

E. E. CLEMENT.
METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.
APPLICATION FILED NOV. 14, 1905. RENEWED MAR. 22, 1910.

1,011,322.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

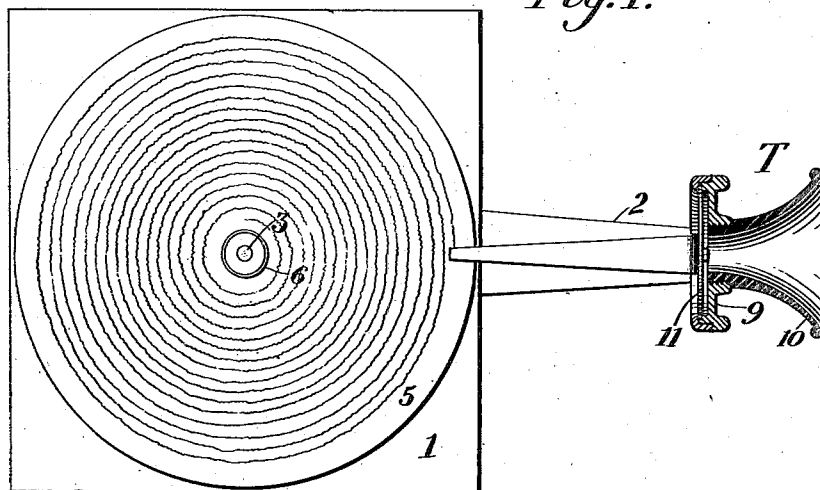
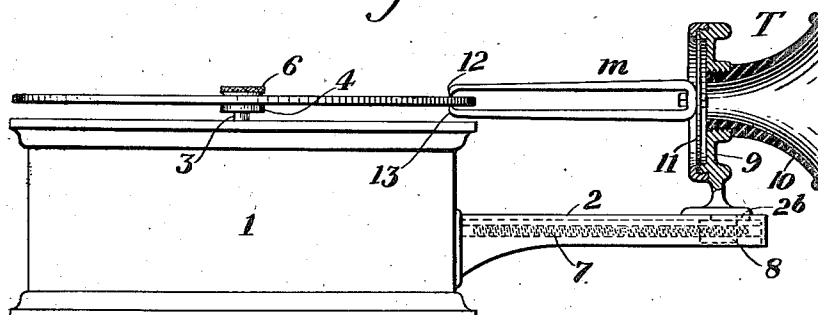


Fig. 2.



Witnesses
H. F. Lowenstein.

James A. Marr

Inventor

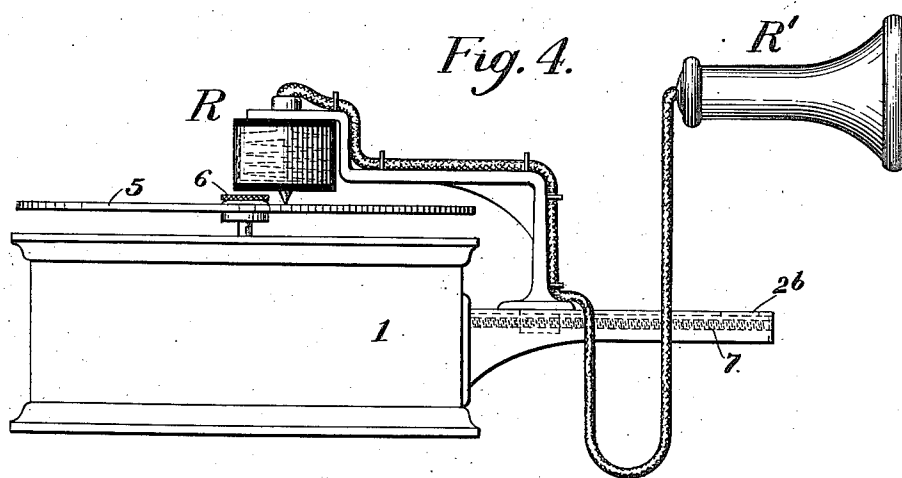
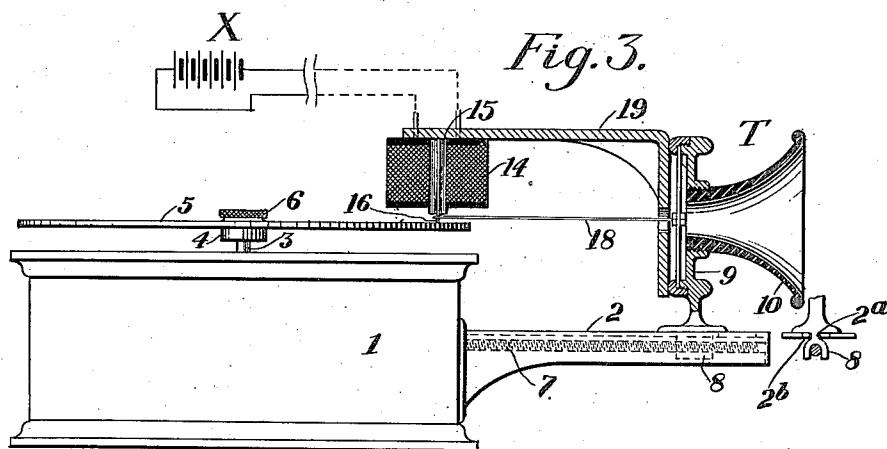
E. E. Clement

E. E. CLEMENT.
 METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.
 APPLICATION FILED NOV. 14, 1905. RENEWED MAR. 22, 1910.

1,011,322.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 2.



Witnesses
H. S. Lowenstein.

James A. Marr

Inventor
E. E. Clement

UNITED STATES PATENT OFFICE.

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

METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

1,011,322.

Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed November 14, 1905, Serial No. 287,328. Renewed March 22, 1910. Serial No. 551,012.

To all whom it may concern:

Be it known that I, EDWARD E. CLEMENT, citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Methods 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 methods of recording and reproducing sound, and has for its object the improvement of such methods.

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 may be either a permanent magnet or an electromagnet and the reproducer is preferably an electromagnet connected to a telephone receiver.

By the use of my method it is possible to make a uniform trace and produce a maximum magnetic effect. The disadvantage of previous methods 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.

A form of apparatus with which my invention may be practiced 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 vertically 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 driv-

ing 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 recorded 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 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 directly 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 rod 16 bearing against the disk 5, and connected to the diaphragm. 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 electromagnet reproducer may be employed as shown in Fig. 4, this method 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.

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

1. The method of recording and reproducing speech or signals, which consists in impressing upon a magnetizable body magnetic waves or undulations of constant strength in a path of variable direction and then subjecting a receiver to the influence thereof.

2. The method of recording and reproducing speech or signals, which consists in impressing a variable trace of constant magnetic condition upon a magnetizable body, and then reversing the action to reproduce the speech or signals.

3. The method of recording and reproducing speech or signals, which consists in subjecting a magnetizable body to the action of a magnet, varying the place of action so as to form on said body a varying trace of magnetism having approximately constant strength, and finally subjecting a second magnetizable body, which is connected to a sounding device, to the action of said wavy magnetic trace.

4. The method of recording and reproducing speech or signals, which consists in subjecting a magnetizable body to the action of a magnetic body, moving said magnetizable body relative to said magnetic body, moving said magnetic body relative to said magnetizable body, whereby the magnetic body is caused to leave a wavy trace of consequent poles of magnetism of constant strength, and finally subjecting a receiver

magnet to the action of said wavy trace of magnetism, whereby it will be caused to vibrate a diaphragm.

5. The method of recording and reproducing speech or signals, which consists in impressing upon a magnetizable body magnetic waves or undulations of substantially constant strength in a path of variable direction, exposing a relatively fixed magnetizable body to said undulations and causing the electromagnetic changes produced in said body to be electrically communicated to a telephone receiver.

6. The method of recording and reproducing sound which consists in (1) impressing upon a magnetizable record body a continuous magnetic trace of substantially constant strength but following an undulatory path corresponding to the undulations of the sound by which it is produced; (2) maintaining the pole of an electromagnet in close relation to the surface of the record body while producing relative motion or travel between the two so as to carry the magnetic trace past the magnetic pole continuously along a fixed line, whereby the several undulations of the magnetic trace will successively approach to and recede from the magnetic pole, producing electromagnetic changes therein and corresponding electrical changes in the magnet windings; and (3) translating said electrical changes through suitable apparatus into atmospheric waves corresponding to the original impressed undulations.

7. The method of recording sound which consists in causing sound waves to effect compound relative movement between complementary magnetic bodies, one of which is at a higher magnetic potential than the other so as to produce thereon a continuous magnetic record of substantially constant strength or intensity, extending in a path having undulations corresponding to the undulations of sound by which it was produced.

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

EDWARD E. CLEMENT.

Witnesses:

HUGH M. STERLING,
JAMES H. MARR.