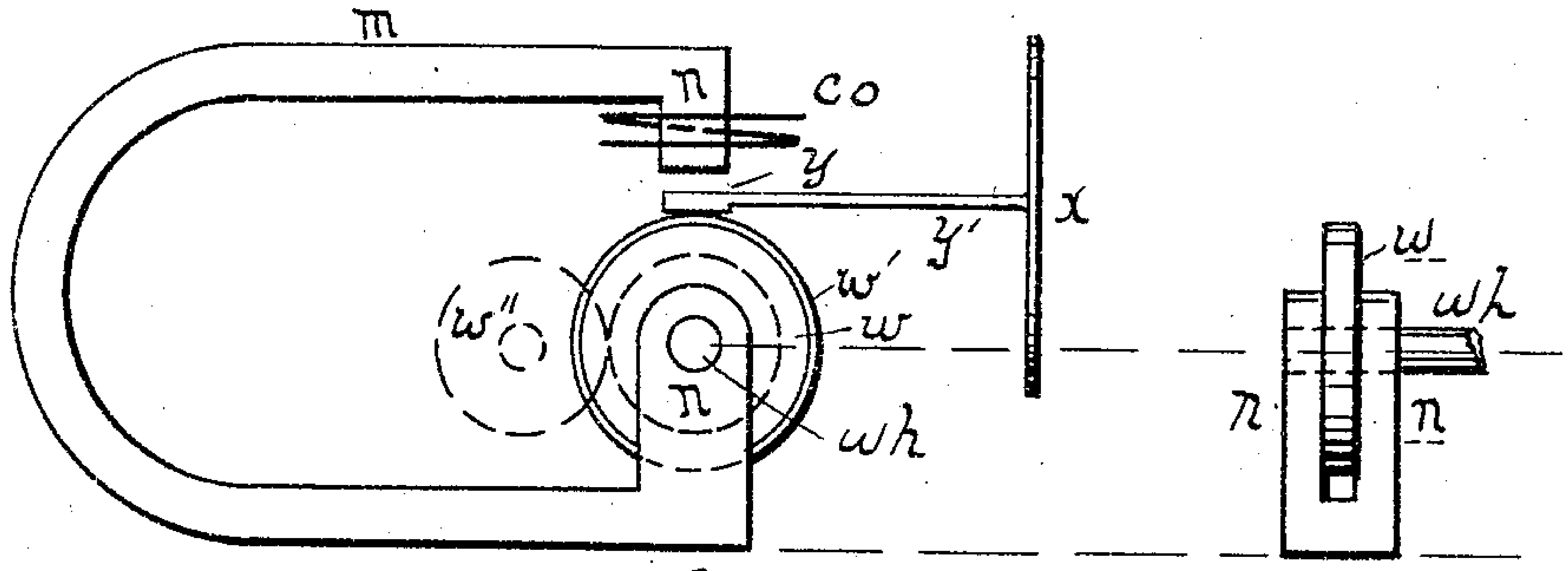

Fig 1.

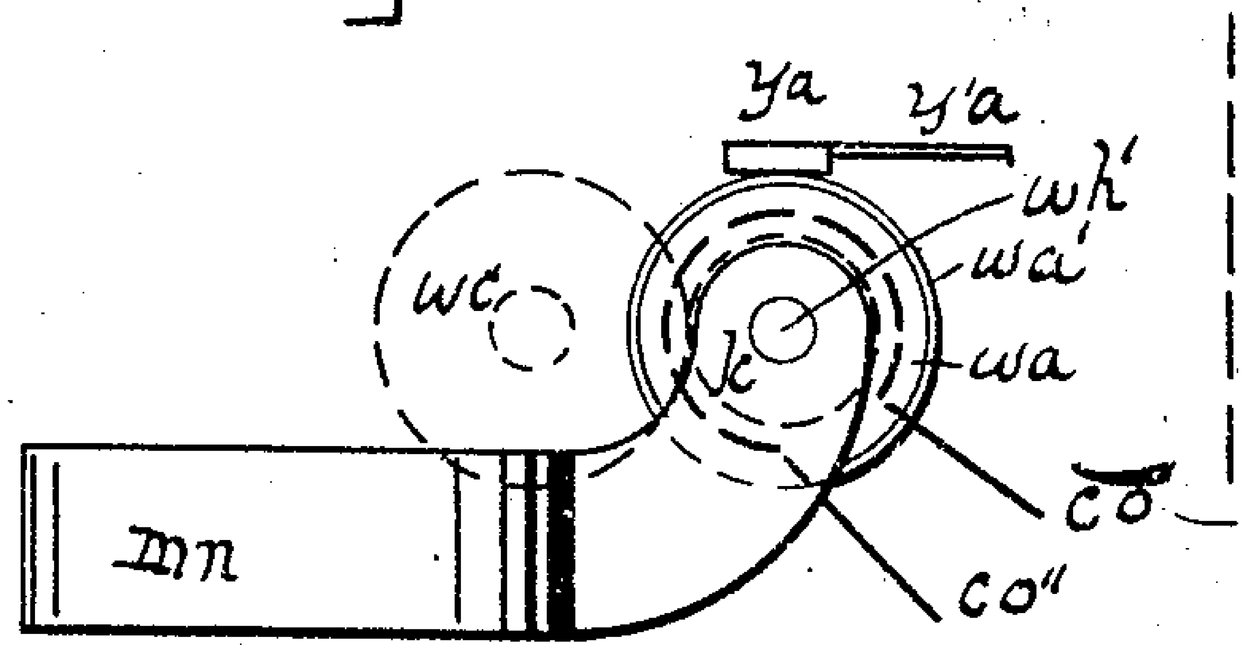

Fig 2.

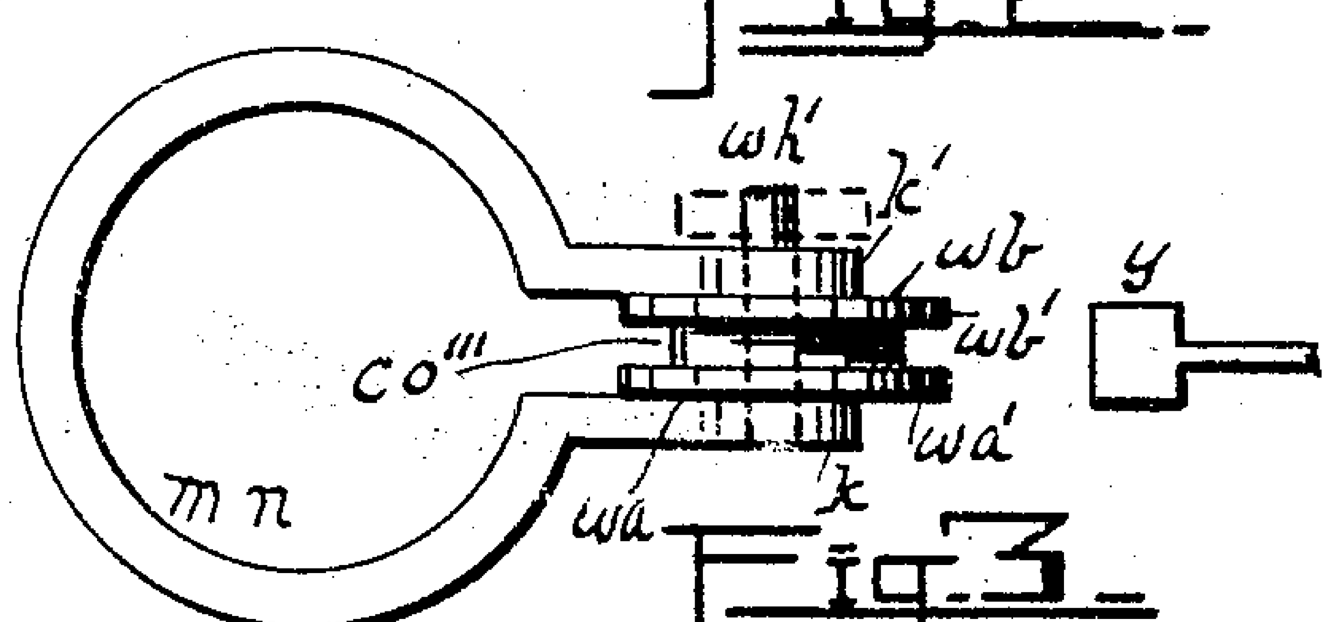

Fig 3.

Witnesses

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Inventor

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No. 774,923. Patented November 15, 1904.

UNITED STATES PATENT OFFICE.

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

RECEIVER FOR TELEPHONES OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 774,923, dated November 15, 1904.

Application filed June 24, 1904. Serial No. 213,975. (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, borough of Manhattan, in said city, have invented certain new and useful Improvements in Receivers for Telephones or the Like, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to receivers for telephonic signals and the like in which the energy of relatively minute electrical current impulses is manifested by the vibration of a diaphragm or otherwise, as may be desired; and the object of the present invention is to provide a more efficient receiving apparatus for telephonic currents as well as to provide a delicate receiving apparatus for use in other directions—as, for example, in telegraphy by alternating currents or impulses—and in general to provide more efficient apparatus than now known for the production of observable indications from extremely-weak current impulses.

Primarily, the invention herein disclosed is a "loud-speaking" telephone-receiver, the increased efficiency manifesting itself in increased loudness of the electrically-produced sounds. It is obvious that the added efficiency may be differently manifested, if desired.

Referring to the drawings, Figure 1 is one type of apparatus showing the invention, while Figs. 2 and 3 are views of a modification differing somewhat in minor detail.

As far as I am aware the experiments leading to a loud-speaking receiver have heretofore been directed along the line of increasing the permeability of the magnetic field embracing the diaphragm, as in the receiver of Ader and in others of related type, and in increasing the power of the magnetic system with the exception, perhaps, of the electromotorgraph of Edison, in which a chalk cylinder moistened with an electrolyte, as a solution of potassium iodid, is revolved in contact with a metallic strip connected with the diaphragm and the friction between cylinder and strip modified by the received current impulses. In the Edison device loud sounds were produced, but at the expense of clearness in articulation. The inherent defect of such an apparatus is the impossibility of freeing the diaphragm from vibrations directly due to the roughness of the chalk cylinder, as no porous body, as chalk or the like, could be made sufficiently smooth to avoid considerable departures from true cylindrical form. The presence of the electrolyte increased this defect.

In the present invention the loudness of received speech or sounds should be as great if not much greater than in the Edison device referred to, while, owing to the construction and principle of operation, the mere "motor noises" can be almost completely obviated. Instead of making use of the decomposition of an electrolyte and consequent reduction of friction in this device the friction is that produced between a revolving wheel forming part of a magnetic circuit and an armature connected to the diaphragm. The wheel can easily be made cylindrical and smooth within a very small percentage of error. The contact between the wheel and armature can be extremely delicate, and the mechanical or motor noises can be reduced at least to the extent possible in a well-constructed phonograph. By varying the magnetic strength of the system the friction is varied and vibrations are produced corresponding thereto. Referring to Fig. 1, such a wheel is shown at *w* upon a shaft *wh* between branches of one pole *n n* of a permanent magnet *m*. *w'* is a rim upon the wheel, which may be either an electroplating of gold or other non-oxidizable metal or a thin tire of metal. The armature is shown at *y* connected by a strip *y'* to the diaphragm at *x*. A motor of any convenient type is indicated at *w''*, but not shown more fully, as its construction forms no part of this invention. A motor such as is used with graphophones and the like is preferable. Upon the upper pole of the magnet *n* is wound the coil *co*, corresponding to the winding of the ordinary type of Bell receiver.

The operation of the apparatus is obvious. The diaphragm is constantly strained by reason of the drag upon the strip *y'*, (direction of rotation assumed counter-clockwise,) due to the friction between y and w'. This friction is due almost entirely to the magnetic attraction between w and y, as the mechanical friction is eliminated as much as possible. It is obvious that upon increase of this "magnetic" friction by reason of a received current impulse the diaphragm will be vibrated, not by the energy of the received impulse, but by that of the motor, the received impulse acting indirectly and merely to throw into operation the local source of power. Hence the loudness of the sounds produced is not dependent directly upon the energy of the received impulses.

In Figs. 2 and 3, for the purpose of obtaining a better magnetic arrangement, the wheel is made double, as wa wb, with respective rims wa' wb'. The coil (shown diagrammatically in Fig. 2) co' co'' lies between the two flanges thus formed and around a central non-magnetic hub co''', Fig. 3, but not in contact with the hub or wheel, as it is desired that the coil remain stationary though the wheel revolve. The magnet mn has poles k k', between which the double wheel revolves upon its shaft wh'. ya, Fig. 2, is the armature, and $y'a$ the connecting-strip. The diaphragm is indicated at x', and the motor at wc. The armature for this type would necessarily be wide enough to be in contact with both wheel-rims, as at y, Fig. 3. In this way the magnetic field through the armature would be stronger than in Fig. 1, and variations in its strength would be more powerfully manifested as vibrations of the armature and diaphragm. It is obvious, further, that various modifications are possible in the arrangement of the variable magnetic field and the friction device without departure from the principle of the invention, and it would even be possible to avoid actual physical contact between the armature and the wheel-flanges of Fig. 3 should this ever become necessary in practice. It is further apparent that whatever actual mechanical friction, as distinguished from that due to the magnetic attraction between the parts, may be present may be reduced to an infinitesimal degree by the adoption of iridium contact-points on the under side of the armature or other like device for lessening friction.

I am aware of the device invented by Anders and shown in United States Patent No. 253,491, February 14, 1882, in which like poles of a magnet were given a rotary motion with reference to an iron ring capable of slight motion upon its axis and connected by a cord to a diaphragm. Instead of using the side of a ring, as in the Anders device, by placing the armature in contact with the perimeter of the disk I gain an extremely great advantage, as it is a very simple matter to adjust the rotating wheel so that the path described by a point on its circumference shall always be the same. Further, by making the wheel one of the poles of the system and by approximating the other pole to the wheel at the point of contact with the armature I utilize practically all of the available flux, as the clearance between the stationary pole and the armature may be as small as the mechanical construction will permit—say a fraction of a millimeter, if desired. In the type shown in Fig. 2 an air-gap in the magnetic circuit becomes unnecessary, as the armature bridges the revolving pole-pieces, and except for the leakage flux the total magnetic energy is available.

Having described my invention, what I claim is—

1. In a receiver of the class described a wheel of magnetically-permeable material normally rotated and forming a part of a magnetic circuit, a magnetic armature in sliding contact therewith and directly connected to a diaphragm, and means for varying the friction between such wheel and armature by received impulses, substantially as set forth.

2. In a receiver of the class described a diaphragm, an armature rigidly connected thereto and in sliding contact with a normally rotating wheel forming part of a magnetic system, and means for varying the friction between such wheel and such armature by received impulses, substantially as set forth.

3. In apparatus of the class described, a rotating wheel forming one pole of a magnetic system, an armature in sliding contact with such wheel, a diaphragm directly connected with such armature, and a winding embracing such magnetic system, substantially as set forth.

4. In apparatus of the class described a normally rotating wheel, means for producing a magnetic flux through such wheel in a practically constant radial direction, an armature in sliding contact with such wheel, and directly connected to a diaphragm, and means for varying the strength of such flux by received impulses, substantially as set forth.

5. In apparatus of the class described a normally rotating wheel, means for producing a normal magnetic flux embracing a portion of the angular travel of such wheel, an armature directly connected to indicating means and in sliding contact with such wheel at the point embraced by such flux, substantially as set forth.

6. In apparatus of the class described, a normally rotating wheel, an armature directly connected to an indicating device and in sliding contact with such wheel, means for producing a normal magnetic flux through such wheel and armature of practically constant position and direction, and means for varying the strength of such flux by received impulses, substantially as set forth.

7. In apparatus of the class described, a normally rotated disk forming one pole of a per-

manent magnetic system, the other pole of such system approximated to the perimeter of such disk, an armature between the disk and the other pole and in sliding contact with the disk, an indicating device directly connected to the armature, and a winding embracing the magnetic system, substantially as set forth.

8. In apparatus of the class described, means for producing an intense magnetic flux between a normally rotating disk and a pole-piece approximated thereto, an armature in sliding contact with such disk and rigidly connected with a diaphragm and traversed by such flux and a winding adapted to vary the strength of such flux with received electrical impulses, substantially as set forth.

9. In apparatus of the class described, a normally rotating iron disk forming one pole of a magnetic system, the other pole of such system approximated to such disk, an armature in sliding contact with such disk at the point of greatest flux density between such poles and in direct connection with a diaphragm, and a winding embracing such magnetic system, substantially as set forth.

10. In apparatus of the class described, a normally rotating iron disk forming one pole of a magnetic system, another pole of such system closely approximated to such disk, an armature between such other pole and such disk and in sliding contact with such disk, drag-indicating means directly connected to such armature, and means for varying the flux strength of such system by received electrical impulses, substantially as set forth.

11. In apparatus of the class described, a normally rotating disk of material of high magnetic permeability, a magnetic system embracing such disk as one of its poles, an armature in sliding contact with such disk between such poles, a diaphragm directly in contact and connected with such armature, and a winding embracing such magnetic system, substantially as set forth.

12. In apparatus of the class described, a normally rotating disk, a magnetic system embracing such disk as one of its poles, an armature in sliding contact with such disk and in the path of the flux between the poles of such magnetic system, a diaphragm directly connected with such armature, and a winding embracing such magnetic system, substantially as set forth.

13. In apparatus of the class described, means for setting up an intense magnetic flux between a pole-piece and a normally rotating iron disk at a normally fixed position in its angular travel, an armature in sliding contact with such disk in the path of such flux, and a diaphragm directly connected to such armature, substantially as set forth.

14. In a receiver operating by variations of magnetic drag a magnetic system having one of its poles a normally rotating disk, and an armature rigidly connected to a drag-indicating device and in sliding contact with such disk between such poles, substantially as set forth.

15. In an apparatus of the class described, a magnetic flux through a short air-gap between a pole-piece and a normally rotating wheel forming part of the magnetic circuit, an armature in such air-gap and in sliding contact with such wheel, and a vibration-indicating device, directly connected to such armature, substantially as set forth.

16. In apparatus of the class described, an armature directly connected to a member capable of vibration, as a diaphragm, a normally rotating iron wheel in sliding contact with such armature, a magnetic system having its poles approximated respectively to such armature and such wheel, and means for varying the flux density of such magnetic system by received electrical impulses, substantially as set forth.

17. In apparatus of the class described, a magnetic system, an iron disk forming one of the poles of such system and normally rotated, another pole of such system approximated to the perimeter of such disk, an armature between such pole and perimeter and in sliding contact with the said wheel and directly connected to a member capable of vibration, substantially as set forth.

In witness whereof I have hereunto set my hand, at New York, N. Y., this the 13th day of April, 1904.

DANIEL WATTS TROY.

In presence of—

HENRY B. FORD,

EDWARD S. HULL.