F. A. GOWER.

Electric Telephones.

No. 218,873. Patented Aug. 26, 1879.

Fig. 1.

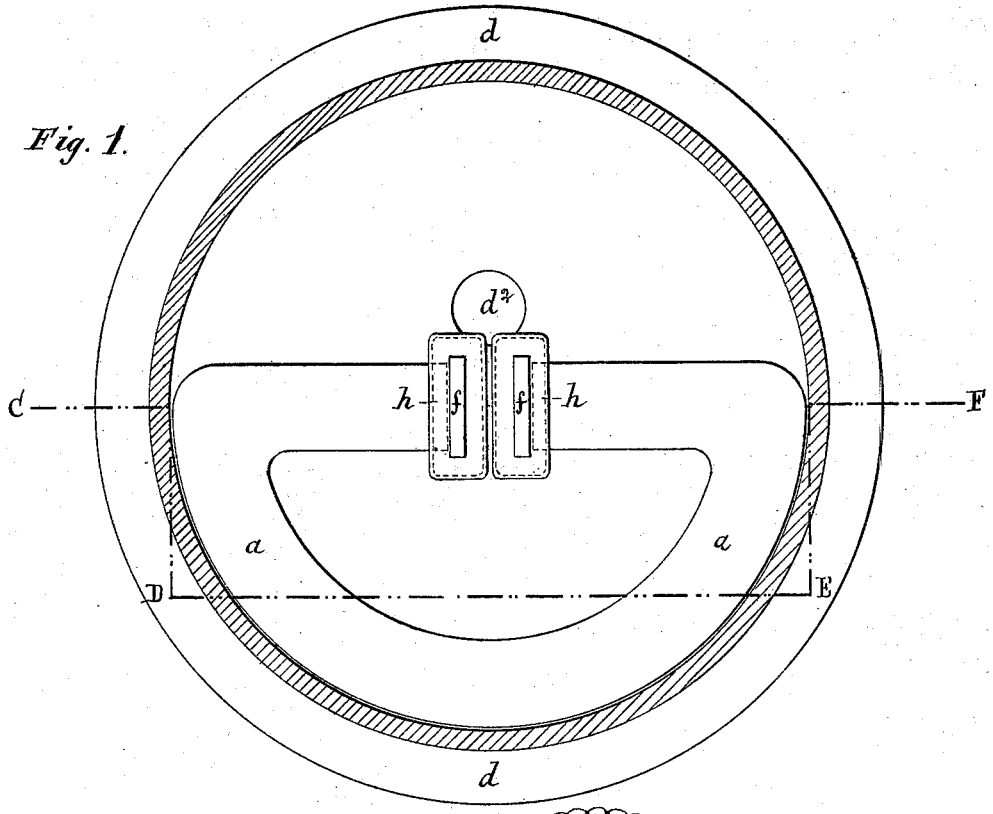
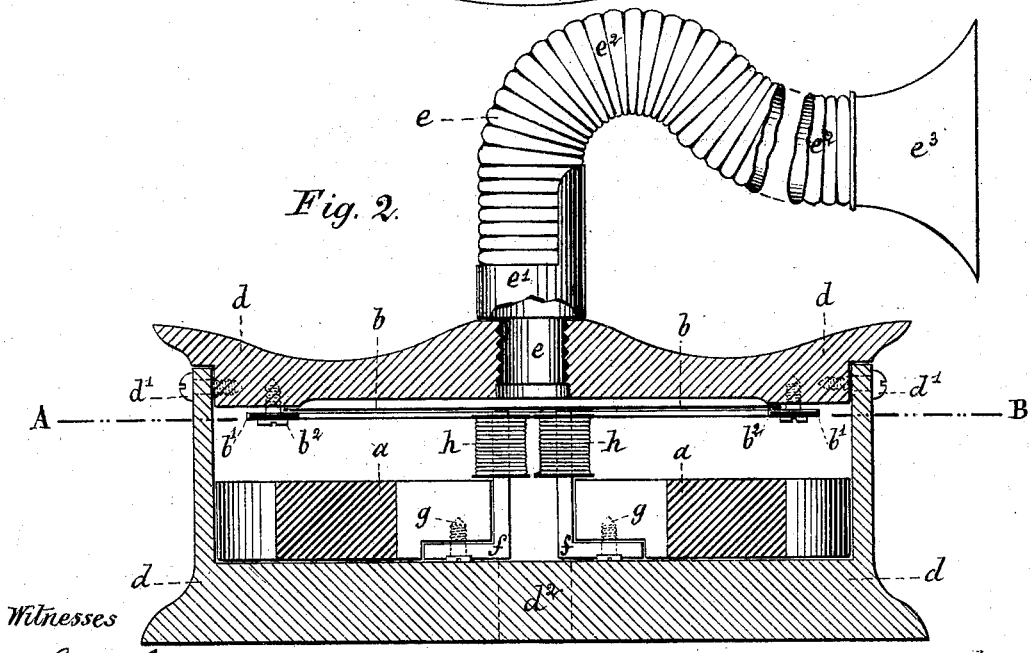


Fig. 2.



Witnesses

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Amy Finch

Inventor

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Fig. 3.

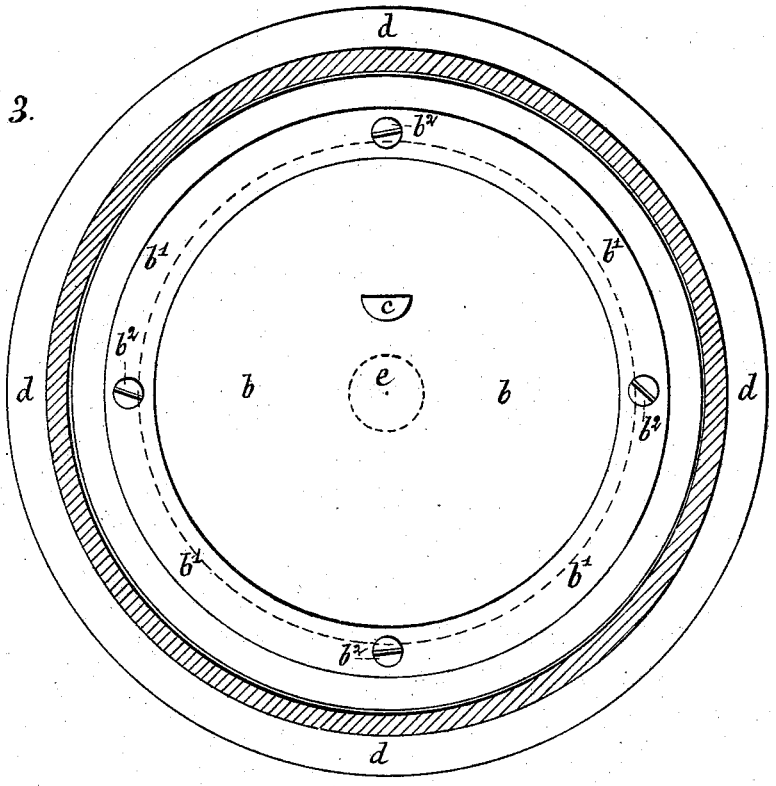
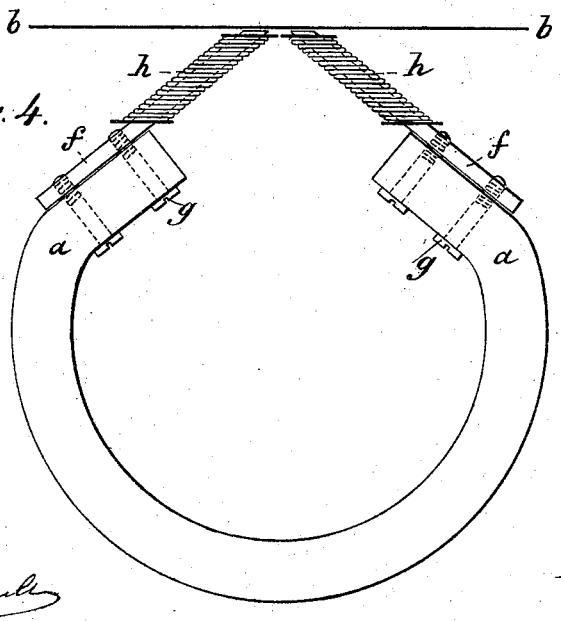


Fig. 4.



Witnesses.

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Fig. 5.

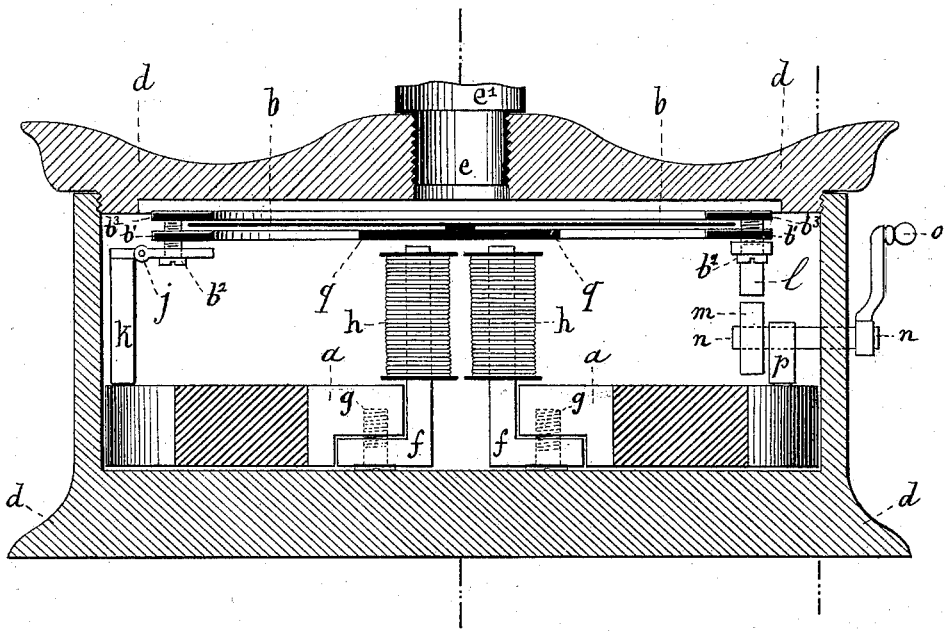


Fig. 6.

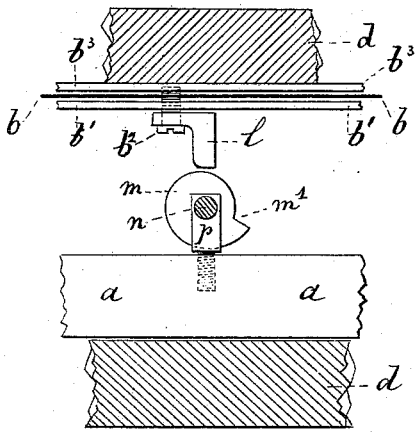
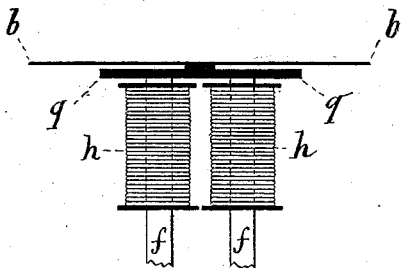


Fig. 7.



Witnesses
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UNITED STATES PATENT OFFICE.

FREDERIC A. GOWER, OF PARIS, FRANCE, ASSIGNOR TO HIMSELF AND CORNELIUS ROOSEVELT, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRIC TELEPHONES.

Specification forming part of Letters Patent No. **218,873**, dated August 26, 1879; application filed January 15, 1879.

To all whom it may concern:

Be it known that I, FREDERIC ALLEN GOWER, of Paris, in the Republic of France, have invented a certain new and useful Improvement in Telephones, called "Chronometer-Telephone," of which improvement the following is a full, clear, and exact description.

This invention relates generally to the instruments known as "telephones," used for the transmission and reproduction at a distance of the human voice or other audible sounds by means of electric or magneto-electric currents, and more particularly to that class of instruments operating to transmit or reproduce sounds by means of a vibratory plate and armature or armature-plate acting to induce electric currents in coils surrounding the poles of a magnet by its vibrations, or to respond to electric currents from other sources traversing said coils.

In this class of instruments, as at present constructed, the horseshoe-magnets employed occupy considerable room, and by reason of their substantially parallel position there is more or less sympathy between the arms. The poles of the magnet are generally not brought so near the center as desirable.

The apparatus to generate a current for signaling is usually entirely or substantially separate from the devices used in talking or telephoning.

The same magnet and coils have, however, been used for both purposes, in some cases the diaphragm itself of the telephone being made to serve as an armature to generate the signaling current by pivoting the magnet and causing the poles thereof with the coils to move away from the diaphragm by means of a push-pin or similar device.

The object of this invention is to render the instruments more efficient and compact in the above respects, and also to otherwise improve their construction.

The invention consists in a new form of magnet; also in special apparatus, as hereinafter specified, for generating a current for signaling, operating by the same magnet and armature used in talking or telephoning in a telephone-box of metal; and in the construction and combination of parts, as hereinafter more fully set forth.

I call the instrument the "chronometer-telephone."

The following description will enable those skilled in the art to which it appertains to make and use my invention.

In the drawings, Figure 1 is a top view of a telephone, partly in section, on line A B, Fig. 2, with the vibratory plate and armature removed, showing the form of the magnet employed. Fig. 2 is a vertical section on lines C D E F of Fig. 1, with armature-plate and mouth-piece in position; Fig. 3, a bottom view of the upper part of the instrument, shown partly in section on line A B, Fig. 2; Fig. 4, a side view of a magnet of improved shape, with coils upon its poles and an armature-plate in position; Fig. 5, a view, partly in section and partly in elevation, of a telephone provided with signaling apparatus operating in accordance with my invention. Figs. 6 and 7 are detail views.

The same letters refer to like parts on all the figures.

a represents the magnet, to the ends or poles of which pole-pieces *f*, surrounded by coils of wire or bobbins *h*, are attached by screws *g*. The magnet is of a generally semicircular form, the curvature corresponding to that of the box or case *d*, with the arms bent inward and converging to bring the poles near together, the bent arms forming substantially the chord of the semicircular part. The pole-pieces are attached in an upright position.

In Fig. 4 is shown a form of magnet somewhat modified from the above described. It will be seen that the poles or ends of the pole-pieces are brought near the center of the plate, and the arms are curved, to avoid the objection to the magnet of ordinary horseshoe form.

The box or case *d* is made of metal. The operation of telephones constructed with metallic boxes or cases is generally more perfect, particularly by reason of the better acoustic effects produced. The articulation is more distinct and perfect, and the sound given out is clearer and louder than with the boxes heretofore employed.

These results were obtained after a long series of experiments, and appear to be due to the homogeneous character of the metallic case with the metallic diaphragm and bind-

ing-ring, and to the vibration of the entire box synchronously with the diaphragm.

The metal of which the box or case is made may be brass or other non-magnetic metal; or iron or steel or a magnetic metal may be employed.

Boxes made of wood might be used in connection with other parts of my invention; but I regard the metallic case as an important improvement.

b represents the elastic vibratory plate, attached by a ring, b^1, and screws b^2 to the top of the case *d*. This vibratory plate may be made itself to serve as the inductive armature, or an armature, *q*, made of soft iron and of circular or other suitable shape, may be used, attached to said plate by solder, if the plate *b* is of metal, or in any suitable manner, according to the material used.

The top of the case or box may be secured to the lower part by screws d^1, or by means of screw-threads upon the outer rim and interior of the lower part, or in any desired manner.

In the lower part of the case, Figs. 1 and 2, is a cavity, d^2, to receive the lower end of the tube containing the vibratory reed, which is attached to the under surface of the membrane or vibratory plate in the manner already described in an application for a pneumatic signaling-telephone. It forms no essential part of the present invention, and may be omitted, as it is in Fig. 5.

In the top of the case is an aperture with a screw-thread, into which one end of the speaking or hearing tube *e* is inserted, a metal supporting-tip, e^1, being used, into which the flexible portion e^2, provided at its outer end with a mouth-piece, e^3, is inserted.

The apparatus for signaling is as follows: The elastic vibratory plate or diaphragm is secured to a hinged frame. The top of the case, with the ring b^1, serves as such frame by providing it with a hinge at one side and dispensing with the screws d^1, or using such a mode of fastening as will permit to the cover a sufficient amount of movement on the hinge, for the purpose hereinafter set forth.

In the drawings, Figs. 5 and 6, the vibratory plate is secured between the ring b^1 and a second ring, b^3, constituting the frame. At the top of a standard, *k*, let into the magnet *a* to hold it more securely, is the hinge *j*, on which the frame and the vibratory plate or diaphragm *b* turn. At the opposite side of the frame is a projection or pin, *l*, which rests against the cam-wheel *m*, secured on an axle or shaft, *n*, which turns in bearings in the standard *p*, secured to the magnet. The shaft is rotated by a crank, *o*, outside the box or case.

By the rotation of the cam-wheel the vibratory plate is raised and lowered at each revolution. The object of this raising and lowering of the diaphragm is to obtain a sufficient current to operate a bell or signal at the receiving-station.

Instead of using the vibratory plate or diaphragm as the inductive armature, I employ, in connection with it, a separate inductive armature, *q*, secured to said vibratory plate, preferably at the center.

It is obvious, however, that the diaphragm itself, if made of sufficient thickness, would serve as above indicated; but a plate or diaphragm of the required thickness would seriously impair its value and effect for the transmission of articulate speech.

By the employment of the independent inductive armature there is obtained in the neighborhood of the poles, without injury to the capacity to transmit speech, a sufficient body of iron to induce, by impact upon or departure from the said poles, a magneto-electric current in the surrounding coils of sufficient force and intensity to ring a bell, to cause the fall of a disk of an annunciator, to bring into circuit an electric current from an auxiliary battery, or to perform such other mechanical function as may be required at the point with which said coils may be properly connected; and such current may also be produced by the sudden removal of such plate from its contact with the poles. The said armature-plate may be fastened upon the upper surface of the vibratory plate or diaphragm, or the said plate may form a structural portion of the diaphragm.

When the vibratory plate is secured to the top of the case a greater rigidity of frame is obtained; but in either case the elasticity of the diaphragm causes, under the operation of the cam, a sudden release and return of the armature from and to the magnet, thereby generating in the surrounding coils effective magneto-electric currents for producing mechanical motion, as above described. The effect in practical use is, that a single complete revolution of the cam-wheel by the crank and axle produces the fall of a disk in an annunciator, or the ringing of a bell, or such other form of signal or mechanical motion as may be desired at the distant station with which this instrument may be properly connected, and leaves this instrument in condition for use in transmitting the human voice along the connecting lines according to laws already known.

In the use for transmitting spoken words or other audible sound of the instrument here described, said instrument is operated by leaving the crank in such position, as seen from the outside of the box, as to cause the cam-wheel to lift the diaphragm and induction or armature plate to the distance of one-thirty-second part of an inch or one-sixty-fourth part of an inch from the poles of the magnet, or to such other distance as may be found to yield the best result in the case of any particular instrument in practical use; and when the parts are in such position as last described, it results that any disturbance of the diaphragm, as by sound-waves produced in its neighborhood, is communicated to the induction-plate, and thence to the magnet and coils, by the magnetic attraction or sympathy, in accordance with laws already known; and it also results

from this disposition that any disturbance of the magnet and coils, as by arrival of magneto-electric currents upon the line-wire, is communicated first to the induction-plate, and thence to the diaphragm, also in accordance with laws already known.

It is evident that by leaving the armature in contact with the poles when not in use it will act as a keeper to preserve the magnetism of the permanent magnet.

This signaling apparatus may be also used in the instrument called the "magnophone," for which I have made separate application for Letters Patent, which operates to transmit speech or audible sounds by means of an armature-plate in permanent contact with the poles of the magnet.

I have before pointed out some of the advantages of the special form of magnet used.

It is also possible with this arrangement of magnet to greatly diminish the interior capacity of the box containing the telephone, and thus avoid much of the reverberating effect which a large box, such as is necessary to contain a horseshoe-magnet, produces. The circular form also tends to concentration directly upon the plate of all sounds produced in such box, whether by use of the pneumatic signal or as received from the vibrations which originate in the telephone at the distant station.

A membrane larger than that commonly employed may be used to good advantage, and thus the power and value of the telephone increased.

In the arrangement shown the manner of joining the pole-pieces with the body of the magnet is intended to more perfectly convey toward the membrane the full power of the magnet, and thus to obtain corresponding increase in the effect of the instrument.

While the metallic box of circular shape, the special form of magnet, and the signaling apparatus above described are represented as used together, constituting the most efficient and compact form of telephone, they may with good effect be used separately with boxes of other shapes and materials, other forms of magnet, or signaling apparatus of ordinary or suitable construction.

Various modifications may be made in the details of the apparatus, some of which I have before indicated.

Having thus described my said invention, and the manner in which the same is or may be carried into effect, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. A telephone-magnet of general semicircular form, with the arms bent inward, and forming substantially the chord of the semicircular arc, substantially as described.

2. The combination, with a telephone box or case of substantially circular form, of the semicircular magnet with inwardly-bent arms, and elastic vibratory plate and inductive armature or inductive armature-plate, substantially as described.

3. The combination, with the box or case of generally circular form, and the elastic vibratory plate and inductive armature or inductive armature-plate, of the magnet of semicircular form, with inwardly-bent arms, and poles or pole-pieces provided with coils, and arranged at right angles to the respective planes in which the magnet and vibratory plate lie, substantially as set forth.

4. The combination, with the vibratory plate or diaphragm, the magnet, and coils surrounding its poles, of an inductive armature attached to said diaphragm, and means for rapidly moving said armature into and out of contact with said poles, substantially as described.

5. The combination, with a magnet and coils surrounding the poles, of a hinged frame, an elastic vibratory plate or diaphragm secured to said frame, an inductive armature secured to said vibratory plate, a projection on said frame, and a rotary cam-wheel and shaft arranged to act against said projection, substantially as described.

6. The combination, with a hinged frame composed of the top of the telephone-box, and one or more distending-rings, of an elastic vibratory plate and inductive armature, and operating mechanism, substantially as described.

7. The combination, with a telephone box or case of generally circular form, and a magnet of semicircular form with inwardly-bent arms, forming substantially the chords of the semicircular arc, of a hinged frame, elastic vibratory plate, and inductive armature, and mechanism for moving said frame to bring the armature into contact with the poles of the magnet or remove it therefrom, substantially as described.

8. In a telephone of otherwise ordinary or suitable construction, the metallic box or case, substantially as set forth.

9. In a telephone having a semicircular magnet with inwardly-bent arms, the circular metallic box or case, substantially as described.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

F. A. GOWER.

Witnesses:
EMILE BARRAULT,
AUG. VINCK.