No. 671,458. Patented Apr. 9, 1901.

E. H. STRAUSS & F. J. STEIN.

ELECTRIC TELEPHONE RECEIVER.

(Application filed Aug. 13, 1900.)

(No Model.)

Fig. 1.

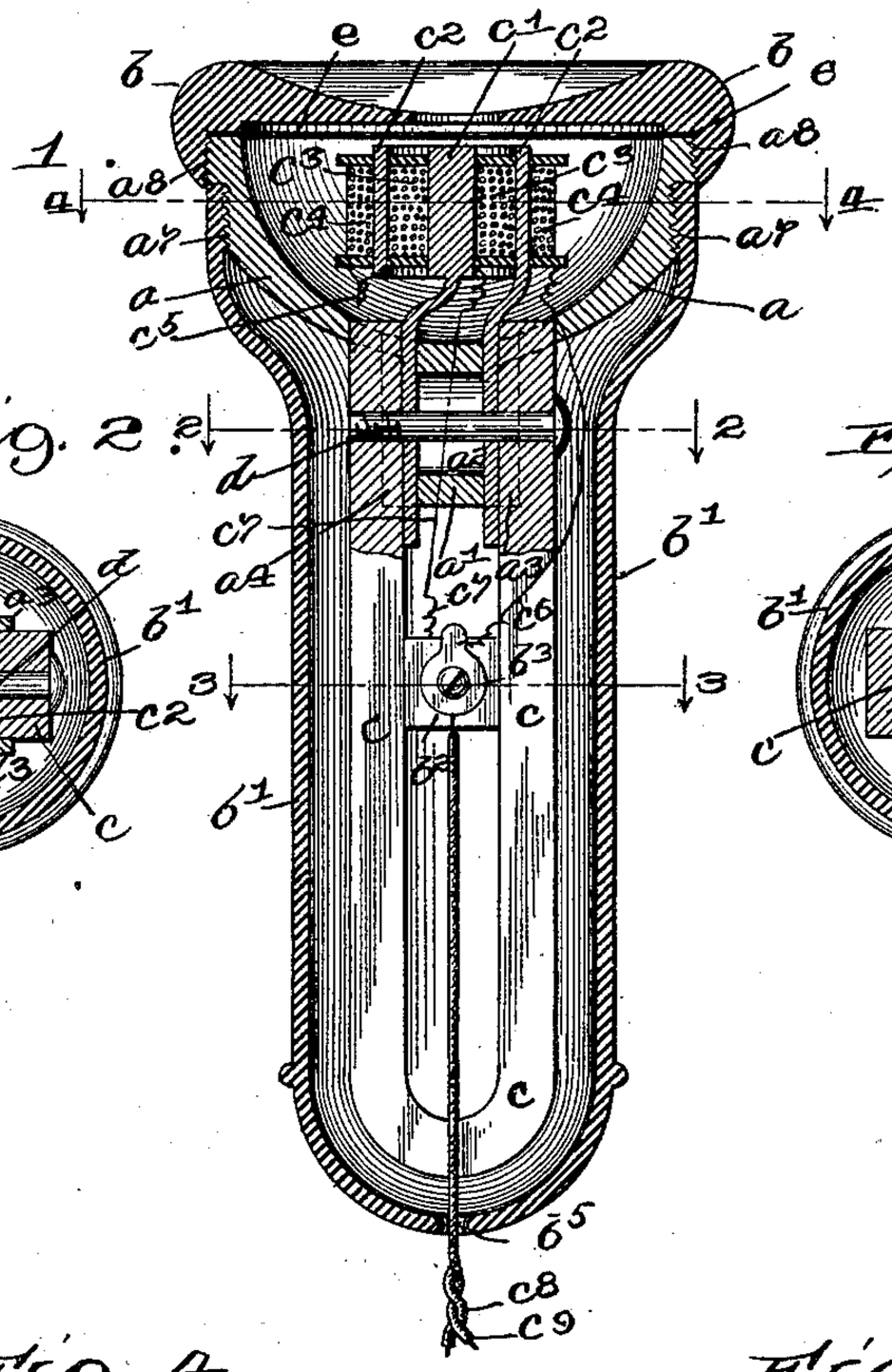


Fig. 2.

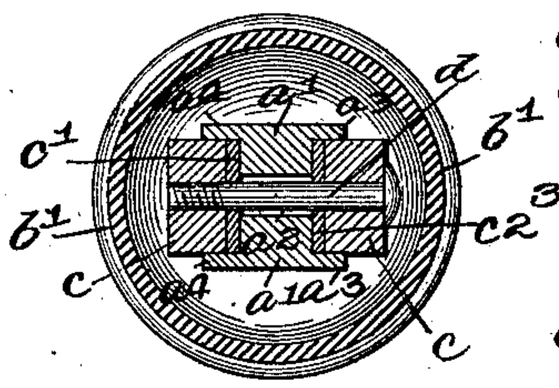


Fig. 3.

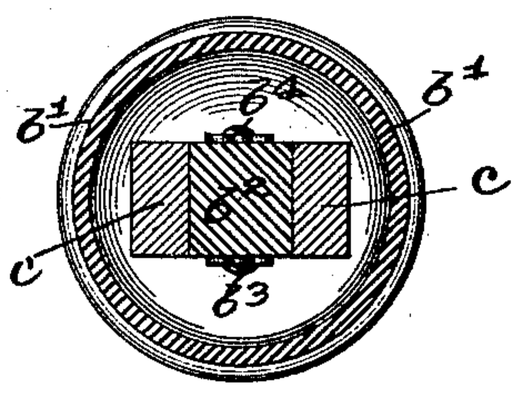


Fig. 4.

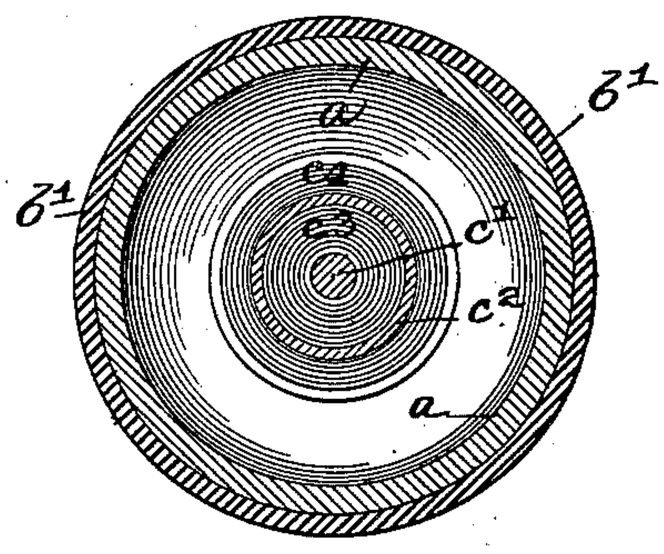
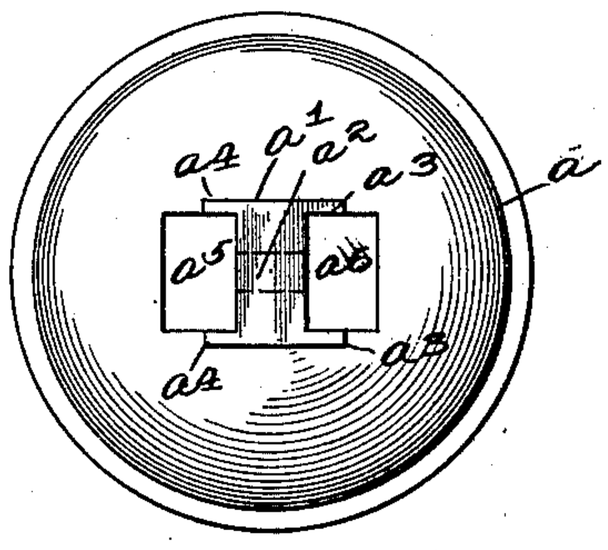


Fig. 5.



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ERNEST HUGO STRAUSS AND FRANK J. STEIN, OF CHICAGO, ILLINOIS.

ELECTRIC TELEPHONE-RECEIVER.

SPECIFICATION forming part of Letters Patent No. 671,458, dated April 9, 1901.

Application filed August 13, 1900. Serial No. 26,694. (No model.)

To all whom it may concern:

Be it known that we, ERNEST HUGO STRAUSS and FRANK J. STEIN, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Electric Telephone-Receivers; and we do hereby declare the following to be a full, clear, and exact description, such as will enable persons skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in electric telephone-receivers.

One object of our invention is to improve the construction and efficiency of telephone-receivers, by which they are rendered easy of accurate and permanent adjustment, unaffected by expansion of the magnet or of the case, and in which all of the parts retain rigid mechanical alinement during the time when they are being shifted for the purpose of adjustment.

Another object of our invention is to provide an instrument wherein the magnetic lines of force are efficiently concentrated and directed toward the diaphragm, and wherein a complete magnetic field of opposing polarities is established within the center of the diaphragm and within a region concentric therewith between the center and the annular support.

With these and other objects in view which may hereinafter appear our invention consists in the novel construction and combination of the parts herein shown and described.

In the drawings, Figure 1 is a longitudinal section of our telephone-receiver. Fig. 2 is a transverse section of the same, taken on lines 2 2 of Fig. 1. Fig. 3 is a similar section taken on lines 3 3 of Fig. 1. Fig. 4 is a similar section taken on lines 4 4 of Fig. 1. Fig. 5 is a view looking from the bottom of the detached metal casing.

In all of the views the same letters of reference are used to indicate similar parts.

Our instrument is of the double-pole permanent-magnet receiver type.

a is a cup-shaped casing, preferably of brass, upon which all of the parts of the receiver are supported. A lug a' depends from the bottom of the said casing. A longitudinal slot a^2 is made in the said lug. Channels are cut into either side of the said lug, leaving guides a^3 and a^4 extending therefrom for the purpose of mechanically guiding the magnet and the terminals of the soft-iron magnet-cores.

a^5 and a^6 are perforations made into the bottom of the casing to permit the entrance of the permanent magnet c. External screw-threads a^7 are cut on the outside of the casing, upon which the internally screw-threaded hard-rubber tubular casing b' is to be secured. Similar threads are cut upon the said casing for the attachment of the hard-rubber cap b.

c is a permanent horseshoe-magnet perforated near its end for the clamping-screw d. A soft-iron round magnet-core c' terminates at its lower end into a flat plate, which is perforated for the entrance of the screw d and which is adapted to lie up flat against one of the poles of the permanent magnet c. An annular soft-iron magnet-core c^2 also terminates in a similar flat plate, which is perforated for the screw d and which also lies up against the opposite pole of the permanent magnet c. These plates are just wide enough to fit neatly in the channels provided in the lug a'.

c^3 is a magnet-coil which surrounds the core c' and which is within the annular core c^2. A similar magnet-coil c^4 surrounds the annular magnet-core c^2. These two coils are connected in series, preferably, as shown at c^5, and their terminals are connected to the binding-posts b^3 and b^4, which are located upon the insulation b^2, contained between the limbs of the permanent magnet c and held by being clamped between the two limbs of the magnet when the screw d is tightened. A flexible cord or terminal wire c^8 and c^9 enter the casing c' through a hole b^5 in the end of the casing and are connected, respectively, to the binding-posts b^3 and b^4, which are the terminals of the instrument.

The instrument is assembled by placing the flat terminal plates of the cores c' and c^2 against the inside surfaces of the respective poles of the permanent magnet c, passing the said plates down from the interior of the casing a, then slipping the permanent magnet over the said plates, which are held separated by the lug a', then passing the screw d through the perforations in the magnet and in the plates and through the slot a^2 of the lug a', and finally tightening the screw in the screw-

threaded hole of the permanent magnet, by which means all of the parts are brought up tight and permanently against the lug a', from which the permanent magnet depends. The perforations in the plates for the screw d are in such a position as to bring the upper terminals of the magnet-cores c' and c^2 in the same plane which confronts the diaphragm e. The electromagnet-coils are then placed upon the respective cores c' and c^2 and connected up in the manner shown and heretofore described. The diaphragm e rests upon the top of the case a and is held in position by the cap b. For adjusting the proximity of the cores c' and c^2 with the diaphragm e the screw d may be loosened, when the magnet system may be moved up or down within the slot a^2 of the depending lug a', and by this means the relation existing between the magnet system with the diaphragm may be easily and accurately adjusted, with all parts remaining in permanent alinement, and when the screw d is tightened all parts will be held rigidly in the position to which they have been adjusted, and it will be very difficult to disturb such adjustment by rough handling or by variation of temperature or from any other extraneous cause. The tubular casing b' may then be screwed onto the metallic casing-cup a, and when the diaphragm has been placed in position the rubber cap b may be likewise screwed in position over the casing a. We prefer to have it pass down far enough over the casing a to break the joint between the tubular casing b' and the casing a, as shown in Fig. 1 of the drawings.

By our construction we produce a very intense central magnetic field and an annular field surrounding the said central field of intense concentrated effect. We also induce a similar condition in the diaphragm. By our construction an intense magnetic field is concentrated upon the diaphragm, and results due to the fugitive lines of force are not produced. These lines of force so common in the ordinary telephone-receiver counteract the results that we are endeavoring to produce.

It will be noticed that the extension of the soft-iron cores c' and c^2 have a very large superficial surface in contact with the poles of the permanent magnet c and that they are held very firmly together by the clamping-screw. By this means the magnetic continuity is almost perfect and no consequent magnetic poles are produced, as frequently occurs at the joint of the permanent magnet and the soft-iron-core extension when the contact is so small as to constrict the magnetic flux.

In the operation of our telephone-receiver we have the bodily movement of the diaphragm e, due to the coacting influence of the two cores c' and c^2 of the magnet c. We also have an independent movement of the diaphragm due to the attractive and repulsive action between the cores c' and c^2 or within the annular magnetic field that exists between these two cores, and we believe that the sensitiveness and general excellence of our instrument are due in a great measure to this peculiar feature.

Having described our invention, what we claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a telephone-receiver a cup-shaped case, a lug depending from the bottom of the said case, vertical channels, or depressions, in each side of the said lug, perforations into the said case, coincident with the said channels, a two-pole magnet, adapted to embrace the said lug, a magnetic-core extension, of round cross-section, in contact with one of the poles of the said magnet, an extension having a cylindrical cross-section and surrounding the said magnetic core, in contact with the other pole, a magnet-coil between the two cores, a coil surrounding the said cylinder-core, and a means for holding the said magnet and the said extensions in contact with the said lug, substantially as set forth.

2. In a telephone-receiver a cup-shaped case, a lug depending from the bottom of the said case, vertical channels, or depressions, in either side of said lug, perforations into said case, coincident with said channels, a horizontal slot in said lug, a magnet, polar-core extensions on said magnet, and a screw passing through said slot for holding said magnet and said extensions to the said lug, substantially as set forth.

3. In a telephone-receiver a cup-shaped case, a magnetic system fixed to the said case, a screw-thread around the lower exterior portion of said case, a tubular insulating-casing around said magnetic system and adapted to engage with the said screw-thread, a screw-thread around the upper portion of the said case, and an insulating-cap, said cap adapted to engage with the said screw-thread and to extend over the joint formed between the said tubular casing and the said cup-shaped case, substantially as set forth.

In testimony whereof we have signed this specification, in the presence of two subscribing witnesses, this 9th day of August, A. D. 1900.

E. HUGO STRAUSS.
FRANK J. STEIN.

Witnesses:
FORÉE BAIN,
M. F. ALLEN.