

(No Model.)

W. L. RICHARDS.
TELEPHONE.

No. 438,828.

Patented Oct. 21, 1890.

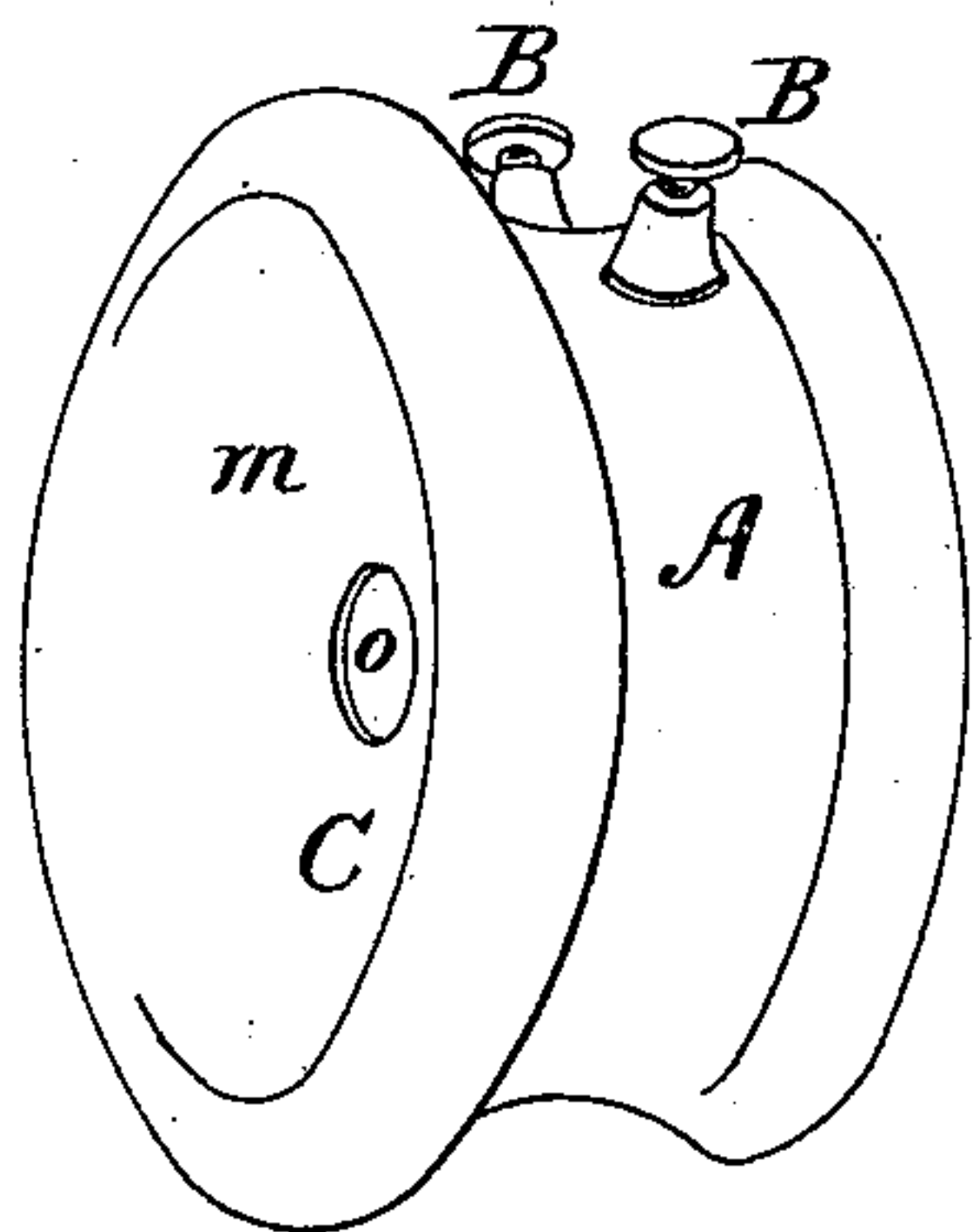


Fig. 1.

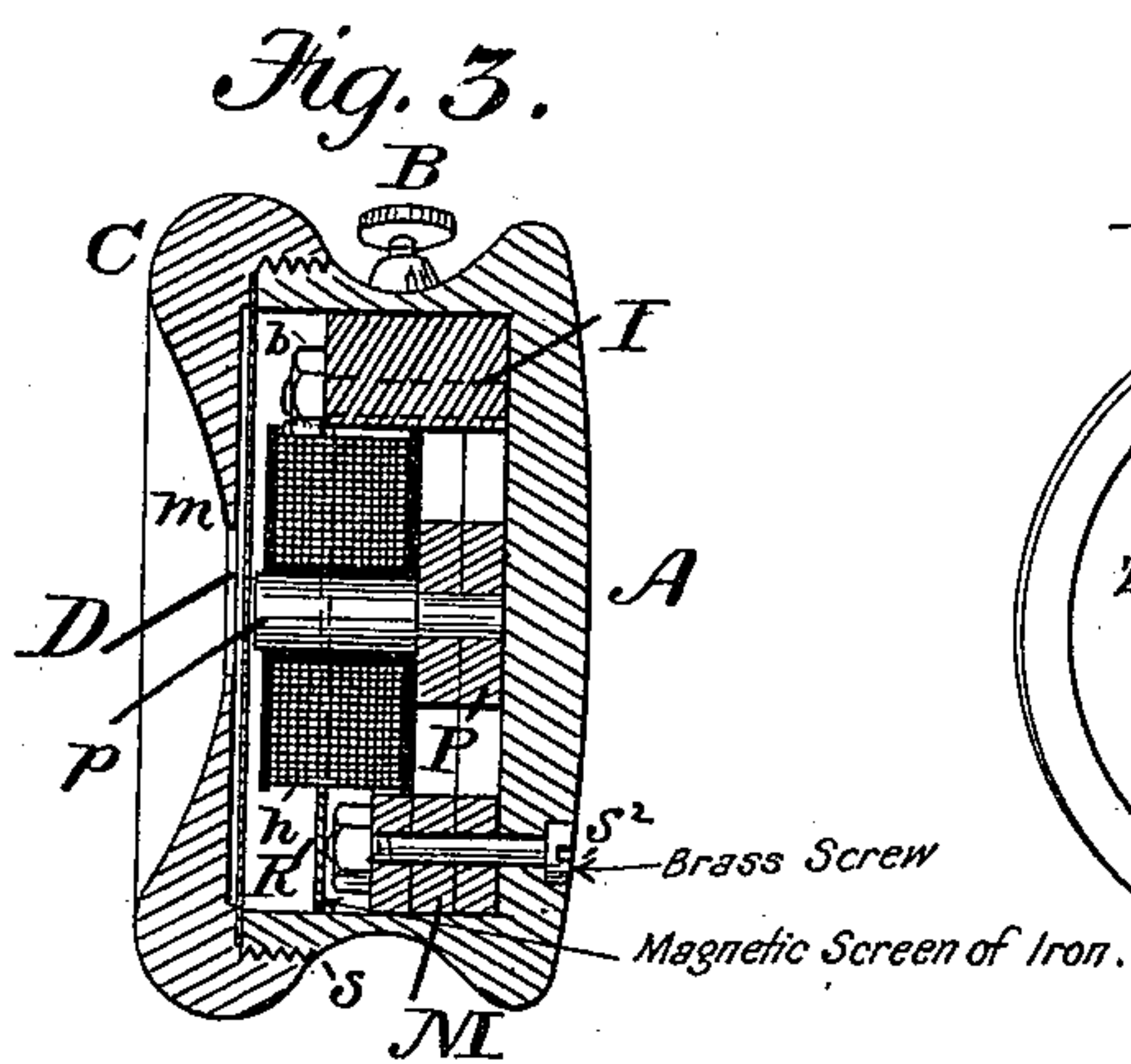


Fig. 3.

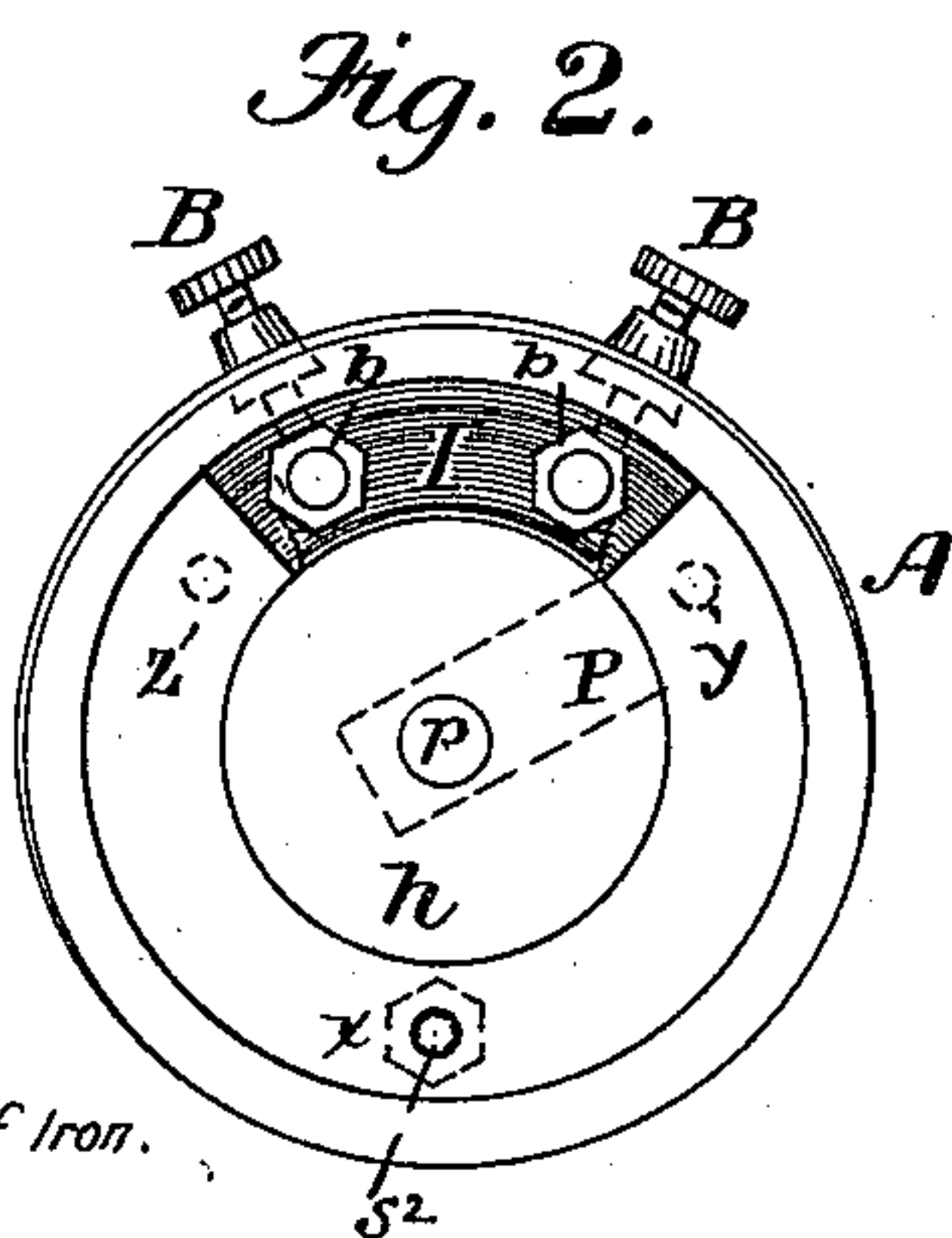


Fig. 2.

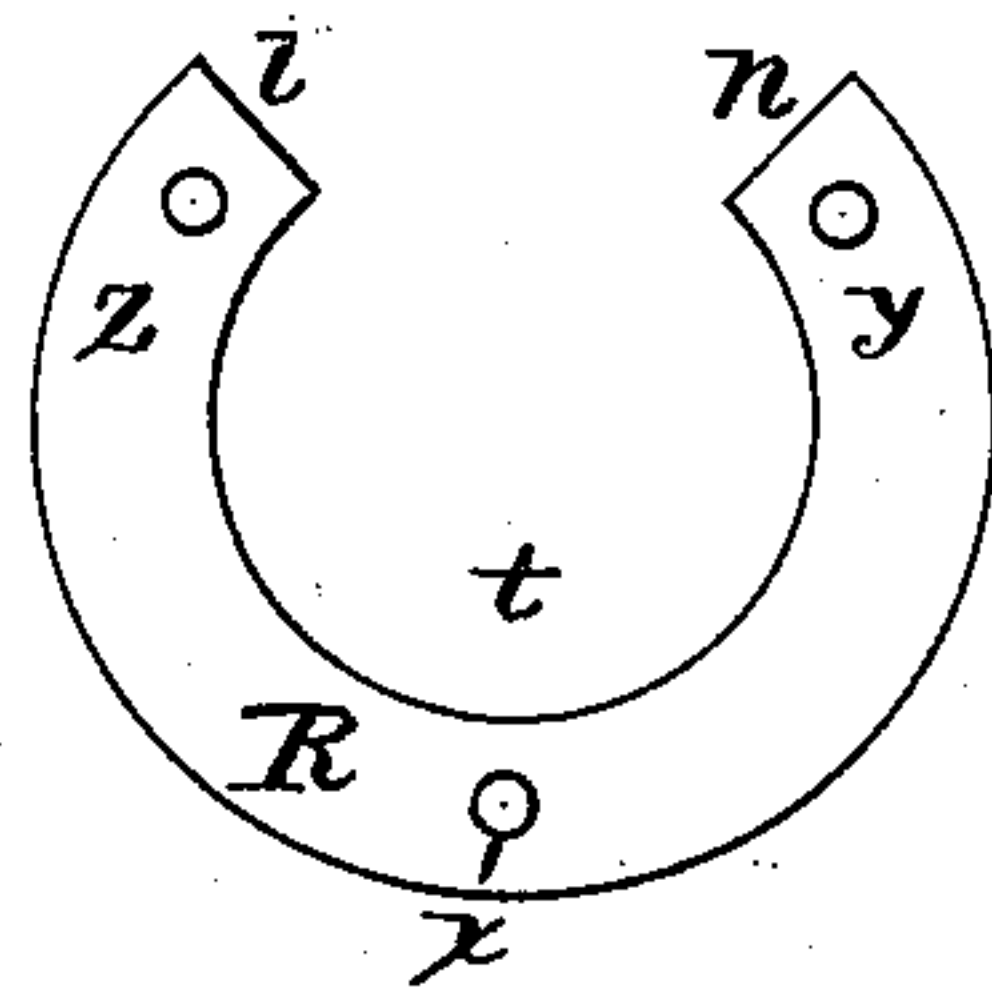


Fig. 4.

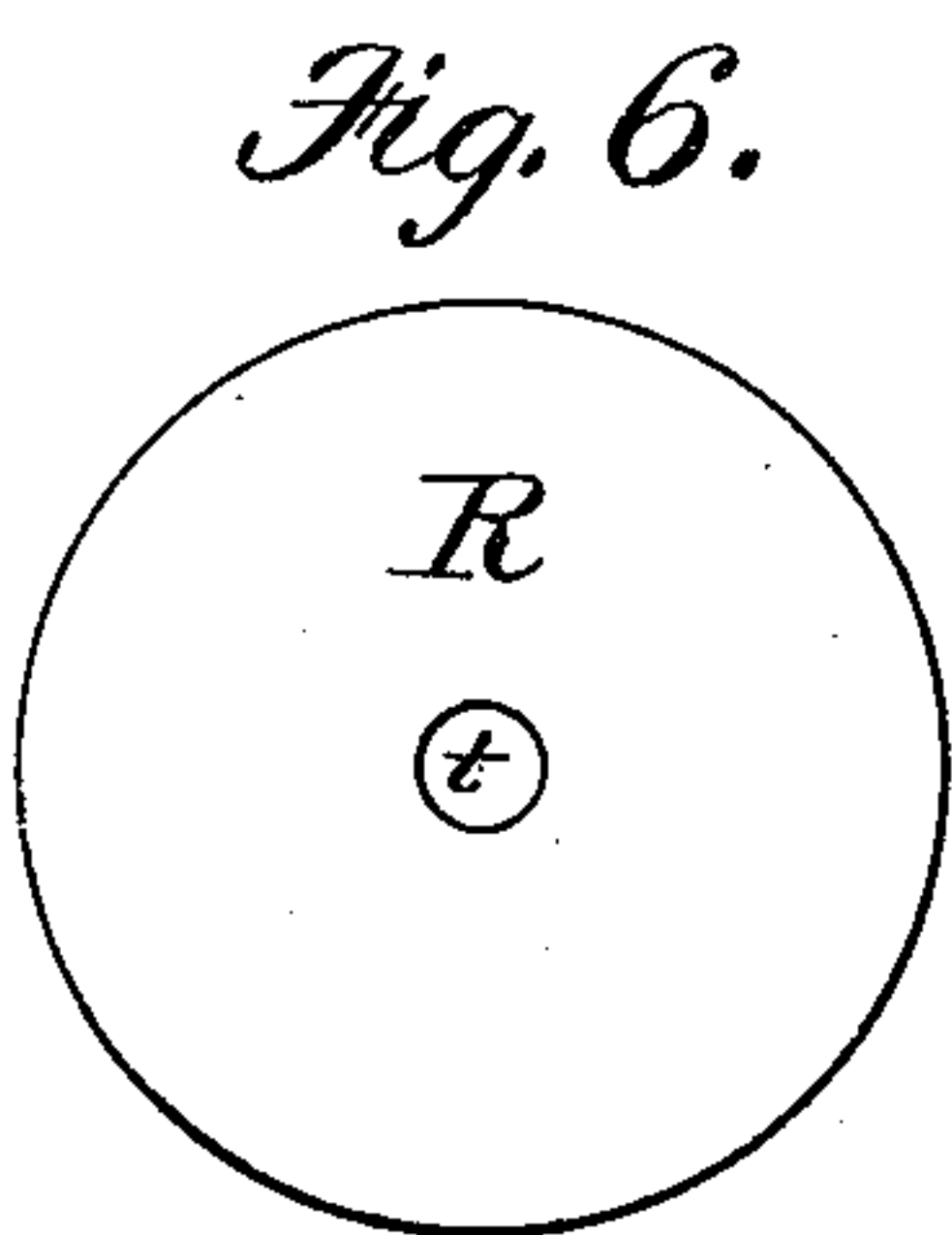


Fig. 6.

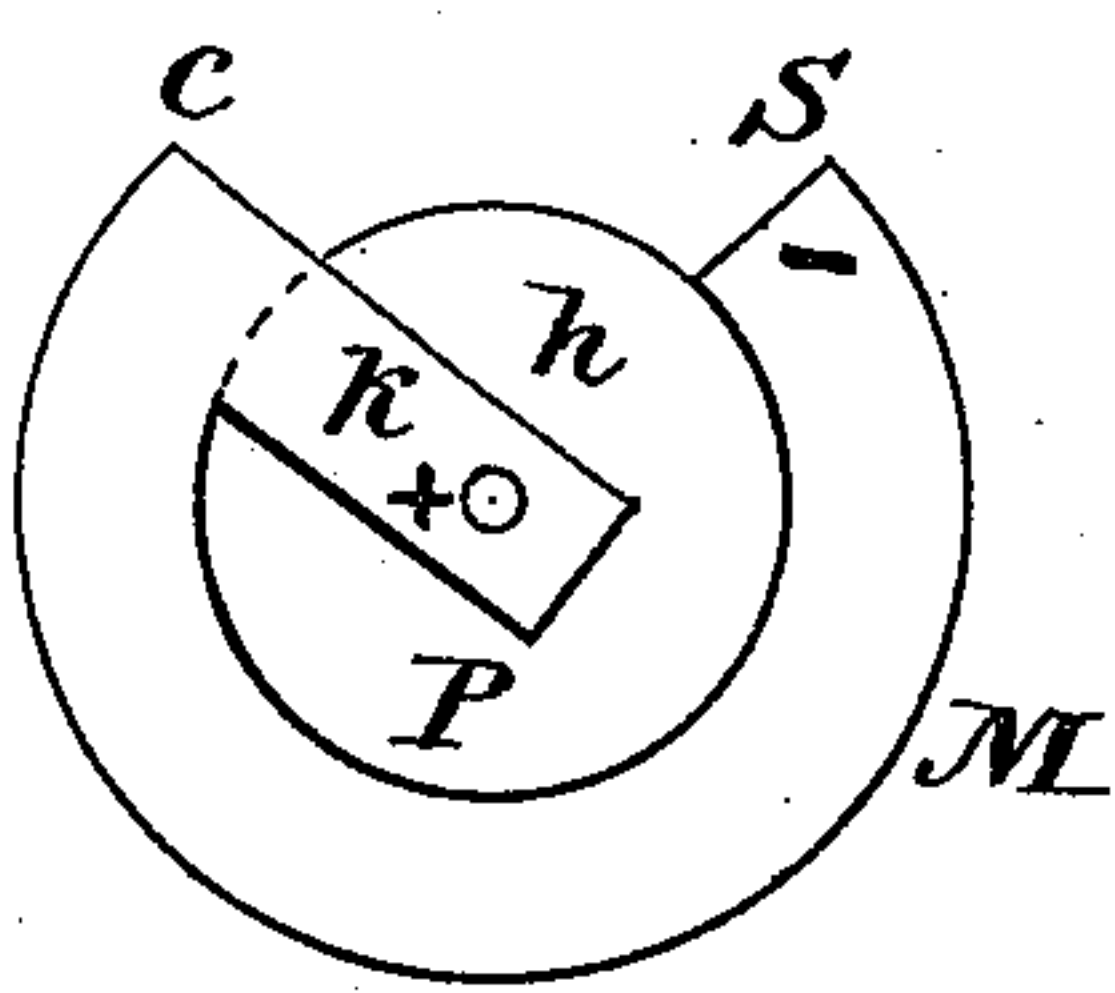


Fig. 5.

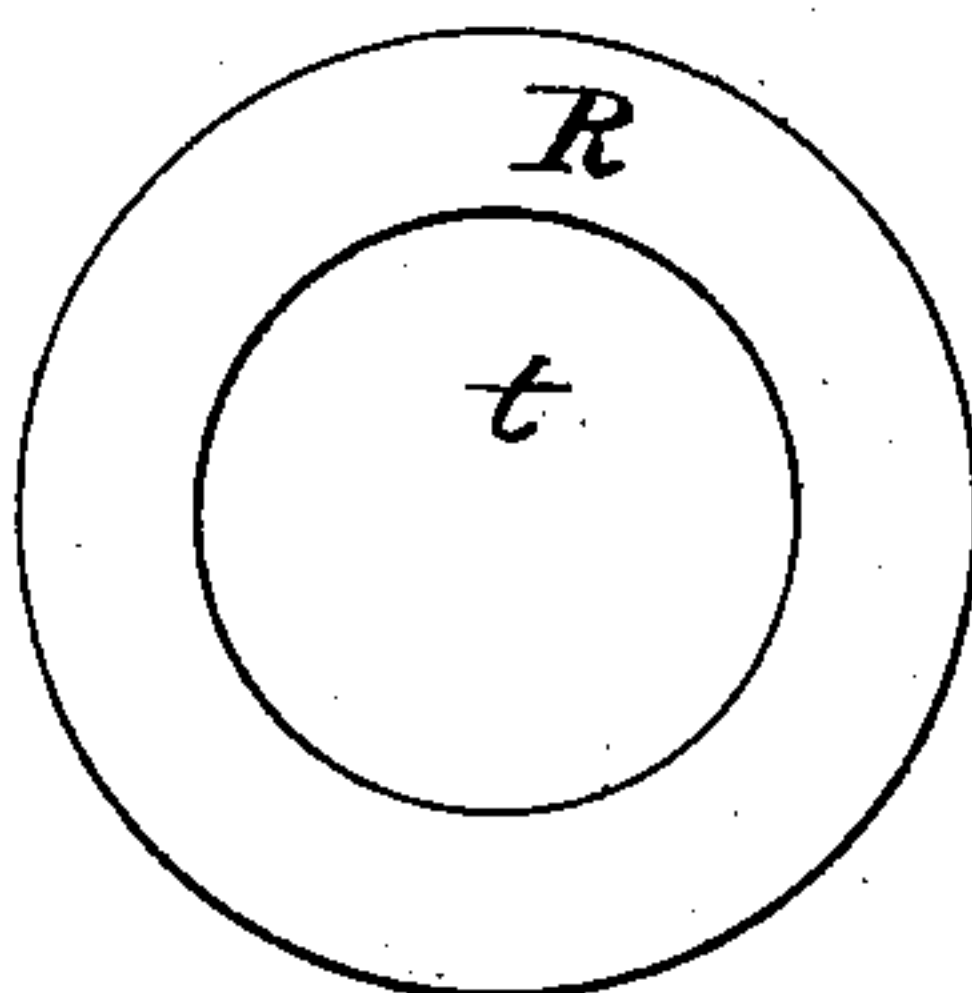


Fig. 7.

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UNITED STATES PATENT OFFICE.

WILTON L. RICHARDS, OF MALDEN, MASSACHUSETTS.

TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 438,828, dated October 21, 1890.

Application filed August 13, 1890. Serial No. 361,897. (No model.)

To all whom it may concern:

Be it known that I, WILTON L. RICHARDS, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Telephones, of which the following is a specification.

This invention is an improvement in magneto-electric telephony, and applies, chiefly, to magneto-telephones employing forms of inducing-magnet which to economize space and weight are coiled, curved, or otherwise brought into a small compass, and which, besides, are comparatively short, so that the polar intensity at both poles occupies a much greater proportion of the total length of the magnet than otherwise would be the case, as well as to forms of magnet in which the active pole is liable to establish its inductive circuit or direct its lines of force not only with and to its legitimate and complementary pole, but also with and to intervening points or portions of the magnet.

It is often convenient to construct telephone-magnets in a circular, helical, or spiral form, as when this is done they do not occupy a large space and can be inclosed in a small and light case.

Portable telephones—such as those described and claimed in Letters Patent of the United States granted September 2, 1884, to me, and numbered 304,667—which are intended to be worn upon the head of the operator are frequently provided for this reason with circular, helical, or curvilinear bar-magnets, and by their employment a comparatively light instrument can be constructed, which greatly conduces to the comfort of the wearer. In using telephones so constructed it has been found that the articulation is often thick and muffled in character and that the reproduced speech is by no means clear, and upon investigation I have ascertained that this imperfect reproduction is largely due to the fact that the magnets which it is expedient to employ exhibit polarity or manifest magnetism not at their poles or ends only, but that the said polarity extends also inwardly or toward the central or neutral point of the magnet to an undue and undesirable extent, while it may in some degree also be attributable to a tendency existing in magnets of such condensed form to develop consequent poles at

different points on the body of the magnet. The result upon the vibratory diaphragm is the distortion of the vibrations which are legitimately produced by the varying magnetism of the polar extremity immediately opposite to its center and which alone is properly active, with of course the ultimate effect of distorting the reproduced conversation or of impairing its perfection of character.

The design of my invention is to improve the articulation of the reproduced sounds in telephones and to cause them to copy more perfectly and accurately the original transmitted sounds, and this without any corresponding depreciation in volume. I accomplish this result by interposing between the diaphragm and all portions of the magnet except the end of the legitimately-active pole a screen of magnetic metal, whereby all disturbing influences of improperly-located magnetic manifestation are averted and prevented from coming into action. Since the said pole is surrounded by the telephone-helix, I find it convenient to cut a space in the said screen for the reception of the helix-spool, although I may, if I so elect, place the screen directly upon the upper surface of said spool, simply cutting a central hole for the passage of the active pole.

I prefer to make the magnetic screen of iron, and I have obtained in actual practice good results from making it of sheet or ferrotype iron and of the same thickness as that of the diaphragm.

In the instrument shown in the drawings it will be observed that the magnet does not extend completely round the inclosing-case and that a block of non-conducting material occupies the remaining space, serving as a support for the circuit or helix terminals of the telephone. In this particular instance, therefore, it is not even necessary that my screening device shall completely encircle the central core, it being sufficient to so construct and arrange it that it shall be interposed between the diaphragm and all parts of the magnet except the said central core thereof, which would otherwise face the said diaphragm and tend to exercise magnetic induction thereon.

In the drawings which illustrate and form a part of this specification, Figure 1 is an ex-

ternal perspective view of one form of telephone with which my improvement has been incorporated. Fig. 2 is a front plan view of the same instrument, the cap-piece and diaphragm having been removed to show the application thereto of a properly-shaped magnetic screen. Fig. 3 is a diametrical cross-section of the same instrument, and Fig. 5 a rear view of the magnet and helix. Figs. 4, 6, and 7 are plan views of differently-conformed magnetic screens which may be used, as hereinafter described, under varying conditions, Fig. 4 representing that adapted for use with the telephone shown in Figs. 1 and 3.

Referring first to Fig. 5, we may assume the central pole P, which is a short bar of steel k , projecting from the corner c of the magnet M, to possess north or + polarity. In that case the pole S at the other end of the magnet will of course possess south or - polarity; but, owing to the peculiarity in form and also in part to the longitudinal brevity of the magnet, there is found a tendency to prolong the central pole rearwardly, so that the point c , where the arm k turns off toward the center to form the pole-piece, also exhibits the same polarity as that of the said pole-piece, and this tendency is found to exist at points even still farther in the rear than the point c . In the same manner the opposing polarity of the pole S is not all concentrated at or near the extremity of the said pole, but is manifested for a comparatively considerable distance in the direction of the magnetic middle or neutral point of the magnet. The consequence of these phenomena, which involve numerous and complicated magnetic reactions, is that a most irregular magnetic field, completing many of its lines of force through the diaphragm, is created, which exercises a varying attraction on the said diaphragm in a correspondingly irregular and disorderly fashion, so that when the instrument is employed to reproduce electrically-transmitted speech the diaphragm necessarily vibrates irregularly and the speech is distorted and made comparatively inarticulate.

In Figs. 1, 2, and 3, A represents the external case of a magneto-telephone, preferably made of hard rubber, wood, or similar material, provided with a cap-piece C, of like material, which can be screwed thereon, as shown at s , and which is made concave externally and perforated at o to serve the purpose of an ear-piece or mouth-piece m . Within the said case is a curvilinear magnet M, which can be compounded of several separate similarly-conformed bars piled upon each other and held together by one or more screws s^2 . The magnet, though curvilinear in form, is preferably a bar-magnet, one of its poles P being at the center of the instrument and furnished with a soft-iron core or pole-piece p , secured to its end and projecting at a right angle therefrom in the axial line of the said instrument. This pole-piece therefore has its end immediately opposite the central ori-

fice o of the ear-piece. The free magnet-pole S lies at the side of the case, and in the space between this and that point of the north pole from which the central bar k proceeds I place a block I, of non-conducting material, on which I mount the terminal screws b of an electro-magnetic helix h , which surrounds the pole-piece p . The said helix is connected at its ends with said terminals, and these are in metallic connection with external binding-screws B, whereby the helix may be included in any electric circuit. The diaphragm D is, as usual, secured between the edge of the case A and its screw-cap C, and is thereby held with its center at the proper distance from the core p . It has been shown that a distortion of the magnetic field results from the construction so far described, and the consequences of such distortion have also been detailed. To prevent these, I provide a magnetic screen or plate of magnetic metal R, and interpose the said plate between the body of the magnet M and the inner surface of the diaphragm, securing it there. I have found that this simple expedient effectually screens the diaphragm and operative field from the adverse influences which I have described, for it entirely partitions off by a substance impermeable by ordinary lines of magnetic force the non-operative portion of the magnet, and thus prevents the formation of scattering magnetic fields, which, prior to the adoption of said screen, acted detrimentally upon the receiver. In the present instance this screen or plate is made of sheet-iron, ferrotyp-iron being preferred, and I have found the thickness of the vibratory diaphragm to be satisfactory for that of the screen also.

The best form of screen for such a telephone as that which has been described is shown in Fig. 4. This closes up the entire space occupied by the body of the magnet, the space between the ends l and n of the screen being occupied by the insulating-block I; and, inasmuch as it is not advisable that the iron screen shall rest upon and in contact with the magnet, (as it would in that event virtually become a part thereof,) I provide a small hole x at the central portion thereof and two small brass feet z and y at the under surface of the two ends, and by these means it is supported upon the upper surface of the magnets, though out of contact therewith, the said brass feet resting upon the magnet, and the hole x being supported on the head of the brass screw s^2 .

It is in some cases desirable to make the cavity between the upper surface of the screen R and the lower surface of the diaphragm D shallower or thinner. In such a contingency the screen may be made as shown in Fig. 6, with a central perforation t sufficiently large to allow the passage of the central core only, the plate R being secured upon and supported by the spool h , or in telephones where the body of the magnet is formed of a circular plate or disk of steel the screen will as-

sume the form depicted in Fig. 7. The said screen then becomes annular in form, with a sufficiently-large opening t through its center to admit the spool. It may be supported
5 on the lower flange of said spool or on brass supports, as in the form first described.

Having now fully and clearly described my invention, I claim—

1. In a magneto-telephone, the inducing-
10 magnet, helix, and diaphragm, in combination with a magnetic screen interposed between the body of the said magnet and the diaphragm, as and for the purposes set forth.

2. A magneto-electric telephone consisting
15 of a helical, circular, or curvilinear magnet, an electro-magnetic helix surrounding one pole thereof, a vibratory diaphragm mounted in front of said pole, and an iron partition interposed between the body of the magnet
20 and the diaphragm and screening from the latter all portions of the former except the helix-encircled pole-piece, substantially as specified.

3. In a magneto-telephone, a curvilinear
25 inducing bar-magnet, an electro-magnetic helix adapted for connection with an electric

circuit surrounding one pole thereof, a vibratory diaphragm mounted in front of said pole, and a plate, ring, or disk of sheet-iron interposed between the said diaphragm and the
30 non-operative parts of said magnet to prevent the formation of irregular magnetic fields between the helix-surrounded pole and the said non-operative portions of said magnet, as described herein.

4. In a magneto-telephone, and in combination with the inducing-magnet, electro-magnetic helix, and diaphragm thereof, a screen or partition of sheet-iron interposed between
35 the diaphragm and the non-operative portions of said magnet and supported thereby mechanically, but magnetically insulated therefrom, substantially as specified.

In testimony whereof I have signed my name to this specification, in the presence of
45 two subscribing witnesses, this 6th day of August, A. D. 1890.

WILTON L. RICHARDS.

Witnesses:

GEO. WILLIS PIERCE,
FRANK C. LOCKWOOD.