No. 850,484. PATENTED APR. 16, 1907.

C. NEWMAN.

REINFORCING TELEPHONES.

APPLICATION FILED JUNE 15, 1906.

2 SHEETS—SHEET 1.

Fig. 1.

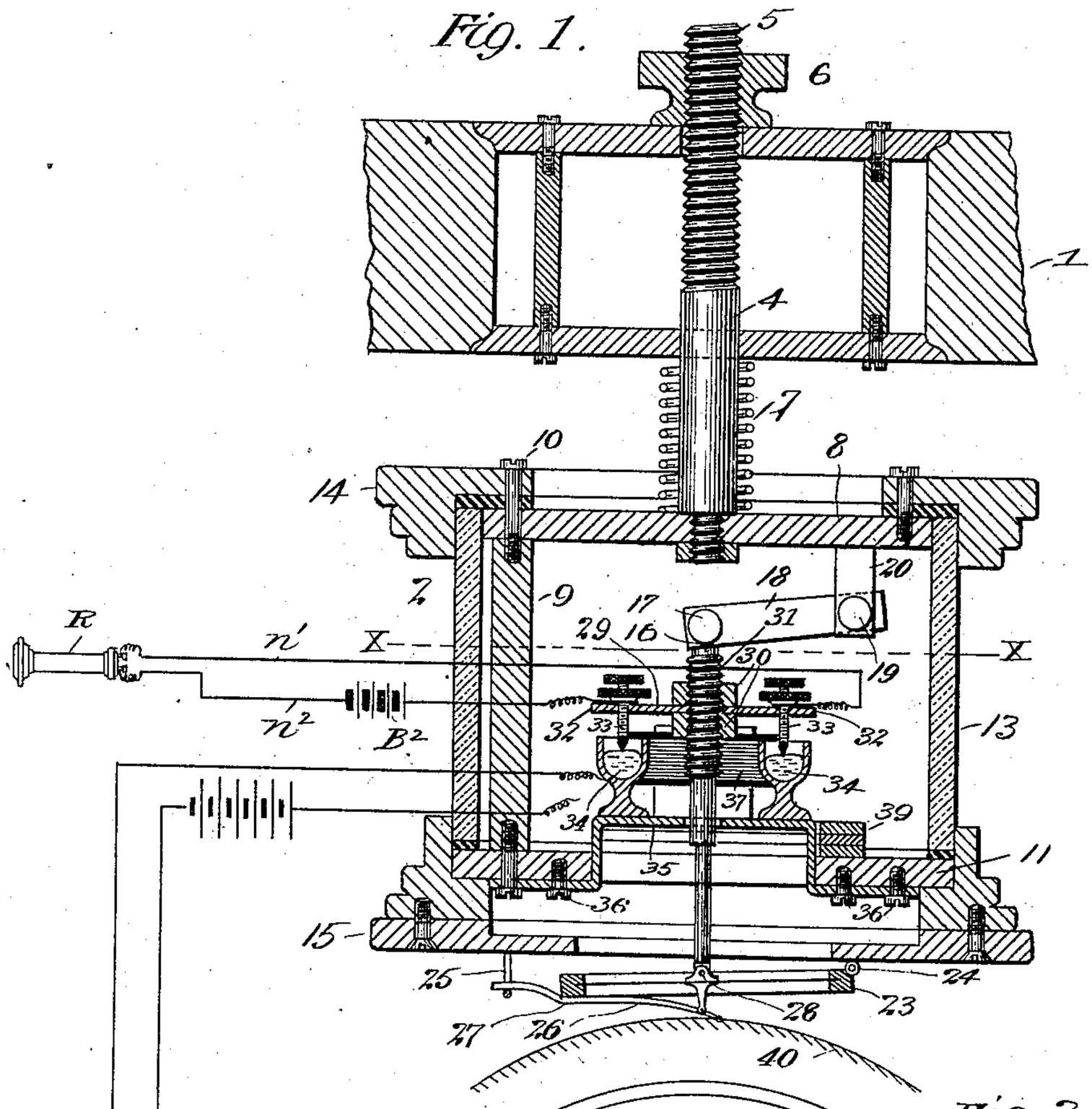
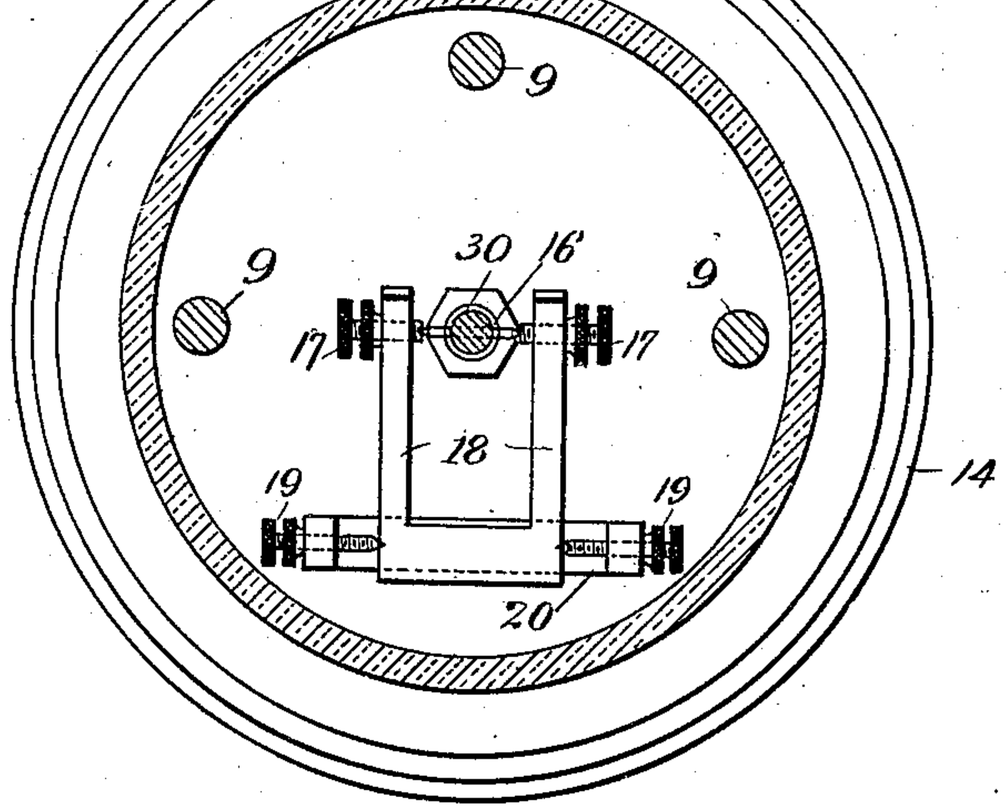


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

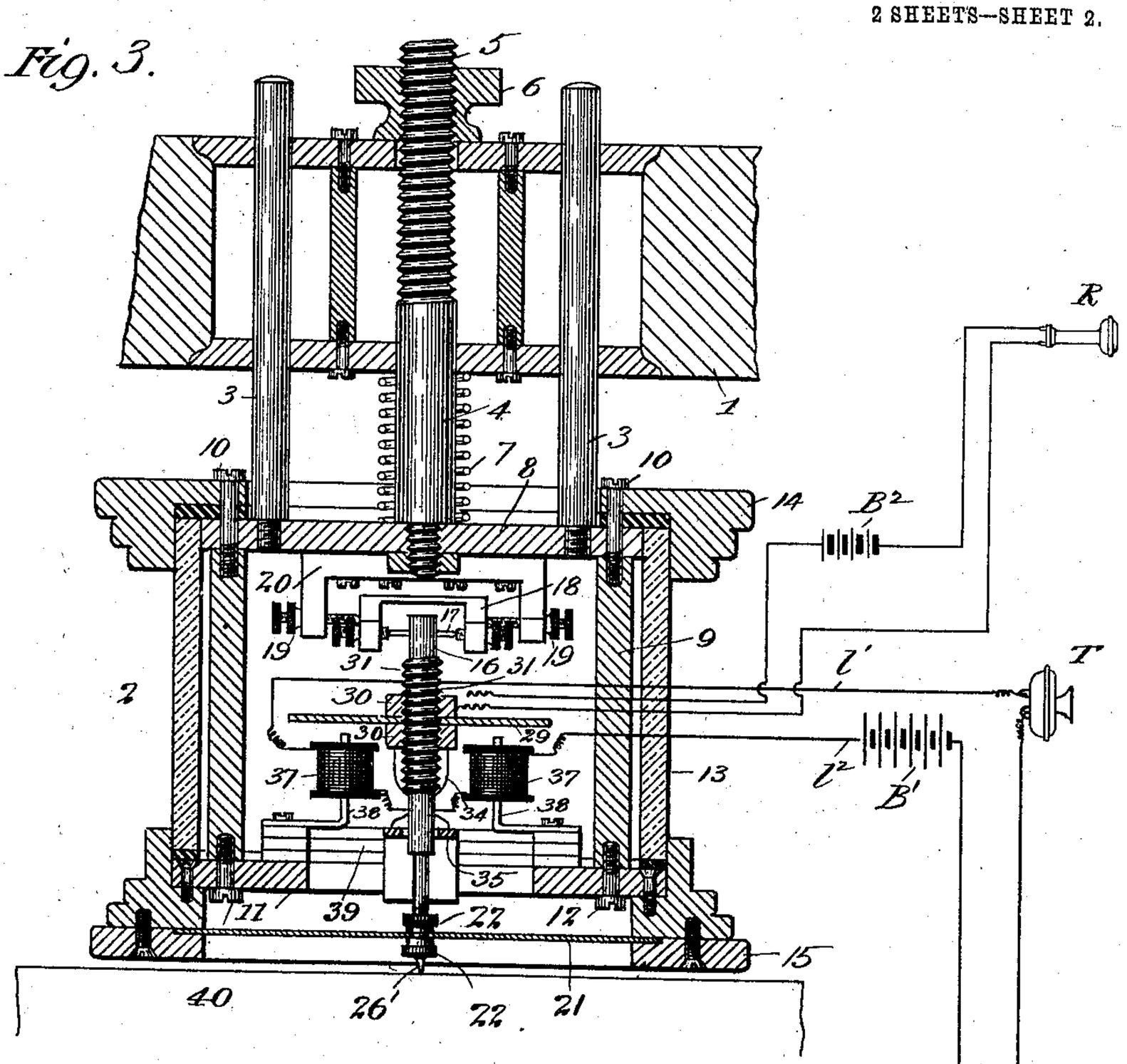
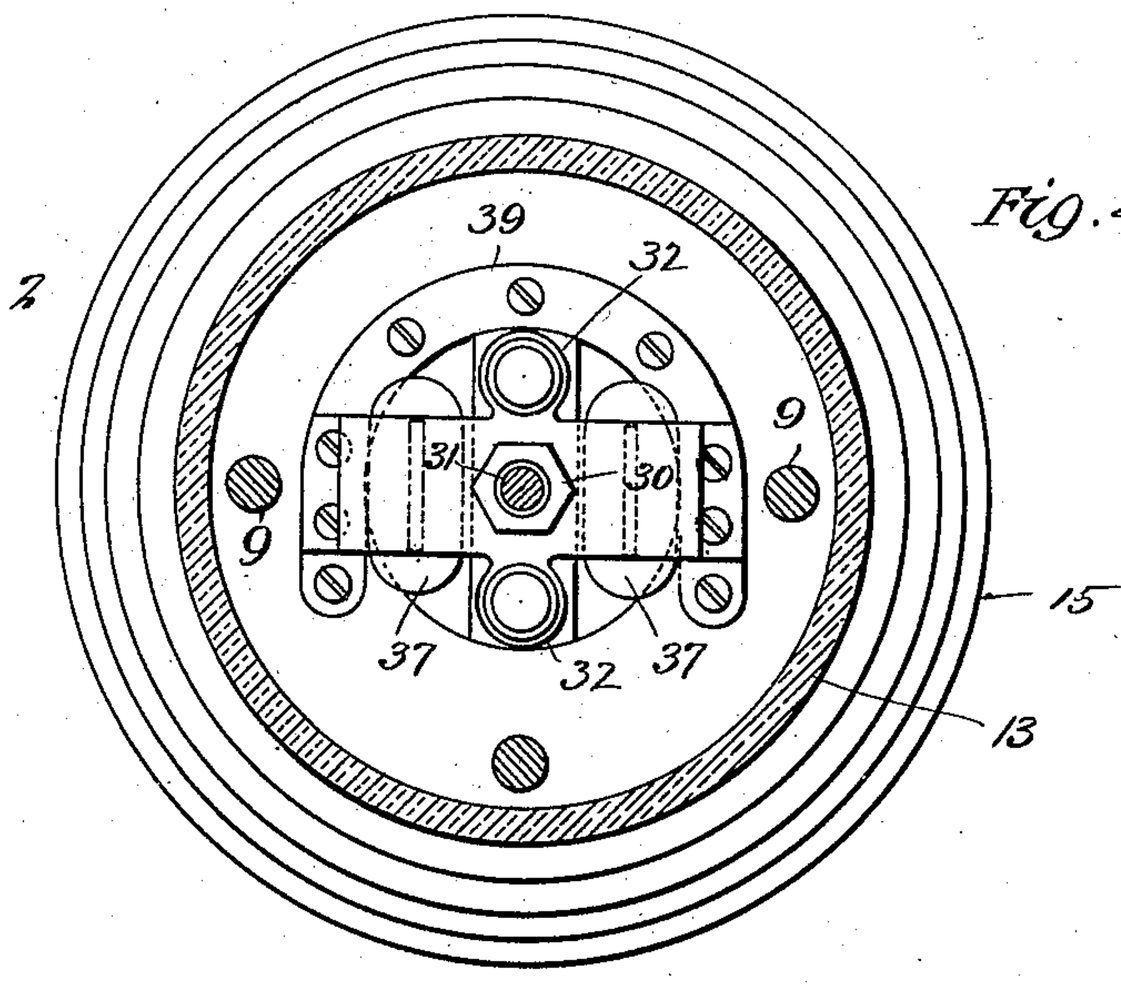


Fig. 4.



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UNITED STATES PATENT OFFICE.

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REINFORCING TELEPHONES.

No. 850,484. Specification of Letters Patent. Patented April 16, 1907.

Application filed June 15, 1906. Serial No. 321,881.

To all whom it may concern:

Be it known that I, CHARLES NEWMAN, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Reinforcing Telephones, of which the following is a full, clear, and exact description.

My invention relates to telephony, and pertains particularly to the provision of a transmitter for long-distance work or for purposes where a loud-speaking telephone is necessary.

More particularly stated, the invention relates to a telephonic relay which is capable of increasing the amplitude of the electrical impulses produced by an ordinary transmitter.

The principal object of the invention is to provide a device of this class which shall be capable of producing electric vibrations of great intensity and power, but in which the sound purity is preserved.

A further object of the invention is to provide a simple and convenient mechanical construction for carrying out the foregoing purpose.

With these and other objects in view the invention consists in the construction, combination, in the location, and in the arrangement of parts, as hereinafter set forth and shown, and finally particularly pointed out in the appended claims.

In the drawings, Figure 1 is a sectional view of a telephonic relay embodying the principles of my invention. Fig. 2 is a section on the line X X of Fig. 1 looking upward. Fig. 3 is a sectional view on a plane at right angles to that of Fig. 1, showing a slightly-modified construction. Fig. 4 is a section on the line X X of Fig. 1 looking downward.

The ordinary telephone-transmitter making use of a carbon diaphragm and the usual body of granular carbon in contact therewith is effective in making a continuous current flowing through the transmitter pulsating in character according to the vibrations of the voice, but the pulsations are not intense, and for the purpose of long-distance telephony and loud earpieces they are not sufficiently intense to satisfy the conditions. In order to overcome the above defect it has been customary to use induction-coils or transformers, so as to step up the voltage of the voice-currents; but it is evident that this does not increase the actual energy of the transmission, but probably somewhat reduces it. The only way to supply additional energy is by means of a separate source of energy, and in the practice of my invention I supply additional energy in two ways: first, by an extra or local battery in the secondary or relay circuit, and, secondly, by a mechanically-rotated cylinder, the kinetic energy of which is utilized for the purpose of assisting the transmission. More specifically stated, I employ a vibratory member which is set in motion by the telephonic currents through a suitable magnet and which has its vibrations strengthened in one direction and otherwise assisted and controlled by a wax cylinder and stylus similar to those used on phonographs and like machines.

Referring now to the drawings, in which like parts are designated by the same reference-sign wherever they occur, 1 indicates a support which may be stationary or movable. For the purposes of this description the support 1 may be considered a part of the bracket of an ordinary phonograph which carries the usual diaphragm and is moved to and fro by a screw connection. The features of this support form no part of my invention, and I have therefore omitted the details thereof from the drawings.

2 indicates a box or housing which is adjustably connected to the support 1 and which carries the essential parts of the mechanism. The nature of the adjustable connection is clearly shown in Fig. 3, from which it will be seen that two rods 3 are fixed to and project from the housing 2, being guided loosely in the support 1. 4 denotes an additional rod projecting from the housing 2 and which is threaded at its upper end, as shown at 5. 6 denotes a nut upon such threaded portion of the rod 4, and 7 is a spiral spring interposed between the support 1 and the housing 2. This connection forms an adjustment for the housing by manipulating the nut 6. The movement of the nut 6 upon its supporting-stem is effective to permit the spring 7 to move the housing toward and from support.

All of the operative parts within the housing 2 are supported from a plate 8, which constitutes a base therefor. It will be seen that the rods 3 and 4 are fixed to this base 8, and in addition thereto I provide the posts 9,

projecting perpendicularly from the base and secured thereto by the screws 10. 11 designates what I shall term a "supplemental" base and is fastened to the posts 9 by means of screws 12. The base 8 also serves as a support for the glass casing 13, which is included between the collars 14 and 15, which are respectively attached to the two bases 8 and 11. This form of construction gives a simple and efficient housing for the contained parts, all of which are supported from a single base and which may be readily opened for inspection or repair.

Within the housing 2 is contained the vibrating member 16, supported so as to be capable of vertical movement axially of the housing 2. For this purpose the vibratory member is conveniently pivoted at 17 to a horizontal link 18, which is conveniently U-shaped, as shown. 19 indicates another pivotal connection with a stationary yoke 20 on the base 8. I prefer to make both of the pivotal connections 17 and 19 with adjustable cone-bearings, secured by lock-nuts of any ordinary sort. The lower end of the vibratory member 16 is guided by a diaphragm 21, to which it is conveniently secured by a pair of clamp-nuts 22. The diaphragm 21 may be stretched across the lower collar 15 of the housing, as indicated in Fig. 3; but I prefer to make the diaphragm 21 in a supplemental collar 23, hinged to the collar 15 at the point 24.

25 indicates a loop or guide on the collar 15 for limiting the movement of the supplemental collar with respect thereto.

26 is a stylus of suitable material fixed to the supplemental collar at the point 27 and attached to the vibratory member 16 at the point 28. With the structure shown in Fig. 3 the stylus 26′ is made integral with the vibratory member 16.

The particular construction of the diaphragm I regard as relatively unimportant, since the vibratory member may be guided to move in a vertical direction at its lower end in any desired way. However, I prefer the structure shown in Fig. 1 as having perhaps a greater range of vibration and somewhat greater efficiency in practical use.

Adjustably fixed upon the vibratory member 16 is an armature 29, secured between clamp-nuts 30 upon a threaded part 31 of the vibratory member. This armature has laterally-extending portions 32, (see particularly Figs. 1 and 4,) and upon these lateral extensions I provide adjustable contact-screws 33. These contact-screws may be of any suitable material at their lower ends, such as carbon or graphite, if desired, and may be arranged to dip slightly into mercury-cups 34. The mercury-cups are fixed to a strap 35, screwed to the supplemental base 11 at the points 36. The relation is such that the adjustable contacts 33 vibrate toward and from the mercury-cups 34 when the vibratory member 16 moves in an axial direction.

I provide an electromagnet in proximity to the armature 29 and which is shown as having two bobbins 37 on pole-pieces 38, which project from a permanent magnet 39. The permanent magnet 39 is secured to the supplemental base 11, so that it is in fixed relation therewith and with the mercury-cups 34. The bobbins 37 are connected in the transmitter-circuit of an ordinary telephone by means of the wires l' and l^2. T indicates the transmitter, and B′ the battery in this circuit.

The two mercury-cups 34 are electrically connected with one another, since they are on the same metal base, and the contact-screws 33 form the respective terminals of a repeating-circuit n' n^2 for a receiver R. The receiver R may be at a remote point—as, for example, at the distant end of a long-distance-telephone line.

The wax or phonographic cylinder to which I have previously referred is illustrated at 40 in Fig. 1 and is arranged to rotate in contact with the stylus 26 or 26′ for the respective structures. It will be understood that the phonographic cylinder 40 is of the ordinary form, except that I prefer to make it quite large, and is driven by a motor or clockwork or in any suitable way. Inasmuch as the construction and operation of the phonographic cylinder of the ordinary form can constitute no part of my present invention, I have omitted these matters from the drawings.

The operation is as follows: A pulsating current being developed in the line-wires l' and l^2 by the voice-vibrations spoken into the transmitter T, it is obvious that the bobbins 37 will be energized in accordance with the vibrations and will develop vibrations in the vibratory member 16 by means of the connected armature 29. The vibrations transmitted to the vibrating member 16 are imparted thereby to the stylus 26 or 26′, and a record is cut in the phonographic cylinder exactly as would be done if the record were made directly by the voice-vibrations. Now the nature of a phonographic cylinder is such that it exerts only slight resistance to the inward movement of the stylus when a cut or incision is made under the action of a single vibration; but the cylinder nevertheless has the effect of returning the stylus with the power obtained by its own rotation. In other words, a rotating phonographic cylinder has a peculiar resilient action which returns the stylus after each operation, but which is entirely different from the action of a spring. Thus it will be seen that by my invention the stylus is drawn down by the magnets and is returned by the rotation of the cylinder, and when the adjustments

are properly made and the cylinder is rotating at the proper speed it will be found that the movements of the stylus are amplified by the cylinder without destroying the purity of the vibration. It is possible that some of the finer or higher harmonics of the voice are destroyed in this action; but all the main or fundamental characteristics of the sound-wave are retained and amplified. The motions of the stylus therefore correspond to voice-vibrations and are quite considerable in magnitude. The magnitude is so great that it is possible to employ the form of mercury contacts 34 shown with very efficient results. Since these lie in the repeating or secondary circuit containing a battery B^2, electric waves will be produced which will be transmitted to the distant receiver R.

It will be seen that I provide all necessary and practical adjustments for obtaining the best and most satisfactory conditions in use. The nut 6 may be manipulated to get the proper pressure of the stylus upon the phonographic cylinder, and, furthermore, it is possible to adjust the nuts 22 to properly position the diaphragm, the contact-screws 33, and the clamp-nuts 30 to get the best results. Other adjustments may be made, if desired, and I do not, of course, desire to be limited or restricted to the particular adjustments shown or the method of making them.

The form of make-and-break contact herein illustrated is regarded as particularly adapted to the purposes of this case, partly on account of the amplitude of the vibration of the vibratory member and partly by reason of the nature of the mercury contacts used, which have an action different from hard resilient contacts in the making and breaking action. The mercury has a yielding action for making the contacts and secures good results even if metallic screws 33 are used. When carbon or graphite screws are used, their varying depth of immersion in the mercury provides a varying resistance which improves the purity of the transmitted sound. An additional feature of these mercury-cups lies in the arrangement by which the contact is simultaneously made at a plurality of points. In this way the spark is divided up and the injurious defects thereof minimized, and, furthermore, the telephonic efficiency is improved. The battery B^2 may of course be located at any desired place in the circuit. For example, it may be included between the two mercury-cups 34 in place of a direct metallic connection between the two, if desired. Another obvious modification might be made by omitting one mercury-cup and completing the circuit through the other alone.

What I claim is—

1. In a telephonic relay, a vibratory member arranged to vary the resistance of a repeating-circuit, means for vibrating said member, and a continuously-movable cylinder in contact with said member.

2. In a telephonic relay, a vibratory member, a repeating-circuit having a telephone-receiver, means whereby the vibrations of said member vary the resistance of said circuit, and a continuously-rotating phonographic substance in contact with said member.

3. In a telephonic relay, a vibratory member having a stylus, a continuously-moving phonographic substance in contact therewith, a magnet for vibrating said stylus, and a repeating-circuit having means whereby its resistance is varied by the movements of said member.

4. In a telephonic relay, a vibratory member having an armature thereon, a magnet in a telephone-circuit acting on said armature, a repeating-circuit, means whereby the resistance thereof is varied by the movements of said armature, and a continuously-moving phonographic substance in contact with said member.

5. In a telephonic relay, a support, a housing adjustably connected to said support, a continuously-moving phonographic substance in proximity to said housing, a vibratory member supported within said housing and extending into contact with said phonographic substance, a repeating-circuit, and means whereby the resistance thereof is varied by the movements of said member.

6. In a telephonic relay, a support, a housing adjustably connected thereto, a continuously-moving phonographic substance in proximity to said housing, a vibratory member within the housing, telephonic means for vibrating said member, and a repeating-circuit arranged to have its resistance varied by the movements of said member.

7. In a telephonic relay, a housing, a vibratory member axially disposed therein, link connections for supporting said member at its upper end, a diaphragm connected to said member at its lower end, and telephonic means for vibrating said member.

8. In a telephonic relay, a housing, a vibratory member axially disposed therein, link connections for supporting said member at its upper end, a diaphragm loosely hinged upon the housing and supporting said member at its lower end, and telephonic means within the housing for vibrating said member.

9. In a telephonic relay, a housing, a vibratory member within said housing, link connections for supporting said member at its upper end, a diaphragm loosely hinged upon the housing and supporting said member at its lower end, an armature on said member, telephonic means acting on said armature, a repeating-circuit, and means whereby the resistance of said repeating-circuit is varied by the movements of said member.

10. In a telephonic relay, a housing having a base, links swiveled to said base, a vibratory member pivoted to said links and axially disposed within the housing, a supplemental base supported from said first-named base, a diaphragm connected to said supplemental base, and means for guiding said vibratory member by said diaphragm.

11. In a telephonic relay, a housing having a base, a vibratory member supported therefrom to have a movement axially within the housing, a supplemental base, a diaphragm thereon and guiding said vibratory member, and telephonic means supported on said supplemental base for imparting vibrations to said member.

12. In a telephonic relay, a housing, a vibratory member axially disposed therein, a continuously-moving phonographic substance in contact with said member, telephonic means for vibrating said member, contacts supported by said member, and a repeating-circuit arranged to have its resistance varied by the movements of said contacts.

In witness whereof I subscribe my signature in the presence of two witnesses.

CHARLES NEWMAN.

Witnesses:
FRANK S. OBER,
ALFRED W. PROCTOR.