J. MURGAS.

MAGNETIC DETECTOR.

APPLICATION FILED MAR. 17, 1909.

930,780. Patented Aug. 10, 1909.

Fig. 1

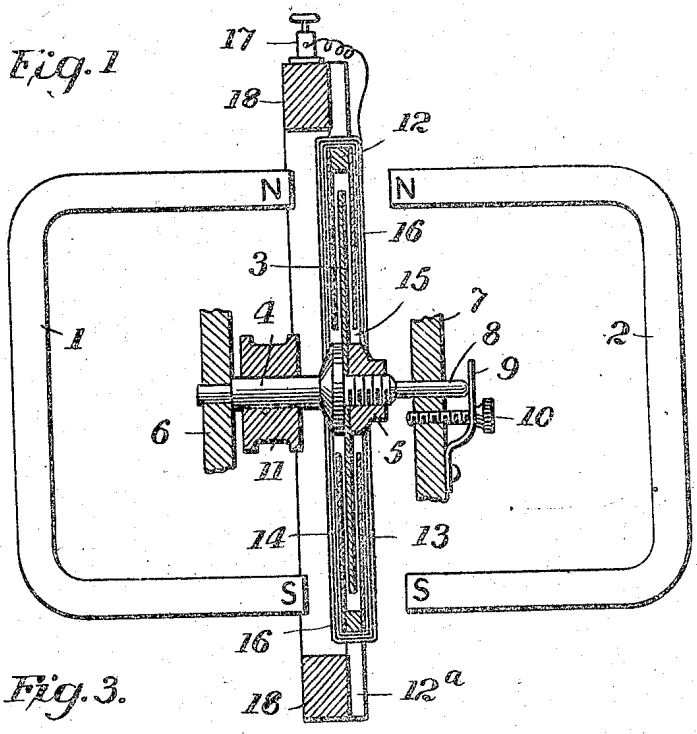


Fig. 3.

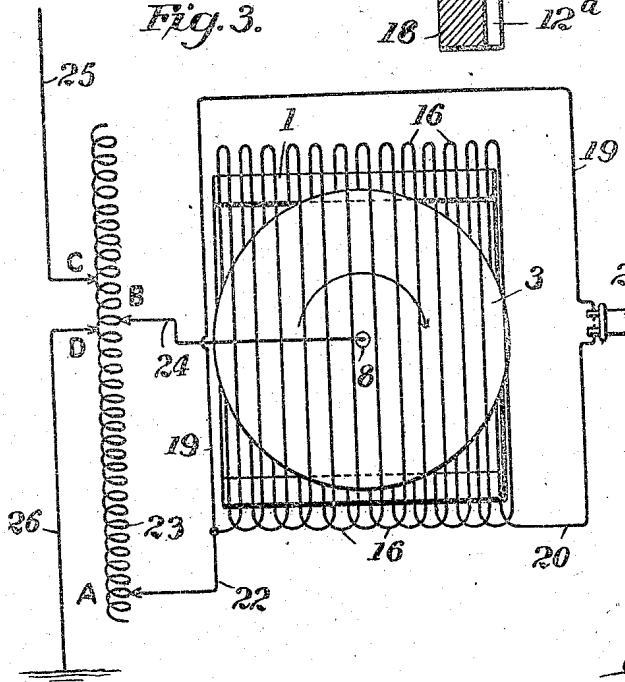
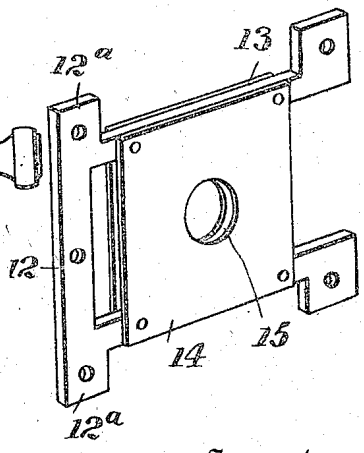


Fig. 2.



Witnesses

J. G. Hinkel

J. J. McCarthy

Inventor

Joseph Murgas

By Foster, Freeman, Watson & Coit

Attorneys

UNITED STATES PATENT OFFICE.

JOSEPH MURGAS, OF WILKES-BARRE, PENNSYLVANIA.

MAGNETIC DETECTOR.

No. 930,780. Specification of Letters Patent. Patented Aug. 10, 1909.

Application filed March 17, 1909. Serial No. 483,964.

To all whom it may concern:

Be it known that I, JOSEPH MURGAS, a citizen of the United States, and resident of Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Magnetic Detectors, of which the following is a specification.

My invention relates to detectors for electric oscillations such as are produced in wireless telegraphy, and more particularly, to detectors of the magnetic type.

A detector of this character is shown and described in my co-pending application Serial No. 455,335, filed September 29, 1908, allowed January 29, 1909. As explained in said application, such devices depend for their operation upon the principle that the hysteresis of iron, or other magnetic material is affected to a marked degree by the action of electric oscillations thereon. If a magnetic mass be continuously moved in a magnetic field, the field will be continuously distorted, due to the lag of the magnetization of the mass behind the magnetizing force. As long as the magnetic mass is moved at a uniform rate in a field of constant strength, the distortion remains the same, but if, now, electric oscillations be caused to act upon said moving mass, there is produced a sudden change in the amount of lag, and consequently, a sudden shifting of the magnetic field. Therefore, by arranging suitable apparatus to indicate this sudden shifting of the field, the presence of such electric oscillations may be readily detected. Such magnetic detectors are designed to coöperate with the usual aerial and ground wire of a receiving station, and are ordinarily connected with a transformer or auto-transformer which is preferably adjustable. In order to facilitate proper tuning, an adjustable condenser also has heretofore been used, the circuit containing the inductance and capacity constituting a resonator, which may be adjusted so as to respond to various oscillation frequencies, as is well understood.

One object of the present invention is to provide a device which shall be more efficient and capable of sharper tuning than those heretofore employed.

A further object is to provide a device combining the functions of detector and condenser, in such manner that no external condenser is required.

With the above and other objects in view, and to simplify and generally improve such apparatus, my invention consists in the construction and arrangement of parts hereinafter described, and illustrated in the accompanying drawing, in which:—

Figure 1 is a central section of my improved device, complete, parts being shown in elevation; Fig. 2 is a perspective view, on a smaller scale, of one of the parts of the device; and, Fig. 3 is a diagrammatic view showing the electrical connections employed.

As shown in the drawing, the magnetic field is produced by means of a pair of permanent horse shoe magnets 1, 2, arranged in opposition, with their like poles adjacent. Other forms of steel magnets or electromagnets may, of course, be equally well employed, if desired, the only requirement being that the field produced shall be substantially constant in force and direction. Mounted between the opposed poles of these magnets is a disk 3 preferably formed of soft iron. This disk is mounted on a shaft 4, and is clamped in position thereon by means of a nut 5, coöperating with an annular shoulder on the shaft. The shaft 4 is journaled at its ends in fixed supports 6 and 7, one end of the shaft projecting beyond the support, as shown at 8. A contact spring 9, secured at one end to the support 7, bears against the extended end of the shaft, and its tension is regulated by means of a thumb screw 10. A pulley 11 is fixed to the shaft and is adapted to receive a belt (not shown) by means of which the shaft and disk may be rotated.

Supported between the poles of the magnet is a rectangular frame 12 having one side open, and formed of hard rubber or other insulating material. This frame is of a thickness slightly greater than that of the disk, and is so disposed as to lie in the same plane. To each side of this frame is secured a thin plate of mica or other insulating material, as shown at 13 and 14, said plates being provided with a central opening 15 adapted to receive the annular shoulder and associated clamping nut 5, as shown in Fig. 1. Around the frame 12 and outside of the plates 13 and 14, is wound a thin flat coil 16 of insulated copper wire, which may consist of one or more layers. This coil is, of course, spread apart at its middle so as to avoid contact with the hub of the disk, but otherwise

the coil is arranged so as to, as nearly as possible, enveiop the disk on all sides. The frame 12 is provided at its corners with projecting lugs 12ª, by means of which it is secured to a supporting frame 18, which frame 18 also carries binding posts 17, adapted to receive the ends of the coil 16.

Referring now to Fig. 3, it will be seen that the two terminals 19 and 20 of the coil 16, are connected to s .ne electro-responsive device as a telephone receiver, 21.

23 designates the usual auto-transformer, to which is connected the aerial 25 and the ground wire 26. The points of connection, C and D, respectively, of these two wires with the auto-transformer are preferably adjustable. Some point in the coil 16 is also connected to a point A of the auto-transformer, and for convenience, there is illustrated a conductor 22 extending from the point A to one end of the coil 16 and forming therewith a common junction with the terminal 19 thereof. It will, of course, be understood, however, that any other part of the coil 16 may be connected to the transformer, if desired, without in any way altering the results.

Extending from the contact spring 9 to some point B of the auto-transformer, is a conductor 24 which thus serves to connect the metal of the disk 3 with the transformer. The points A and B, of connection of the wires 22 and 24, respectively, are made adjustable so that any desired amount of inductance may be included between them.

It will now be seen that the disk 3 and coil 16 constitute the two plates of a condenser, such plates being separated by a suitable dielectric, such as the mica plates 13 and 14. It will also be observed that the parts 22, 23, 24, 3 and 16, constitute a resonator, including a condenser and an adjustable inductance. By moving the points of connection A and B closer together or farther apart, any desired tuning may be obtained, as is well understood.

In operation, the disk 3 is caused to rotate continuously at an uniform speed. As explained above, the magnetic field will be thus continuously distorted, but, since the disk is of symmetrical form relative to its axis of rotation, and since it is driven at uniform speed, the distortion of the field will remain constant, and no effect will be produced in the telephone receiver. When, however, electric oscillations are set up in the resonator circuit, above described, such oscillations passing into and through the disk 3 serve to produce a sudden variation in its hysteresis, and a consequent sudden shifting of the magnetic field relative to the stationary coil 16. Such shifting of the field therefore causes induced currents in the coil 16, which in turn produce an audible effect in the telephone receiver, and thus serve to render the passage of the electric oscillations manifest.

It will be observed that the apparatus illustrated in Fig. 1 serves the double purpose of a detector and condenser, thereby obviating the necessity of using any external condenser. By varying the size of the disk and the distance between it and the coil 16, the capacity of the apparatus as a condenser may be varied, and, by providing an adjustable inductance in the resonator circuit, any required tuning may be effected.

It will thus be seen that I have provided a very simple device with few parts and no delicate adjustments, and one which experiment has demonstrated is capable of producing very efficient results, and it is thought that the numerous advantages of my invention will be readily appreciated by those skilled in the art.

What I claim is:—

1. In an electric oscillation detector, the combination with means for producing a normally stationary magnetic field, a conductor of magnetic material movable in said field, means for continuously moving said conductor in said field, and means in inductive relation to said field, for rendering the passage of oscillations manifest, said last mentioned means and said conductor together constituting a condenser through which the oscillations pass.

2. In an electric oscillation detector, the combination with means for producing a normally stationary magnetic field, a disk of conducting magnetic material rotatable in said field, means for continuously rotating said disk, means for conducting the oscillations of said disk and means in inductive relation to said field for rendering the passage of oscillations manifest, said last mentioned means and said conductor together constituting a condenser through which the oscillations pass.

3. In an electric oscillation detector, the combination with means for producing a magnetic field, of a disk of conducting magnetic material, said disk and field being relatively movable, means for conducting the oscillations to said disk, and means for rendering the passage of oscillations manifest comprising a coil surrounding said disk, said coil and disk constituting a condenser through which the oscillations pass.

4. In an electric oscillation detector, the combination with means for producing a magnetic field, of a conductor of magnetic material in said field, means for rendering the passage of the oscillations manifest comprising a coil in inductive relation to said field, said coil and field being normally stationary with relation to each other but said coil and field on the one hand and said conductor on the other being relatively movable and means for conducting the oscillations

through said conductor, said means including a condenser formed by the said coil and conductor themselves.

5. A combined condenser and oscillation detector comprising a disk of conducting magnetic material, means for producing a magnetic field, means for rotating said disk in said field, a stationary coil surrounding said disk, and a dielectric separating said coil and disk.

6. In a magnetic detector, means for producing a magnetic field, a magnetic mass and means for continuously moving the same in said field, said mass constituting one plate of a condenser, means constituting the other plate of said condenser, and means for conducting the electric oscillations through said condenser.

7. In a magnetic detector, means for producing a magnetic field, a magnetic mass, and means for continuously moving the same in said field, said mass constituting one plate of a condenser, means in inductive relation to said field for rendering the passage of oscillations manifest, said means comprising the other plate of the condenser, and means for conducting the oscillations through said condenser.

8. In a magnetic detector, means for producing a stationary magnetic field, a symmetrical magnetic mass and means for rotating such mass about its axis in said field at a uniform rate so that a constant unvarying distortion of said field is produced, means for subjecting said mass, while rotating, to the influence of electric oscillations and thus producing a change in the distortion of the field, and means in inductive relation to said field for rendering such change manifest.

9. In a magnetic detector, means for producing a stationary magnetic field, an iron disk, and means for continuously rotating said disk on its axis in said field, and a thin flat stationary coil of wire enveloping said disk but insulated therefrom, said disk and coil serving as a condenser to conduct the oscillations, and an electro-responsive device connected with the terminals of said coil.

10. In a receiving apparatus for electric oscillations, the combination with an autotransformer, and aerial and ground wires connected thereto, of means for producing a magnetic field, an iron disk in said field, means for rotating said disk, a conductor connecting said disk to one point of said transformer, a stationary coil in proximity to said disk and insulated therefrom, a conductor connecting said coil with another point of said transformer, both said points of connection being adjustable, and an electro-responsive device connected with the terminals of said coil.

11. In a magnetic detector for electric oscillations, in combination, a magnetizing member, and a magnetizable member relatively movable, said magnetizable member being located in the field created by the magnetizing member, and means for creating changes in magnetism in the magnetizable member, said means and magnetizable member forming a condenser.

12. In a magnetic detector for electric oscillations, in combination, a magnetizing member, and a magnetizable member relatively movable; said magnetizable member being located in the field created by the magnetizing member, and means for creating changes in magnetism in the magnetizable member, said means being inductively affected by the magnetizable member for receiving oscillations, and said means and magnetizable member forming a condenser.

13. At a receiving station in a wireless telegraph system, the combination with an oscillation receiving conductor, of means for creating a magnetic field, a core of magnetic material, said means and core being relatively movable, means connected to the oscillation receiving conductor for creating changes in magnetism in said core and a receiving instrument inductively affected by the core for receiving oscillations, said second means and core forming a condenser through which the oscillations pass.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH MURGAS.

Witnesses:

JOHN P. POLLOCK,

JOSEPH L. CAREY.