E. E. CLEMENT.

APPARATUS FOR RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

APPLICATION FILED NOV. 29, 1911.

1,156,976.

Patented Oct. 19, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

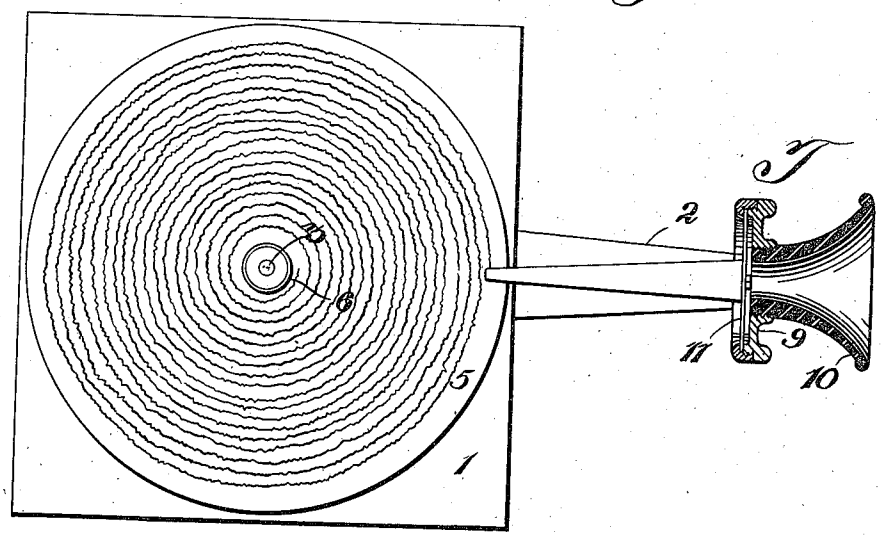
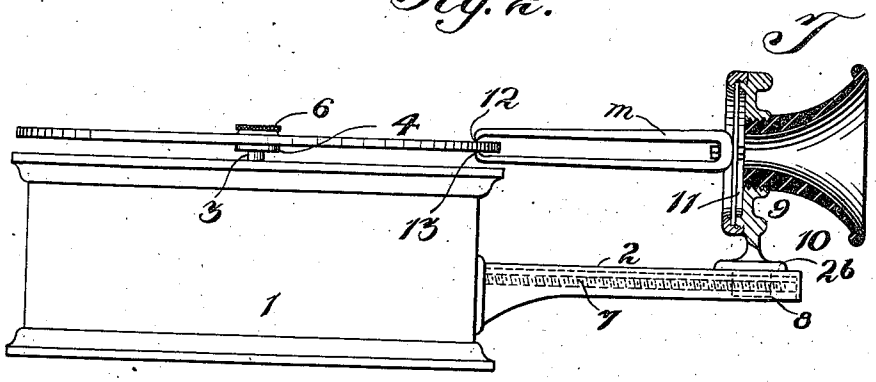


Fig. 2.



Witnesses

H. B. Löwenstein.

James H. Marr

Inventor

Edward E. Clement

E. E. CLEMENT.

APPARATUS FOR RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

APPLICATION FILED NOV. 29, 1911.

1,156,976.

Patented Oct. 19, 1915.

2 SHEETS—SHEET 2.

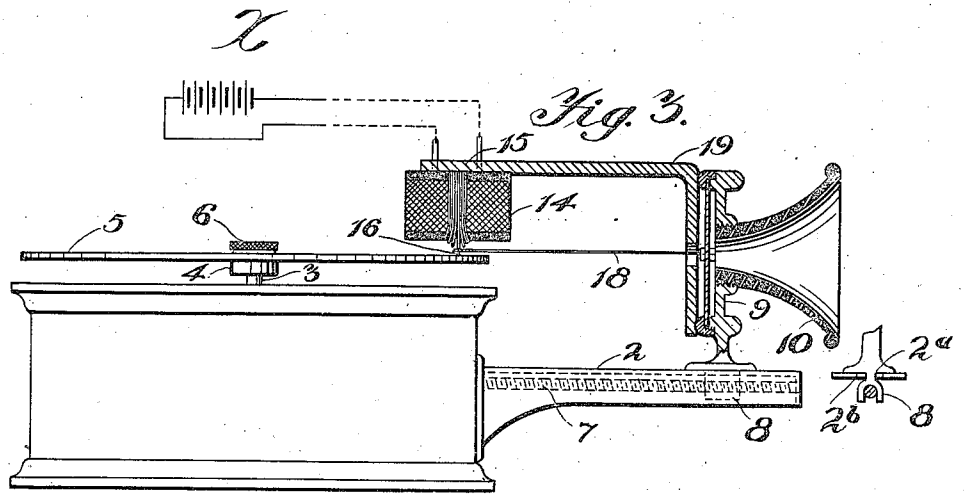


Fig. 3.

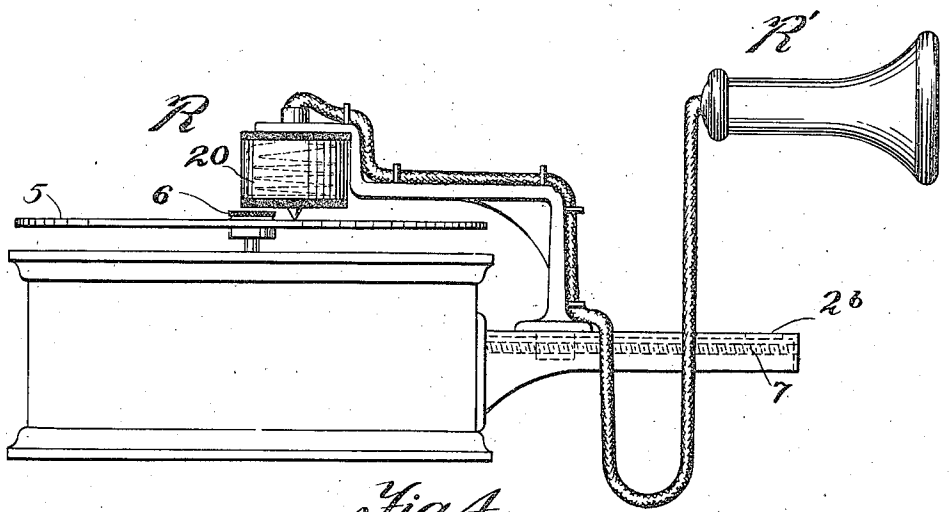


Fig. 4.

Witnesses

H. F. Löwenstein.

James H. Marr

Inventor

Edward E. Clement

UNITED STATES PATENT OFFICE.

EDWARD E. CLEMENT, OF WASHINGTON, DISTRICT OF COLUMBIA.

APPARATUS FOR RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

1,156,976. Specification of Letters Patent. Patented Oct. 19, 1915.

Original application filed November 14, 1905, Serial No. 287,328. Divided and this application filed November 29, 1911. Serial No. 663,115.

To all whom it may concern:

Be it known that I, EDWARD E. CLEMENT, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Recording and Reproducing Sounds or Signals, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to means for recording and reproducing sound, and has for its object the improvement of such means.

This application is a division of my prior application Serial No. 287,328, filed November 14, 1905, in which I have claimed the method of operation disclosed herein.

Briefly stated the invention consists in the use of a steel disk or cylinder upon which a magnetic spiral record is traced with the variations due to speech or other sound extended laterally thereon, the recorder being either a permanent magnet or an electromagnet and the reproducer, preferably, an electromagnet connected to a telephone receiver.

By the use of my invention it is possible to make a uniform trace and produce a maximum magnetic effect. The disadvantage of previous inventions along this line has been that they depend upon variations in the magnetic strength, so that no matter how strong the electromagnets employed, the reproduction would be weak because it would represent only the variations.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a plan view of the device with a permanent magnet for the recorder, parts being shown in section. Fig. 2 is a side view of the same with parts in section. Fig. 3 is a side view of the same with an electromagnetic recorder. Fig. 4 is a side view of the device showing the magnetic reproducer, with its circuit connections.

Referring to the drawings 1 represents a box or casing with any suitable driving mechanism, such as a clock train, which forming no part of my invention, is not shown. The main arbor or driving shaft 3 of said mechanism projects vretically from the casing 1 and is provided with an annular collar 4 on which a steel disk 5 is adapted to rest. The disk 5 is secured for rotation by a screw-cap or thumb-nut 6 which engages the shaft 3 and presses against the upper face of said disk 5.

Connected to the clock train or other driving mechanism, so as to be driven a partial revolution for every revolution of the shaft 3, is a lateral screw shaft 7. The screw threaded portion of the shaft 7 engages a bifurcated and threaded lug 8 which projects through a slot 2^a in the top 2 and carries the shell 9 of the recorder T provided with the usual mouth-piece 10 and diaphragm 11, which in this instance stands at right angles to the disk 5. The slot 2^a (Fig. 3) is provided with button-hole openings 2^b, which permit ready removal of the lug 8 from engagement with the screw shaft 7. Rigidly secured to the diaphragm 11 is a permanent magnet *m* having one pole 12 in engagement with the upper face of the disk 5, and the other pole 13 in engagement with the disk 5 immediately below the pole 12, so that the lines of magnetism will be directed through the plate.

In Fig. 3 I have shown an electromagnet 14 energized by a source of current X, and provided with a soft iron core 15 through which extends a flexible rod 16 of magnetic material bearing against the disk 5, and connected to the diaphragm by a rigid rod 18. A frame 19 is secured to the shell 9 and supports the magnet 14 in proper relation to the disk 5.

In the operation of the recording device the shaft 3 is given motion in the proper direction and the message or signal delivered to the diaphragm 11 so as to vibrate it, thus moving the magnet back and forth over the disk, which having a rotary motion receives a magnetic trace. The recorder being fed steadily forward by the screw 7, makes the trace a spiral.

For reproducing, the spiral trace may be caused to give motion mechanically to a light magnetic body attached to a thin diaphragm after the manner shown in Figs. 1 and 2, or an electromagnetic reproducer may be employed as shown in Fig. 4, this means being preferred.

In Fig. 4 the electromagnet 20 of the reproducer is shown connected in circuit with the telephone receiver R'. This circuit connection may be arranged in any well known manner to produce the best and sharpest

sounds in the receiver. The pole piece of the electromagnet is pointed or rounded and as the combined motion of the disk 5 and shaft 7 maintains the point of the magnet in the steady spiral line followed by the recorder, the magnetic trace in its recession from and approach to the pole piece will produce varying magnetic effects in the magnet and thereby in the receiver.

The record may be removed from the disk by passing a broad-faced magnet over the surface or exposing it to an alternating field.

Various changes may be made in the apparatus employed without departing from the spirit of my invention among which I may mention the substitution of a cylinder for the disk, which, however, must be so arranged that the vibrations of the recorder will be at right angles to the direction of motion of the surface, or in other words that the tracer will move back and forth along one element of the cylinder.

In the appended claims I use the term "sounding device," and I desire to have it herein understood that by such term I intend to include any sounding devices irrespective of whether the same may be active to produce sounds, or acted upon by sounds.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In an apparatus for recording and reproducing speech or signals, the combination of a magnetizable body having a magnetized trace of substantially uniform intensity and following an undulatory path corresponding to sound waves, a second magnetizable body connected to a sounding device, and means for subjecting said second magnetizable body to the action of said magnetized trace whereby the undulations of the trace are transmitted in vibrations to the sounding device.

2. In an apparatus for recording and reproducing speech or signals, the combination of a magnetizable body having a magnetic trace of uniform magnetic strength and following an undulatory path corresponding to sound waves, a magnetic device of constant magnetic strength, a sounding device connected with said magnetic device, and means for effecting compound relative movement between said body and said magnetic device, whereby the magnetized part of said body will act in passing upon said magnetic device.

3. In an apparatus for recording and reproducing sound, the combination of a magnetic body having upon it a continuous magnetic trace of substantially constant strength or intensity extending in a sinuous path, a movable magnetic pole piece, a vibrating device, connecting means between said pole piece and said vibrating device, together with means for producing compound relative motion between the magnetic body and the movable pole piece whereby the latter will follow the general path of said magnetic trace, and will be affected by the sinuosities thereof, and will in turn produce corresponding movements of the vibrating device.

4. In an apparatus for recording and reproducing sound and signals, the combination of a magnetic body having a continuous magnetized trace therein of substantially constant strength or intensity extending in a wavy path, a receiver magnet and diaphragm, and means for subjecting said magnet to the action of said wavy trace of magnetism, whereby it will tend to follow said trace and thus vibrate its diaphragm.

5. In an apparatus for recording and reproducing sound, the combination of a magnetic body having a continuous magnetic trace thereon of substantially constant strength or intensity extending in a wavy path, a magnet, a diaphragm, means for producing motion of said magnetic body and for exposing said magnet to the action of said wavy trace of magnetism during said movement, and means for transmitting from said magnet to said diaphragm the waves or vibrations thus magnetically set up.

6. In an apparatus for recording and reproducing sounds, the combination of a magnetic body having upon it a continuous magnetic trace of substantially constant strength or intensity extending in a sinuous path, and a reproducer comprising a magnet and a diaphragm, and means connecting the same, together with means for producing motion of said magnetic body to cause said sinuous magnetic trace during such motion to variably affect said magnet and through the magnet affect said diaphragm, to produce sounds corresponding to the sinuosities of the magnetic trace.

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

EDWARD E. CLEMENT.

Witnesses:
H. F. LÖWENSTEIN,
C. S. GRUMMAN.