

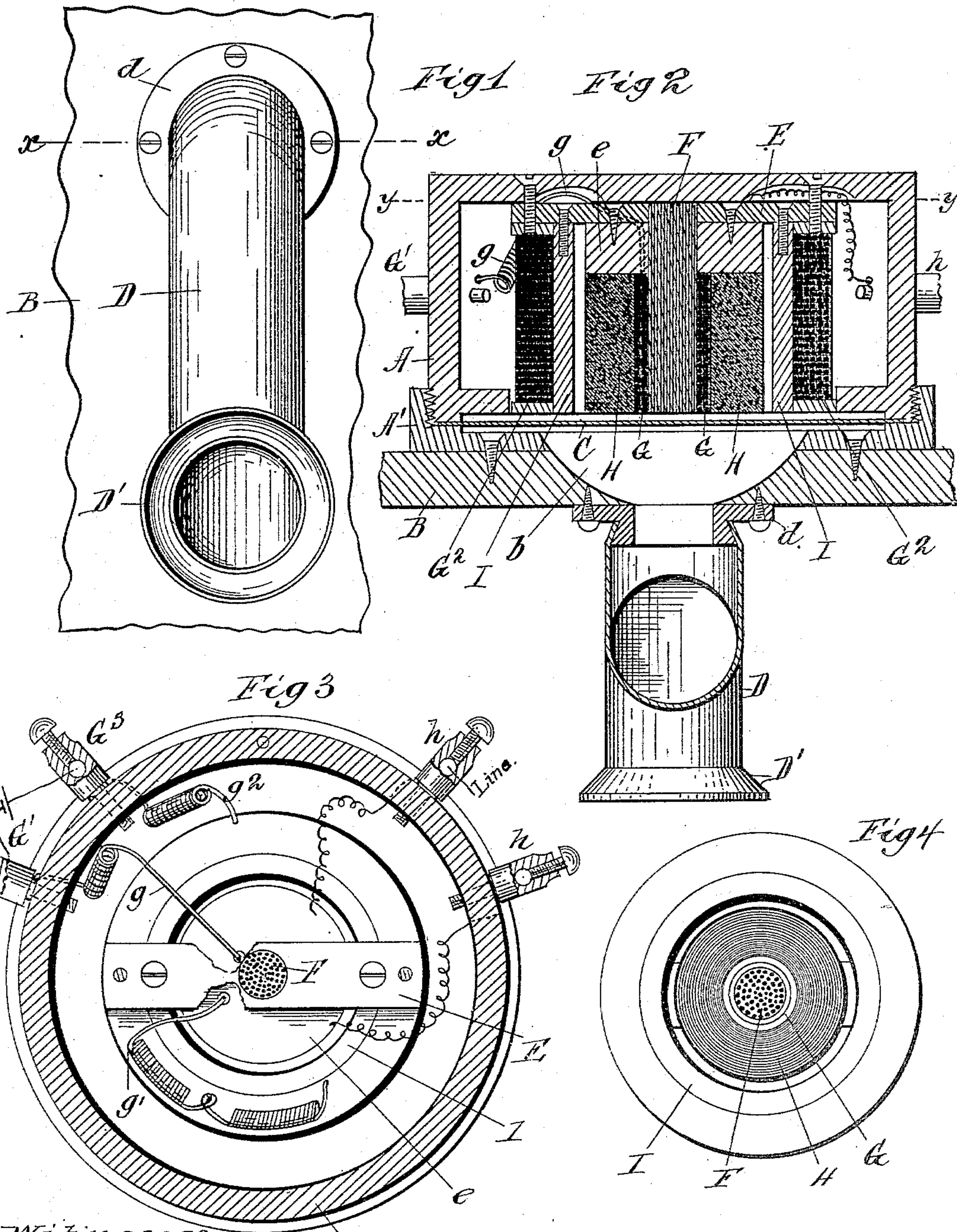
(No Model.)

2 Sheets—Sheet 1.

W. H. COLLINS.  
TELEPHONE RECEIVER.

No. 381,531.

Patented Apr. 24, 1888.



Witnesses,  
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William H Collins.

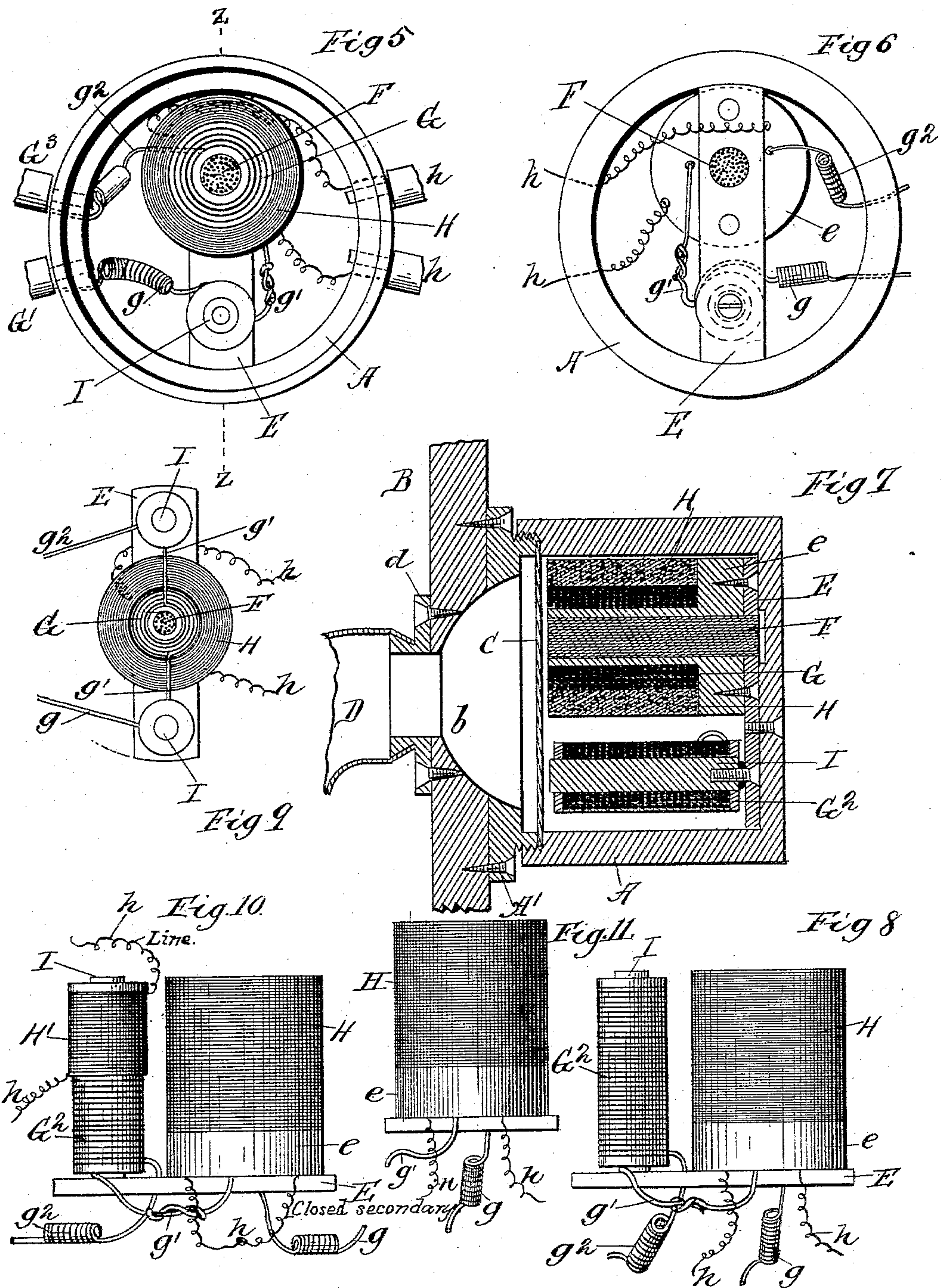
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# UNITED STATES PATENT OFFICE.

WILLIAM H. COLLINS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO JACOB KIRKNER, OF NEW YORK, N. Y., AND ROBERT BINES, OF CHICAGO, ILLINOIS.

## TELEPHONE-RECEIVER.

SPECIFICATION forming part of Letters Patent No. 381,531, dated April 24, 1888.

Application filed March 11, 1887. Serial No. 230,560. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. COLLINS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone-Receivers, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

10 Figure 1 is a front elevation of an apparatus embodying my invention in one form; Fig. 2, a sectional view of the same, taken on the line *x x* of Fig. 1; Fig. 3, a sectional view taken on the line *y y* of Fig. 2; Fig. 4, a detail front face  
15 view of the magnets and coils detached; Fig. 5, a front face view or elevation of a modified form of apparatus, the diaphragm being removed; Fig. 6, a rear view of the same with the back of the cup or casing removed; Fig.  
20 7, a sectional view taken on the line *z z* of Fig. 5; Fig. 8, a detail view of the magnets and coils detached; Fig. 9, a view similar to Fig. 5 of another modified form of apparatus; Fig.  
25 10, a view similar to Fig. 8 of another modification, and Fig. 11 a view similar to Fig. 8 of another modification.

Like letters refer to like parts in all the figures of the drawings.

30 My invention relates to telephone receivers, or, in other words, to sound-reproducing devices employed in conjunction with a suitable transmitter, whereby sound is transmitted by means of electricity. It has for its object to produce a receiver of increased effectiveness  
35 in operation; and to these ends my invention consists in certain novel features, which I will now proceed to describe, and will then particularly point out in the claims.

40 In the drawings, A represents a suitable cup or casing, constructed of glass, hard rubber, or any other good sound-insulating material, and forming the outer casing of the instrument. This cup is preferably secured within the telephone B, its outer margin being screw-threaded to screw into a correspond-  
45 ingly-threaded retaining-ring, A', attached to the inside of the said box B in any suitable manner. Between the meeting edges of the cup or casing A and the retaining-ring A' a

suitable seat is formed to receive the dia- 50  
phragm C, which is thus held firmly by its margin between the ring and casing. The box B is cut away in front of the diaphragm, as shown at *b*, to form an aperture for the pas-  
55 sage of the sound-waves from the diaphragm to the exterior of the box, and a ring, *d*, is provided on the outer side of the box B, surrounding the aperture *b*, for the attachment of a flexible tube, D, for conveying the sound to the ear,  
60 said tube being provided with a suitably-shaped ear-piece, D', for the purpose.

Within the cup or casing A, at the rear thereof, is secured a soft-iron plate or bar, E, upon which is mounted centrally a soft-iron  
65 core, F, preferably constructed of fine iron wires; but it may of course be constructed in a single piece, although I prefer the construction shown. A disk, *e*, of wood, rubber, or  
70 other insulating material, surrounds the core F at its rear end, and represents one end or head of the spool of the induction-coil surrounding the core F.

G represents a coil of the primary wire, preferably a copper wire, which is covered with  
75 any suitable insulating material, so as to insulate it from the core and secondary coil, and is connected at one end by a portion, *g*, thereof to a binding-post, G', from which a wire leads  
80 to the battery. This primary coil G is surrounded by a secondary coil, H, of fine copper wire, the ends of which are led to binding-  
85 posts *h*, suitably connected to the line upon which the transmitter is located. The secondary coil extends, along with the primary coil and core F, almost to the diaphragm, there being no spool-head at the front end, so that the  
90 end surface of the said secondary coil is exposed to the diaphragm as well as the core.

I represents a soft-iron cylinder mounted on the plate E and surrounding the core F and its  
95 coils G and H, but not in contact with them. This cylinder extends forward to an extent equal to the length of the core F and its coils, their front surfaces being all on a level and a short distance in the rear of the diaphragm.  
The primary wire is wound around this cylinder to form a coil, G<sup>2</sup>, which is preferably so  
connected with the coil G as to give to the cyl-



inder I a polarity the reverse of the core F, the connecting portion  $g'$  of the primary wire being connected to the inner portion of the coil  $G^2$  and to the outer portion of the coil G.

5 From the coil  $G^2$  the primary wire is led by a portion,  $g^2$ , to a second binding-post,  $G^3$ , from which a wire leads to the other pole of the battery.

10 Instead of so connecting the auxiliary core formed by the cylinder I as to give it a polarity the reverse of that of the central core, F, it may have the same polarity; but I prefer the construction and arrangement shown. Moreover, instead of arranging this auxiliary  
15 core in the form of a cylinder surrounding the central core and its coils, it may be arranged at one side thereof, as shown in Figs. 5 to 8, inclusive, of the drawings, in which the auxiliary core I and its coils  $G^2$  of primary wire  
20 are shown as mounted upon one end of the plate E and the main core and its coils mounted on the other end. In order to obtain a central position, which I deem preferable, although by no means indispensable, for the main  
25 core, I may adopt the construction shown in Fig. 9, in which the main core is opposite the center of the diaphragm, while two of the cores I are employed, one on each side thereof. This is, however, a mere duplication of the second  
30 core, the principle being identical, and it is obvious that a series of these cores suitably arranged may be employed in conjunction with the main core; or, indeed, they may be entirely dispensed with, (see Fig. 11,) relying  
35 entirely upon the action of the main core and its coil upon the diaphragm, although I prefer to employ these auxiliary cores in one form or another.

40 The operation of the instrument is as follows: A current passing through the primary wire and its coils from the battery magnetizes the cores F and  $G^2$  and the diaphragm C, which is in the magnetic field. The exposed end surface of the secondary coil likewise influences  
45 the diaphragm when any electrical disturbances of the battery-current occur. Any electric current received from the main line wire, due to the transmitter thereon located, will pass through the secondary coil, and will there-  
50 by affect the current passing through the primary coils, increasing or diminishing the same, as the case may be, and causing an increase or diminution in the action of the cores upon the diaphragm, thereby imparting to the same a  
55 vibratory action corresponding to that of the transmitting-instrument, and causing it to reproduce the sounds which cause the original vibrations. The secondary coil also partakes of this increase and decrease in its magnetic  
60 action, and operates upon the diaphragm in conjunction with the main core or magnet, its end surface being exposed, as hereinbefore described, so that a magnetic field of increased intensity is thereby produced, and the action  
65 of the diaphragm is thus rendered more ample and efficient.

In the construction just described the sec-

ondary coil H is connected to the line, and serves not only to increase the intensity of the magnetic field, as just pointed out, but also to  
70 vary the battery-current, as stated in the preceding paragraph. Now this latter function may be performed by means of a separate coil, and in Fig. 10 of the drawings I have shown a  
75 construction embodying this modification. In this case the coil H is not connected to the line, but has its ends connected to each other, while a separate secondary coil,  $H'$ , surround-  
80 ing one of the coils of primary wire on one of the auxiliary cores, is connected to the line. In this construction the line-current, passing through the coil  $H'$ , will vary the battery-cur-  
85 rent by its action upon that coil of primary wire which is surrounded by the said secondary coil  $H'$ . The battery-current thus varied will of course act upon the coil H through the  
90 medium of the coil G inclosed thereby, and a current corresponding to the line-current will thus be created in the said secondary coil  $H'$ . The magnetic effect of the main core F and ex-  
posed coil H upon the diaphragm will thus be substantially the same as in the construction  
hereinbefore described.

It is obvious that various modifications may be made without departing from the principle  
95 of my invention. For instance, instead of mounting the receiver in a fixed position within the box and employing a flexible tube to convey the sound to the ear, the cup or casing may be detached and connected to the trans-  
100 mitter in the usual manner, but with a three or four strand cord. Moreover, various other modifications than those described may be made, and I therefore do not wish to be un-  
105 derstood as limiting myself strictly to the precise details hereinbefore described, and shown in the drawings.

Having thus described my invention, what I claim as new, and desire to secure by Letters  
110 Patent, is—

1. In a telephone-receiver, the combination, with a vibratory diaphragm of magnetic material, of a soft-iron core, a coil of primary wire surrounding said core and suitably con-  
115 nected to a battery or other source of electricity, and a coil of secondary wire surrounding said primary coil, connected to the line, and having its end surface exposed to the diaphragm and exerting a magnetic influence thereon, substantially as and for the purposes  
120 specified.

2. In a telephone-receiver, the combination, with a vibratory diaphragm of magnetic material, of a soft-iron core, a coil of primary wire surrounding said core and suitably con-  
125 nected to a battery or other source of electricity, and a coil of secondary wire surrounding said primary coil and suitably connected to the line, the said coils having their end surfaces exposed to the diaphragm and exerting  
130 a magnetic influence thereon, substantially as and for the purposes specified.

3. In a telephone-receiver, the combination, with the vibratory diaphragm of magnetic ma-



terial, of the main soft-iron core and one or  
more auxiliary soft-iron cores presenting their  
end surfaces to but not in contact with the dia-  
phragm, an iron plate on which said cores are  
5 mounted, the primary wire coiled around the  
said main and auxiliary cores and connected  
to the battery, and the secondary wire con-  
nected to the line and coiled around the pri-  
mary wire, substantially as and for the pur-  
10 poses specified.

4. In a telephone receiver, the combination,  
with the vibratory diaphragm of magnetic ma-  
terial, of the central soft-iron core, a coil of

primary wire surrounding the same and con-  
nected to a battery or other source of elec- 15  
tricity, a coil of secondary wire surrounding  
said primary coil and connected to the line,  
the cylindrical auxiliary soft-iron core sur-  
rounding the said core and coils and itself sur-  
rounded by a coil of the primary wire, and an 20  
iron plate on which both cores are mounted,  
substantially as and for the purposes specified.

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