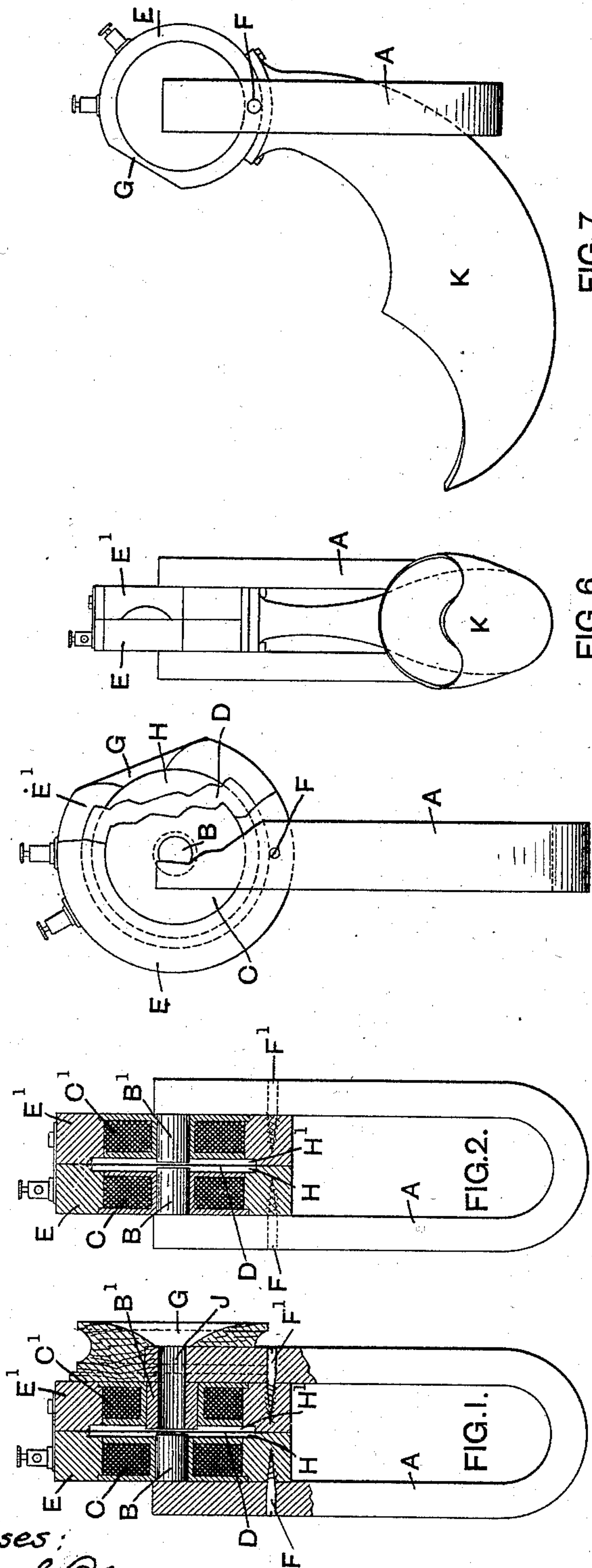


(No Model.)

J. B. S. BOOTH & E. J. FALCONER.
TELEPHONE.

No. 505,087.

Patented Sept. 19, 1893.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOSEPH BIRDUS SMITH BOOTH AND ERNEST JAMES FALCONER, OF
MANCHESTER, ENGLAND.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 505,087, dated September 19, 1893.

Application filed January 31, 1893. Serial No. 460,242. (No model.) Patented in England March 2, 1892, No. 4,068.

To all whom it may concern:

Be it known that we, JOSEPH BIRDUS SMITH BOOTH and ERNEST JAMES FALCONER, citizens of the United Kingdom of Great Britain and Ireland, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Telephones, (patented in Great Britain March 2, 1892, No. 4,068,) of which the following is a specification.

This invention relates to electro magnetic telephones of that type or class in which the poles of a permanent or electro magnet are arranged on opposite sides of the diaphragm or diaphragms and its object is to increase the efficiency of such telephones.

According to this invention we arrange a coil upon each pole or pole piece of the magnet or magnets and join them up in the line circuit, preferably in parallel or derivation. Each of the coils is wound or joined in the same direction. The coils however may in some cases be joined in series instead of in derivation. In all cases however the coils are so placed and connected that upon the passage of a current they tend to form similar polarity upon the opposite sides of the diaphragm, thus diminishing the magnetic force of the pole piece on one side of the diaphragm and correspondingly strengthening that on the other. The diaphragm is thus attracted on one side and released on the other upon each variation of current. In the event of an electro-magnet being used the energizing coils and the direction of current therein will remain constant.

In order that our invention may be more clearly understood, we have hereto appended drawings to which we will refer.

Figure 1 illustrates a cross section of a telephone constructed according to this invention with the ear or mouth piece placed over one of the pole pieces of the magnet. Fig. 2 is a similar section of a telephone with the ear or mouth piece arranged at right angles to the position in Fig. 1. Figs. 3 and 4 are respectively plans of the instruments shown in Figs. 1 and 2. Fig. 5 illustrates partly in elevation and partly in section, a view of the instrument represented in Fig. 2 at right angles therewith. Figs. 6 and 7 show a form of

the apparatus which may be used both as a transmitter and as a receiver.

As indicated by the drawings the telephone magnet A which may be either permanent or electrically energized is furnished with two inwardly projecting pole pieces B B' each of these pole pieces carrying a coil of wire C C' in connection with the line circuit. These coils of wire are so wound disposed and connected that upon the passage through them of an electric current they would tend to create similar poles in each pole piece at the ends next to the diaphragm. By this means of course the normal magnetism of one of the pole pieces would be increased and that of the other diminished. Many methods of winding and joining the coils to give this result are obvious but a preferred method is to wind both coils in the same direction and connect them in parallel the beginning of one coil and the end of the other being connected to one line terminal. The same end may of course be easily attained by suitably connecting them in series.

Between the pole pieces is placed the diaphragm D which is held in place by and clamped between the two halves E E' of the body of the telephone. This telephone body is preferably constructed of ebonite and may be secured to the magnet by the screws F F'. For the purpose of accurate adjustment the pole pieces may be capable of longitudinal movement by means of a screw. The diaphragm is thus placed in an intense magnetic field and is attracted equally by both poles until the passage of a current through the coils. The diaphragm is then attracted by the increased magnetism of one pole and the movement is augmented by the corresponding decrease in the magnetism strength of the pole on the other side of the diaphragm. The pole pieces are preferably not permanently secured to the limbs of the horseshoe magnet but are furnished with projections which engage with holes in the magnet. The limbs of the magnet are sufficiently elastic to allow of their being sprung into place over the pole pieces.

In the form shown in Fig. 1 the ear or mouth piece G is placed over one limb of the magnet and is in communication with one only

of the chambers H H' which are respectively formed on each side of the diaphragm by suitable recesses formed in the halves E E' of the telephone body. The communication may
 5 be effected by carrying a passage or hole J through the magnet limb and pole piece. Both of the chambers may if desired be in communication with the ear piece, it being preferred in this case to form the ear piece G
 10 on one side of the telephone body as shown in Figs. 2, 4, and 5, suitable holes leading to each of the chambers.

Figs. 6 and 7 illustrate a form which may be employed when it is desired to use the
 15 same instrument both as a transmitter and as a receiver. The instrument is provided with a lateral ear piece as shown in Figs. 2, 4 and 5, which however is in communication with one side only of the diaphragm. The cham-
 20 ber on the other side of the diaphragm is in communication with a peculiar quadrant shaped mouth or trumpet K the entrance of which comes about opposite to the speaker's mouth when the ear piece is placed to the ear.
 25 The pole pieces and coils on each side of the diaphragm may if desired in large instruments be multiplied and joined and connected in a manner similar to that employed with the single pair of coils.

30 Having now particularly described and as-

certained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In an electric telephone, a single diaphragm arranged perpendicular to and be- 35
 tween two co-axial pole pieces of a permanent or electro-magnet, the pole pieces having thereon coils included in the line circuit and wound or joined in such a manner that the line current tends to produce similar polarity 40
 in the ends of the pole pieces next to the diaphragm, substantially as set forth.

2. In a telephonic apparatus, a diaphragm having an air chamber on each side, a receiving and a transmitting aperture entering said 45
 chambers respectively at their edges, and a sound conveying trumpet, quadrant shaped, connected to one of said apertures and opening at its outer end toward the other aperture, for the purpose set forth. 50

In testimony that we claim the foregoing as our invention we have signed our names, in presence of two witnesses, this 3d day of January, 1893.

JOSEPH BIRDUS SMITH BOOTH.
 ERNEST JAMES FALCONER.

Witnesses:

GEORGE WILLIAM ROWE,
 ARTHUR WILLIAM PULMAN.