(No Model.) 2 Sheets—Sheet 1.

C. J. SCHWARZE.

TELEPHONIC APPARATUS.

No. 552,972. Patented Jan. 14, 1896.

Fig. 1.

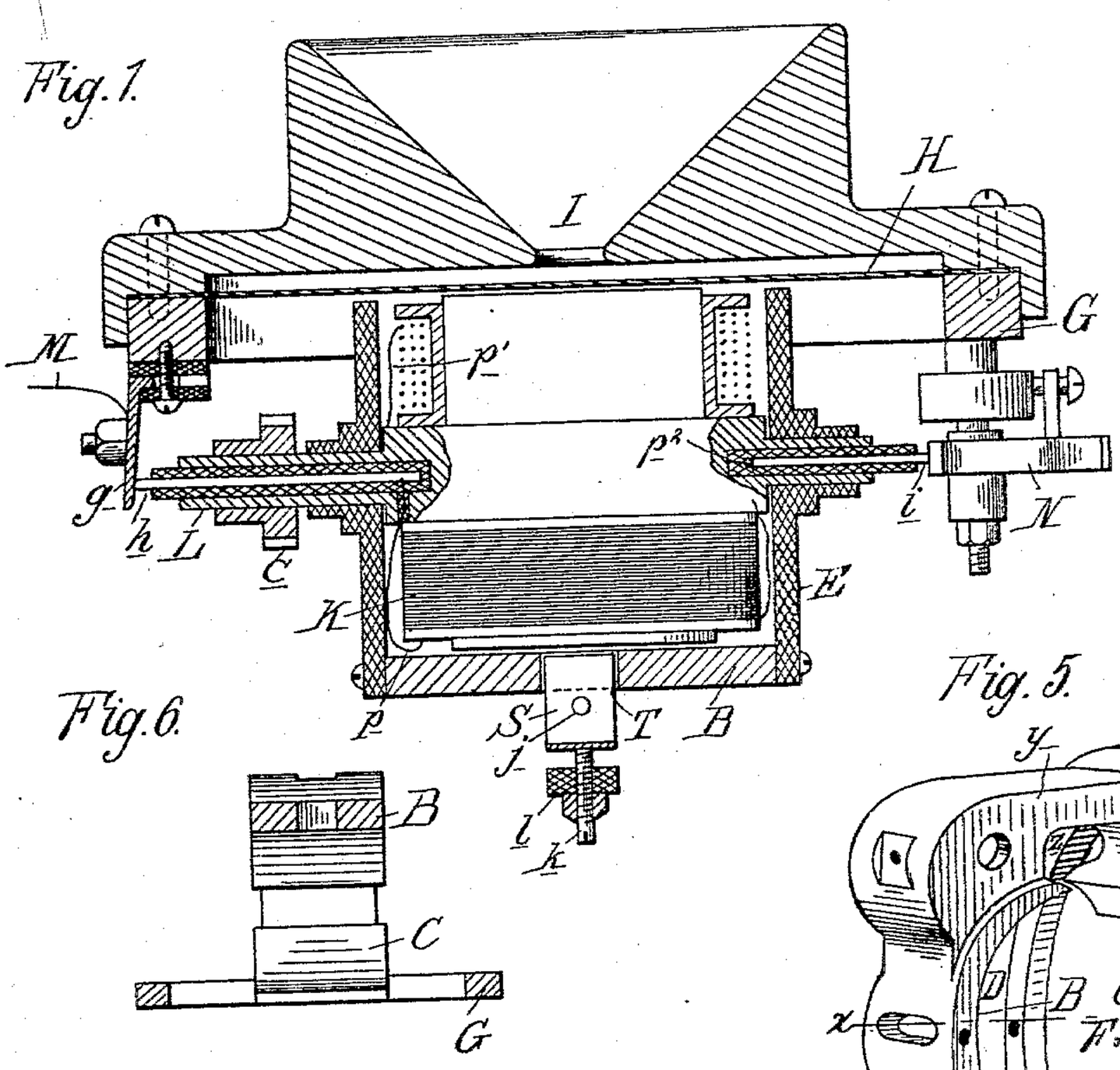


Fig. 6.

Fig. 5.

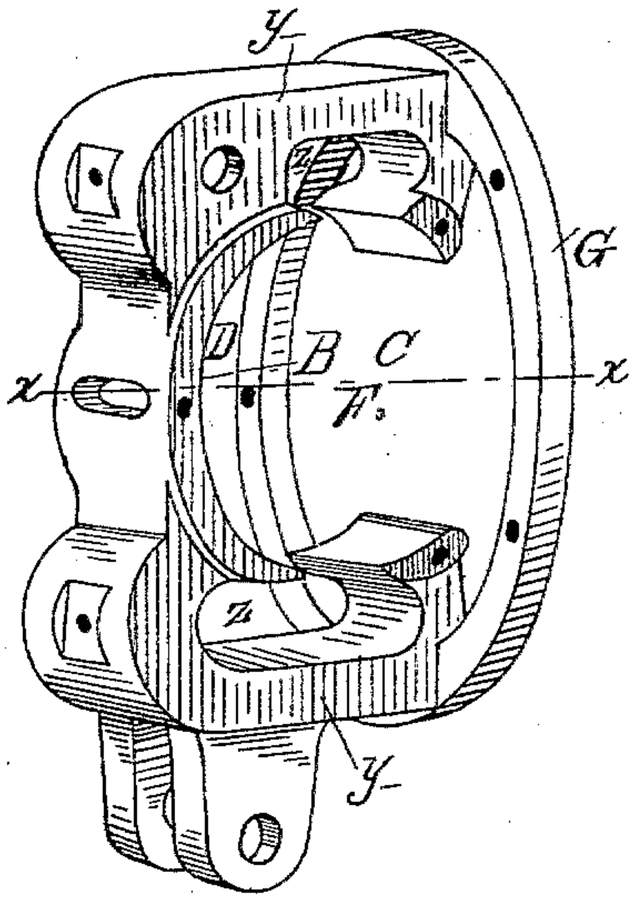
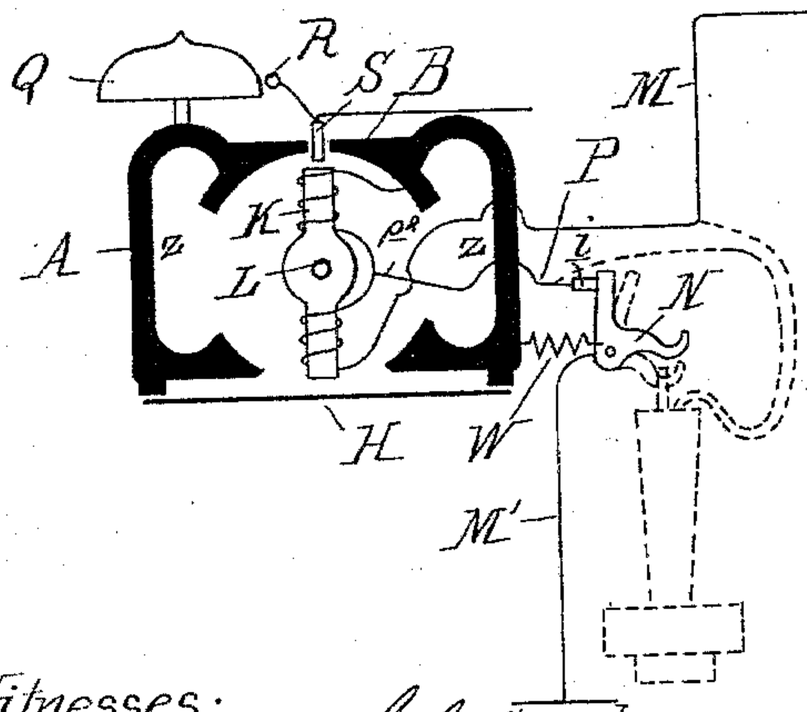


Fig. 4.



Witnesses:
O. F. Barthel
W. A. Dougherty

Inventor:
Carl J. Schwarze
By Thos. S. Sprague & Co.
Attorneys.

(No Model.) 2 Sheets—Sheet 2.

C. J. SCHWARZE.

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No. 552,972. Patented Jan. 14, 1896.

Fig. 2.

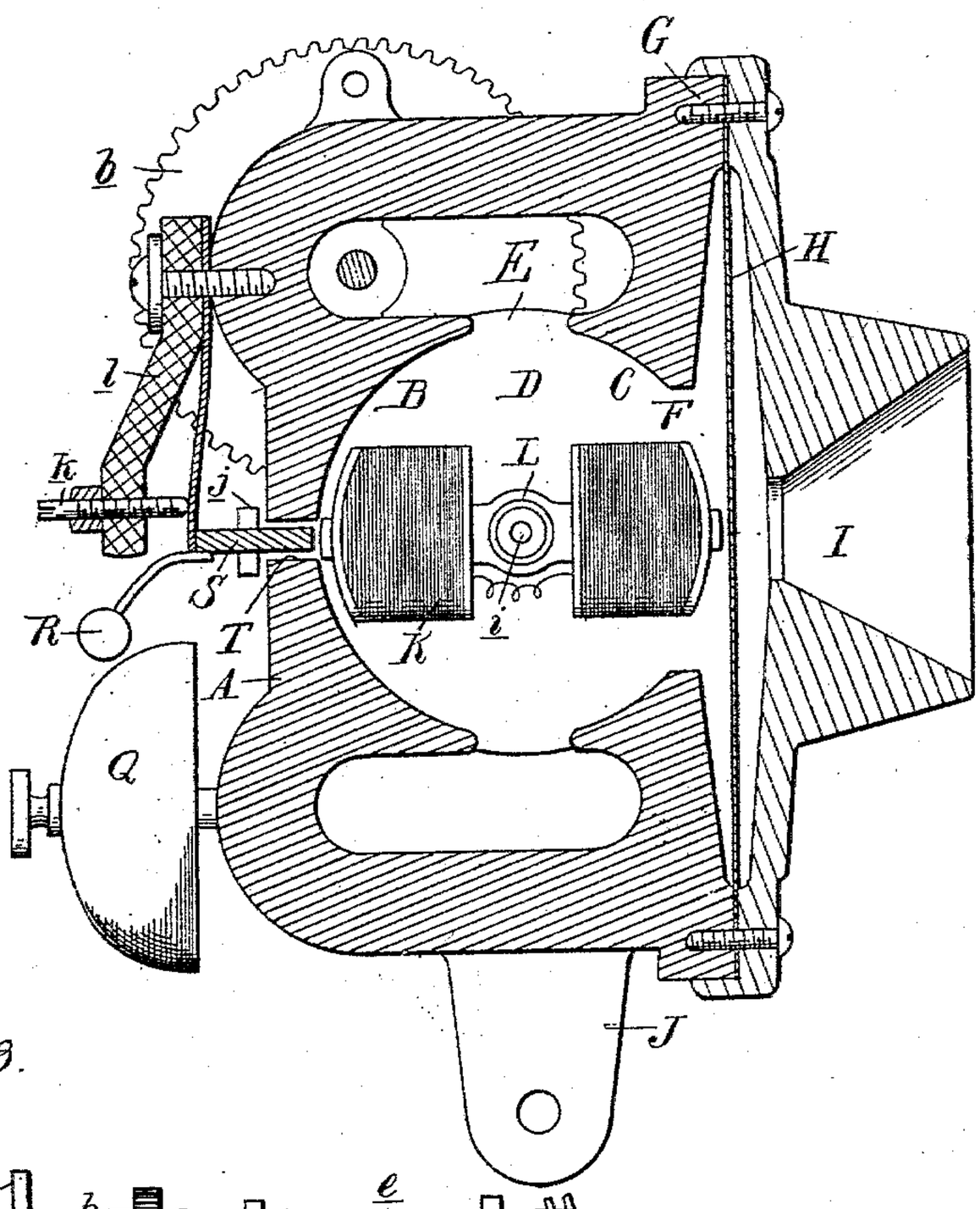
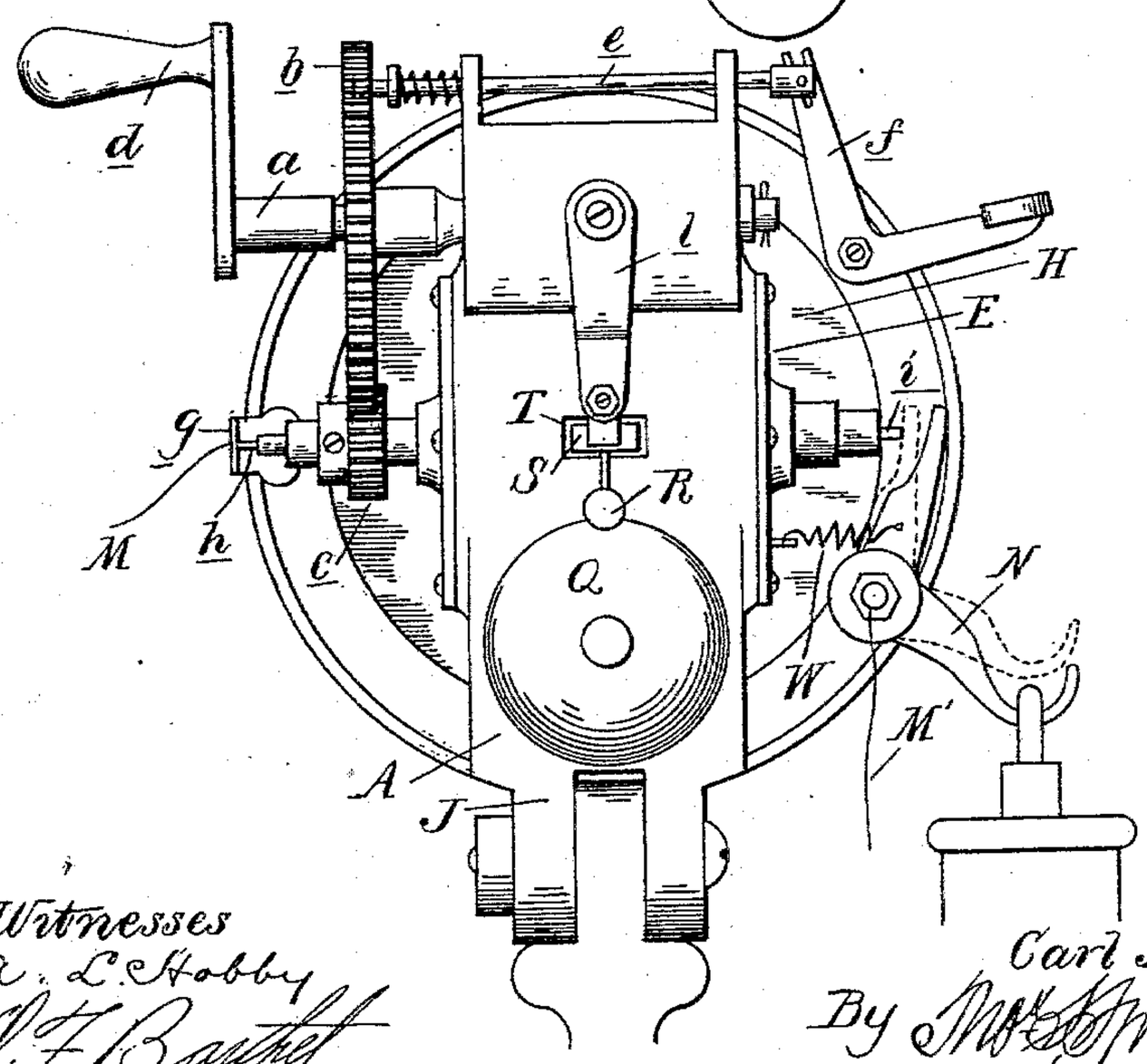


Fig. 3.



Witnesses
A. L. Hobby
O. F. Barthel

Inventor
Carl J. Schwarze
By Thos. G. Sprague & Son
Attys.

UNITED STATES PATENT OFFICE.

CARL J. SCHWARZE, OF ADRIAN, MICHIGAN.

TELEPHONIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 552,972, dated January 14, 1896.

Application filed April 22, 1895. Serial No. 546,664. (No model.)

To all whom it may concern:

Be it known that I, CARL J. SCHWARZE, a citizen of the United States, residing at Adrian, in the county of Lenawee and State of Michigan, have invented certain new and useful Improvements in Telephonic Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of my invention is to reduce the aggregate number of parts required in a magneto-telephonic apparatus; and to this end it consists in the peculiar and novel construction of a combined signaling apparatus and transmitter, all as more fully hereinafter described.

In the drawings, Figure 1 is a horizontal section through my combined transmitter and signaling apparatus. Fig. 2 is a vertical central section thereof. Fig. 3 is a rear elevation, and Fig. 4 a diagram, of the apparatus. Fig. 5 is a perspective view of the permanent magnet detached. Fig. 6 is a horizontal section thereof on line *x x*, Fig. 5.

A is a permanent magnet, formed with segmental cylindrical poles B and C on opposite sides of a cylindrical opening D, which extends through the body of the magnet and is closed upon the opposite ends by non-magnetic heads E E. The pole B on one side is continuous, but the opposite pole C is divided by an opening F, formed through it and communicating with a circular orifice inclosed within an annular flange G, which magnetically unites the divided poles and forms an annular seat, to which the diaphragm H, of magnetic material, is secured free to vibrate in close proximity to the poles C, which gradually recede therefrom toward the center. Upon the diaphragm the usual mouthpiece I is peripherally secured. The magnet is preferably cast in this form in one piece, and it may be considered as a double horseshoe-magnet, with the like poles united on the one side by the pole-piece B and on the other side by the ring-flange G, from which the pole-pieces C may be said to project and form jointly the other pole of the magnet. By passing an electric current around the parts Y Y, which represent the bent portions of the horseshoes, it is obviously an easy matter to produce a strong permanent magnet of this form.

The permanent magnet A by its peculiar shape is adapted to form an inclosing casing and support for the apparatus, and is provided with suitable means, such as the ears J, for securing it pivotally to a wall-bracket.

K is a pole-armature secured upon an armature-shaft L, free to rotate in the magnetic field of the magnet and constituting in connection with it a magneto-generator. The actuating devices of this armature consist of a crank-shaft *a*, journaled in suitable bearings formed in the magnet and carrying a gear-wheel *b*, which meshes with a pinion-wheel *c* on the armature-shaft, which latter is journaled in suitable bearings in the heads E, all so arranged that by turning the crank *d* the armature may be rapidly revolved within the field of the magnet. This actuating mechanism is provided with a locking device of any suitable description, whereby the armature is normally locked in the position shown in Fig. 2; and the device shown in the drawings for this purpose consists of a spring-bolt *e*, which is adapted to engage with a hole in the gear-wheel *b* and engages with a finger-lever *f*, whereby it may be withdrawn when desired.

The core-bar of the armature is of soft iron and is wound with a continuous conductor forming two helices upon the opposite ends of the bar. One terminal *p* of this conductor is electrically connected to an insulated pin *h* secured in one end of the armature-shaft and making electrical contact through a spring-contact *g* with one end of the line M, while the other terminal *p'* of the conductor is in electrical connection with the armature-shaft which connects it with a ground or return conductor M' through the frame. The conductor is also connected at p^2, intermediate between the two helices, with an insulated pin *i*, secured in the opposite end of the armature-shaft and adapted to make with its free end electrical contact with the pivoted crotch or hook N, all so arranged that when the receiver is secured in place upon the hook the electrical contact is broken, and when the receiver is taken off the crotch a shunt P is formed to the ground or return circuit.

Q is a call-bell adapted to be actuated by the spring-hammer R, which carries an armature S. This armature projects freely through

an aperture T in the pole-piece B of the magnet into proximity to the core-bar of the armature when the latter is in the position shown in Fig. 2, and a stop-pin *j* and set-screw *k* (the latter upon a non-magnetic arm *l*) are arranged to control the movement of the armature.

The parts being constructed and arranged as shown and described, they are intended to operate as follows: As shown in Fig. 4, the line-wire M, which connects two stations together, is electrically connected to the ground-wire M′ (or to the return-circuit) by way of the armature-winding, thence to the metallic casing, (formed by the magnet A and the metallic heads E,) thence to crotch N, either by way of spring W, as in Fig. 4, or by way of the pivot of crotch N, which, as shown in Fig. 3, is directly connected to the ring portion of magnet A. The shunt P is only closed to the ground when the receiver is taken off the crotch, which allows the spring W to draw the crotch into contact with *i*. The magnet A in connection with the revolving armature forms a magneto-generator, and the office of the locking-bolt is to lock the armature normally in the position shown in Figs. 2 and 4. Thus if we suppose the other end of the line M to be equipped with the same apparatus it will be seen that either end can call up the other, the operator having simply to turn the crank *d* after releasing it from engagement with the locking-bolt and then permit it to re-engage again. As the armature of the generator at the other end of the line is locked in its normal position and is included in the circuit, it will be seen that the alternating current has to pass through the helices of the same and convert it into an electromagnet, thereby attracting the armature S and ringing the bell Q in the well-known manner.

If the operator who answers the call now takes the receiver off the hook N, it will be seen that the latter, by means of its spring W, is drawn into contact with the pin *i*, the shunt P is closed, and thus the condition of the armature is such that the line is completed through that coil which is nearest to the pole C of the magnet, the other coil being short-circuited. In this condition the magnet A, together with the diaphragm H and armature K, constitutes the elements of a transmitter, as it will be seen that the core-bar of the armature now acts as a stationary armature, through which the magnetic lines of force pass between the pole B and the diaphragm which constitutes the other pole of the magnet A, and the vibrations of the diaphragm set up currents in the helix of the core-bar and speech will be transmitted as in the usual manner of the operation of magneto-telephones. The receiver is of any known construction adapted to that class of apparatus, and forms no part of my invention.

With my improved construction it will be seen that the aggregate number of the parts required for a telephone apparatus is greatly reduced, as the elements of the generator at the same time are adapted to operate as parts of the transmitter and of the call-bell.

It is not necessary to place two coils upon the armature of the generator, as it is adapted to operate with one helix only. However, if two coils are used one of the coils must be short-circuited for transmitting.

What I claim as my invention is—

1. The combination with the permanent magnet and revolving armature of a generator organized for the production of currents for signaling, of a diaphragm forming a vibrating pole of said permanent magnet and constituting with the armature and the other pole the elements of a telephonic transmitter, substantially as described.

2. In a telephonic apparatus, the combination with the magneto generator for signaling, of a diaphragm constituting one of the poles of the permanent magnet thereof, a line circuit permanently including the coils of the revolving armature of the generator, a shunt circuit around the coils of one half of the armature and a switch for said shunt circuit, substantially as described.

3. In telephonic apparatus, the combination with the magneto generator for signaling, of a diaphragm arranged to form one of the poles of the permanent magnet thereof, a line circuit permanently including the coils of the revolving armature of the generator, a shunt circuit around the coils of one half of the armature, and a switch in said shunt circuit controlled by the hook or crotch of the receiver, substantially as described.

4. In telephonic apparatus, the combination of a permanent magnet having opposite poles, a revolving pole armature adapted for the production of alternating currents for signaling by revolving it between the poles of said magnet, means for normally holding said armature inductively adjacent with its poles to the poles of the magnet, a call bell having an actuating armature inductively adjacent to one of the poles of the armature, a diaphragm forming a vibrating inductive element of the magnet in relation to its armature, a line circuit permanently including the coils of the armature and provided with a shunt around the coils of one half of the armature and a switch in said shunt controlled by the weight of the receiver, substantially as described.

5. In a telephonic apparatus, a combined magneto transmitter and generator, said generator having a revolving pole armature adapted to be normally held in position inductively adjacent with its poles to the poles of the magnet of the generator and to the diaphragm of the transmitter, substantially as described.

6. In a telephonic apparatus, a combined magneto generator and call bell, said generator having a revolving pole armature, the coils of which are normally included in the line circuit and adapted to be held in position

inductively adjacent with one of its poles to the vibrating armature of the bell, substantially as described.

7. In a telephonic apparatus, the combination of the permanent magnet A, the diaphragm H located in an aperture in one of the poles of the magnet, the revolving pole armature K, actuating devices for revolving the same, and a locking device therefor, whereby said armature is adapted to be normally held in position inductively adjacent with its poles to the poles of the magnet and to the diaphragm of the transmitter, substantially as described.

8. The combination of the magnet A provided with a cylindrical opening D, the poles B and C on opposite sides of said opening, the revolving armature K, means for revolving said armature and holding it normally in position inductively adjacent with its poles to the poles of the armature, the diaphragm H located in an aperture of one of the poles, a bell having a vibrating armature located in an opening of the other pole of the magnet, the coils of the armature included in the line circuit, and the shunt P having a switch controlled by the crotch or hook of the receiver, substantially as described.

9. In a telephonic apparatus, the magnet A integrally formed in one piece with the poles B and C, the opening F formed in one of the poles, and the annular flange G forming a circular orifice communicating with the opening F and constituting the seat for the diaphragm, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CARL J. SCHWARZE.

Witnesses:
A. K. KELLER,
ANNA WAHLIG.