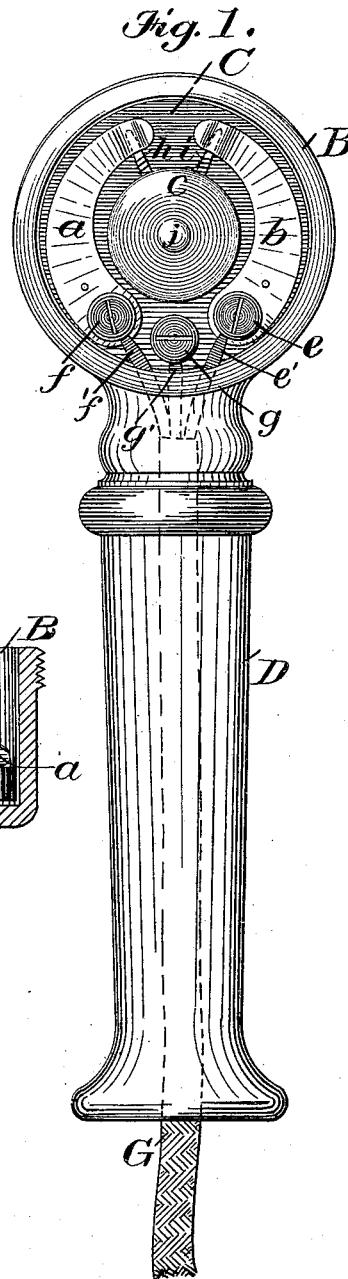
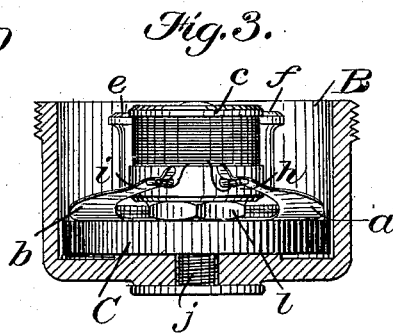
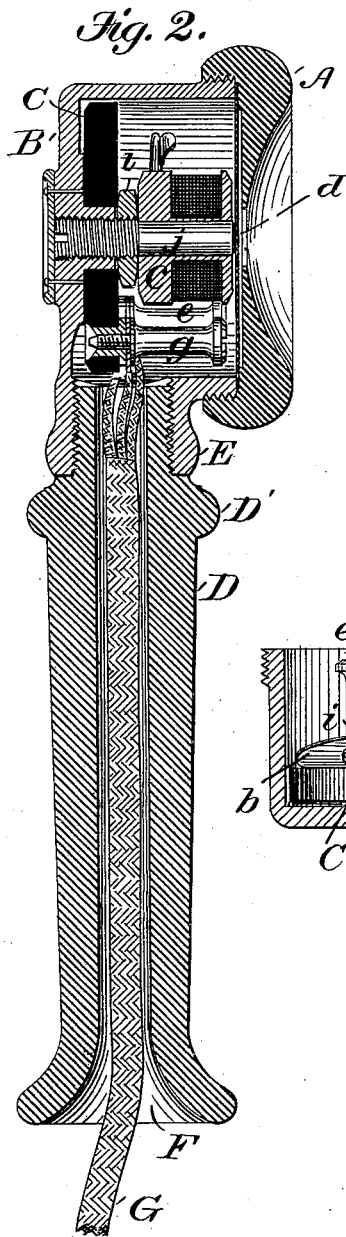


E. T. GILLILAND.

TELEPHONE.

No. 343,449.

Patented June 8, 1886.



Witnesses.
Geo. Willis Pierce
Geo. H. E. Frouvelot.

Inventor.
E. T. Gilliland

E. T. GILLILAND.

TELEPHONE.

No. 343,449.

Patented June 8, 1886.

Fig. 4.

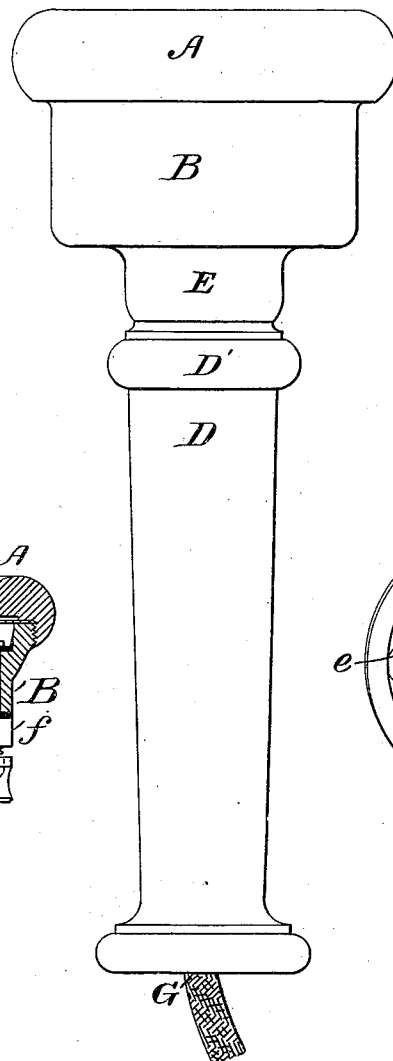


Fig. 5.

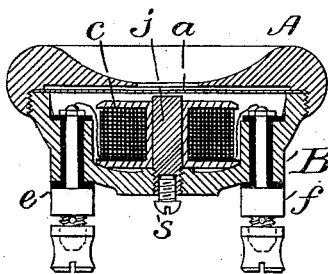
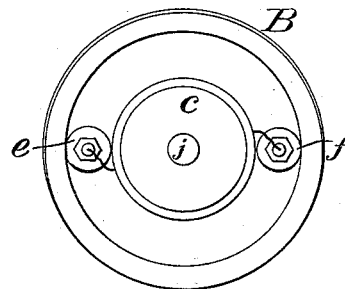


Fig. 6.



Witnesses.

Geo. Willis Pierce—

Geo. H. E. Trowelot

Inventor:

E. T. Gilliland

UNITED STATES PATENT OFFICE.

EZRA TORRANCE GILLILAND, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO
THE AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 343,449, dated June 8, 1886.

Application filed September 14, 1885. Serial No. 177,062. (No model.)

To all whom it may concern:

Be it known that I, EZRA TORRANCE GILLILAND, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Telephones, of which the following is a specification.

My present invention has reference to that class of speaking-telephones commonly known as "magneto-receivers," (although capable for use also as transmitters,) which comprise a vibratory diaphragm, and an exciting-magnet with a spool or bobbin of insulated wire adapted for inclusion in an electric circuit fixed upon one or more poles of said magnet. It constitutes an improvement and modification of the ordinary and widely-known Bell receiving-telephone, and its object is to intensify the magnetic moment of the instrument, to simplify the construction, to make a more economical instrument, to produce an instrument which shall not be susceptible to changes in temperature and climatic conditions, and, finally, to produce an instrument which requires no adjustment, and which is in every respect strong and efficient.

For the achievement of these most desirable results, my invention consists in the employment of an iron core, in mechanical and magnetical connection with the upper or coil-inclosing portion of the telephone-case, both core and inclosing-cup being made of magnetizable metal, the latter being preferably cast-iron and magnetized by any of the ordinary and well-understood modes.

It also consists in making the said coil-inclosing portion of the case of cast-iron, it having been ascertained that that condition or quality of iron receives and retains magnetism, when properly applied, as well as steel, while it has the additional advantage of being much cheaper, and of being easily made into the desired cup-like form. The core I preferably make, as usual, of soft iron, and screw it to the center of the interior of the cup base-plate, and I bring it to such a height relatively to the flange of the cup, that when the diaphragm rests upon the latter it is permanently adjusted at its center at a proper distance from the central core. By using a similar metallic

substance for both cup and core, I avoid all risk of variation of distance between diaphragm and core under the influence of change in temperature which, with the ordinary hard-rubber case, is in practice a very grave defect.

It further consists in inclosing all the screw-terminals of the instrument in the helix-holding cup; in providing a third screw-terminal by which a separate strand of the mechanical fabric of the flexible cord may be held to take the strain from the conductors thereof; in bringing the ends of the telephone coil or helix to a pair of fixed metal terminal pieces, and in providing the screw terminals with contact-springs adapted to bear firmly upon the terminal pieces of the coil.

In the drawings which form a part of this specification, Figure 1 is a front elevation of my improved telephone with the diaphragm removed to show the arrangement of the parts. Fig. 2 is a sectional side elevation of the same. Fig. 3 is an elevation of the head of the telephone, showing the spring-contacts, the metal inclosing-cup being in section. Fig. 4 is an elevation of my telephone in which the ear-piece, instead of being at right angles to the longitudinal axis of the telephone, is in line therewith. Fig. 5 is a sectional elevation, and Fig. 6 is a front plan of my improved telephone with cup and diaphragm removed made in portable form for attachment to the head-gear of operators.

Referring to the drawings, B is the magnetized cast-iron inclosing-cup, and *j* is the soft-iron core, which, as shown, is screwed into the center of the base of said cup, by which it also is maintained in a magnetic state, and projects parallel to the walls thereof outwardly. The said walls extend outwardly a short distance beyond the extreme end of the core, so that when the diaphragm *d* is laid upon the edges of said walls, its center will be in close proximity to said core, but will not be in contact therewith.

The edge of the cup B is threaded externally, and a cap, A, of ordinary form and made of any suitable material, is adapted to be screwed thereon so as to constitute an ear-piece, and, moreover, to hold the diaphragm in place in a

manner well understood. A circular disk, C, of hard rubber, vulcanized fiber, or any suitable non-conducting material is perforated centrally, so as to lie in the bottom of the metal case or cup B, and to allow the central core to pass therethrough. Fixed upon this disk in such a manner as to be insulated from the metal case are two screw-posts, *e* and *f*, and from the base of these screw-terminals contact-springs *a* and *b* of brass, steel, phosphor bronze, or like resilient metal or alloy, project, being made of an approximately-circular form, so as to be conveniently arranged within the inclosing-case. The coil or helix *c* of insulated wire is, as usual, placed on and surrounding the core *j*, and its two ends, in place of extending through the handle of the telephone to external screw-posts, are fastened to a pair of metal pins, *h* and *i*, which are mechanically affixed to the edge of the spool *e*, so that the said pins actually form the terminals of the coil of wire. The two springs *a* and *b* overlie and are in contact at their ends with the coil-terminal pins, thus bringing the helix into circuit with screw-terminals *e* and *f*, and the spool or bobbin of the coil may be prevented from any risk of slipping away by the insertion between its lower side and the non-conducting disk C of a washer or nut, *l*. The spool may readily be detached from the core and contact-springs at any time for repairs or examination, by slipping it round until one of the pins (say *h*) is brought from under the spring *a*, then pressing the same spring down, so that the pin *b* overrides it, and turning the spool oppositely until the second pin, *i*, is released from the spring *b*.

Integral with the iron cup B and extending as a neck therefrom at right angles to the face of the ear-piece is a socket, E, threaded internally so as to serve as a sleeve for the reception of the handle D, the latter being made of wood or of any similar non-conductor.

The handle D has a projecting ring, D', by which the instrument may be hung in the yoke of a telephone-switch; or, if preferred, a ring may be attached to either end of the instrument, by which it may be hung on a hook. The handle is perforated throughout its length, and the longitudinal channel F flares into a bell-formed muzzle at the extremity of the handle.

The channel F opens into the cup of the telephone and the flexible conducting-cord G passes through it, so that the two wires *e'* and *f'* of said cord may connect with the screw-terminal posts of the coil, thus enabling the said coil or helix to be united to any electric circuit, while a separate strand, *g'*, of woven material, usually made of one piece of the protective covering of the cord, is screwed into and held by a third screw-post, *g*, standing between the binding-post *e* and *f*, which post *g*, though not an electric connection, is, like the others, attached to the non-conducting disk C.

The advantages I gain by inclosing the screw-posts within the case, and by providing the third to support the cord are the following: In the ordinary form wherein the screw-posts are placed externally at the end of the instrument, the person using the telephone is liable from accidental or cross currents to receive a severe shock if his fingers happen to touch the metal screw-post. When they are inclosed, this danger is avoided. The durability of the conducting-cords is greatly increased by the addition of the third screw-post, which, holding a strand of the woven fabric of the cord, takes the strain completely away from the conductors. By flaring the outer end of the telephone-handle channel I also aid in extending the life of the conducting-cord by exempting it from the abrasion which would ensue were the edge square or sharp.

By forming the spool-holding cup of magnetic material by magnetizing the same, (as I do in practice by any of the methods familiar to those skilled in the art,) and by causing the edges of the same to serve as the diaphragm-seat, I not only concentrate the magnetic field so that the magnet-core is enabled to exercise a much stronger effect on the diaphragm than would otherwise be the case, but I also render the diaphragm in a measure magnetic, with a polarity opposing, and hence complementary to that of the core.

Another advantage accruing from the use of a metal inclosing-case and diaphragm-seat, is that no unequal expansion or variation of distance between the coil and core and the diaphragm can arise from variations in temperature, whereas as great a variation in distance as sixty per cent. frequently occurs when a hard-rubber case is employed. By forming the inclosing-case head of cast-iron I am enabled to produce the required shape or figure readily and at reasonable cost.

I have already stated the advantage of my plan of mounting the coils—i. e., facility and readiness of attachment and detachment.

In Fig. 4 I show a form in which the iron case-head B is attached in the same longitudinal axis as the handle of the instrument, and for some purposes this form would be preferred. In other respects the construction is identical with the form hereinbefore described.

Figs. 5 and 6 show a form of portable telephone which may by means of a suitable cap or spring attachment be worn on the head. B is the cast-iron case, and *j* the iron core screwed to the internal center thereof. The case and core are both magnetized, and the core will retain the magnetism by contact with the case, which remains permanently magnetic. *c* is the helix of wire, which surrounds the core and which terminates in the binding-screws *e* and *f*, these being fixed in the substance of the cast-iron cup B, albeit insulated therefrom. A diaphragm of iron or steel rests on the circumferential edge of the case B, so that its center is opposite and close to but not

in contact with the end of the core or pole-piece *j*. The diaphragm is held in position by the cap A, which is screwed down thereon, serving also as an ear-piece for the telephone.

5 Fig. 6 indicates the appearance of the front of this telephone, the diaphragm and cap being removed, B showing the edge of the case, *c* the coil, *e* and *f* the screw-connections, and *j* the core.

10 I am well aware that it is not broadly new to use an iron case for a telephone-magnet and to magnetize the diaphragm inductively thereby, this construction having been embodied in one of the earliest of the speaking-telephone receivers of Alexander Graham Bell, which
15 form has become widely known under the title of the "Centennial Receiver." I am also aware that it is not new, *per se*, to connect the flexible conductor with the magnet-coil within
20 the body of the instrument, and I do not broadly claim these details; but

What I do claim, and desire to secure by Letters Patent, is—

1. In a magneto-telephone, the combination
25 of a permanently-magnetic cast-iron inclosing-case, a core or pole-piece metalically attached thereto and in magnetic connection therewith, so that the edge of the said case constitutes one pole of the magnet and the said core the
30 other, and a diaphragm resting on the edge of the said case.

2. In a telephone, a circular magnetized cast-iron inclosing case or cup, a core or pole-piece of iron attached to the internal surface of the
35 base of said cup, and maintained in a magnetic condition by virtue of attachment, a diaphragm resting on the edge of said cup, the said edge being extended outwardly beyond the end of the core sufficiently to enable the
40 center of the diaphragm to be close to said core without touching the same, a coil or helix of insulated wire adapted to be included in an electric circuit surrounding the said pole-piece within the said magnetic inclosing-case,
45 and a cap capable of being screwed down on the case to hold the diaphragm in place, and to serve as an ear-piece, substantially as described.

3. In a telephone, the combination of the
50 metal inclosing-case, a hollow handle therefor attached thereto, as described, an insulating-disk attached to the floor of said case, a pair of binding-screw posts secured to said disk for the attachment of the electric connections of a
55 flexible conductor, and a third binding-screw attachment similarly mounted, and adapted to be connected with a non-conducting strand of the said flexible cord, so as to relieve the strain upon the electric conductors thereof, substantially
60 as described.

4. In a telephone, a permanently-magnetic case, adapted to contain the operative parts and to serve as a seat for the diaphragm, an iron core deriving its magnetism from the
65 said case and constituting a central pole therefor, and a wire coil surrounding said central

pole, and connected by contact-springs with screw-terminals, whereby the said coil may be included in an electric circuit.

5. In a magneto-telephone, a detachable inducing coil or helix, complete in itself, and adapted by means of terminal pins affixed to the edge of the bobbin on which the said helix is wound to engage and lock with contact-springs connected with or adapted to be connected with an electric circuit, as and for the
70 purposes described. 75

6. In an electric telephone, a magnet, and an iron core or pole-piece therefor, a coil or helix of insulated wire surrounding the said
80 core, binding-screws for connection with an electric circuit, and spring-connections extending between the said binding-screws and the coil-terminals, the said springs being permanently secured to the former and adapted
85 to make contact with the latter by the resiliency of their free ends, whereby the coil may be readily attached for use, or detached for inspection or repairs.

7. In a magneto-telephone, the following
90 elements in combination: a magnetized cast-iron inclosing cup or case, a core or pole-piece attached to and projecting from the center of the floor of said cup and magnetized therefrom, a pair of screw-connections attached to
95 a non-conducting disk (which disk is permanently attached to the floor of the inclosing-case) and adapted to connect by suitable wires with an electric circuit, a metal spring attached to each screw-connection and extending therefrom within the case, and a helix of insulated
100 wire, the spool of which is adapted to slide easily over the pole-piece, and is likewise provided with rigid metal pins constituting the terminals of the helix, which pins are adapted
105 when the helix is slid on the core to be turned round, and to be brought under and into electrical contact with the free ends of the metal springs, or to be reversely detached therefrom, in the manner and for the purposes described. 110

8. A magneto-telephone comprising the following elements: a circular magnetized cast-iron case, an iron core or pole-piece projecting from the interior center of the floor thereof, a vibratory diaphragm resting by its edges on the edge of the case and having its center in close proximity to but not in contact with the core, a helix or coil surrounding the said core, a non-conducting disk or washer mounted upon the interior surface of the floor of the
120 inclosing-case, a pair of binding-posts mounted on said disk, and adapted for connection with the electrical conducting-strands of a flexible conducting-cord, a single binding-post adapted to hold a non-conducting strand of said
125 cord, spring-connections between the two electrical binding-screws and the coil-terminals, a hollow handle opening into the case, whereby a flexible conductor is conveyed to the binding-screws, and an ear-piece or cap, all arranged as described, and for the purposes set forth. 130

9. The combination, in a telephone, of the magnetized iron case or head B, provided with a threaded and perforated shoulder, E, with the non-conducting perforated handle D, 5 the said handle having a collar, D', by which it may be suitably supported in a yoke, and having a flaring or bell-shaped expansion to the channel at its outer end or muzzle, substantially as and for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 25th day of August, 1885.

EZRA TORRANCE GILLILAND.

Witnesses:

GEO. WILLIS PIERCE,
GEO. H. E. TROUVELOT.