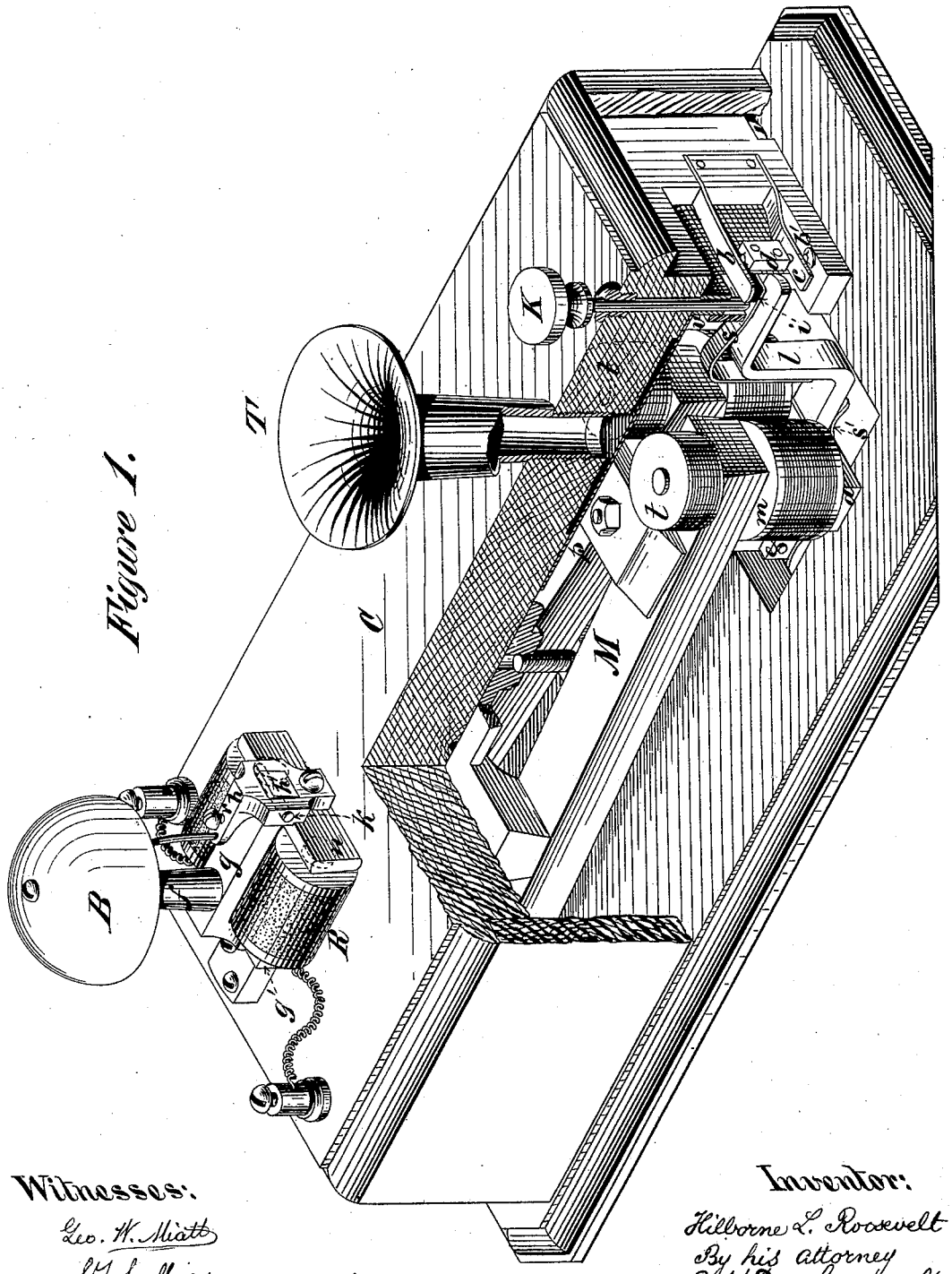
5 Sheets—Sheet 1.

H. L. ROOSEVELT.
Electric Telephones.

No. 218,776. Patented Aug. 19, 1879.

Figure 1.



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S. H. Sullivan

Inventor:
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Figure 2.

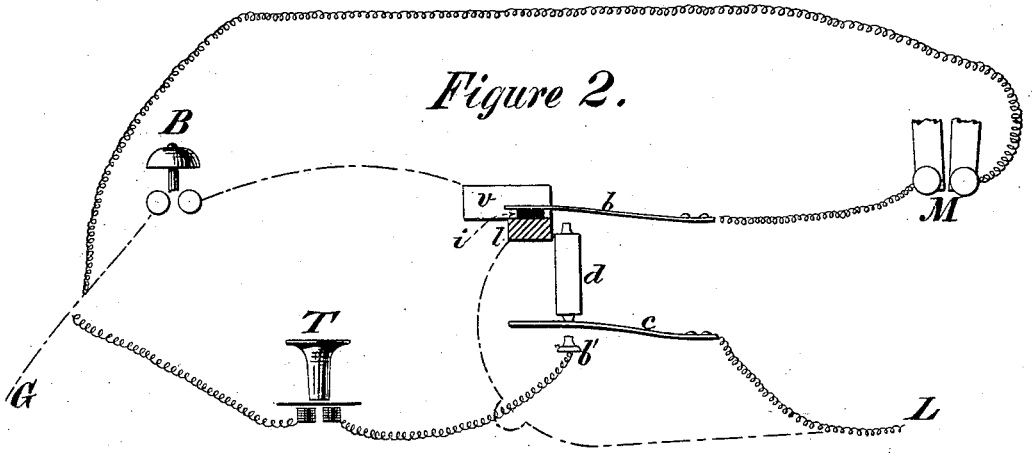


Figure 3.

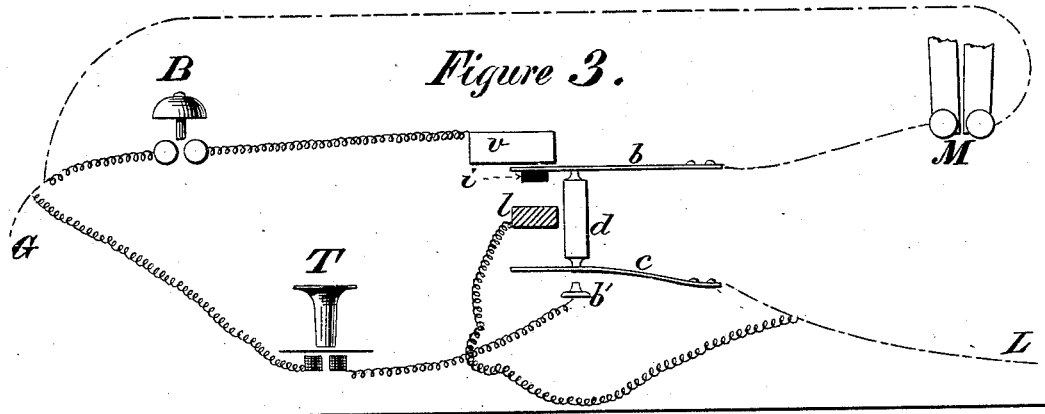
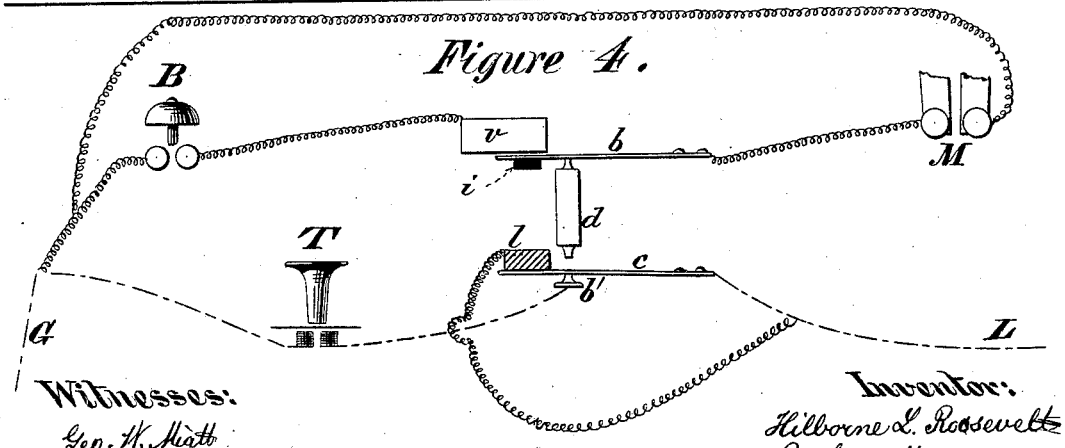


Figure 4.



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5 Sheets—Sheet 3.

H. L. ROOSEVELT.

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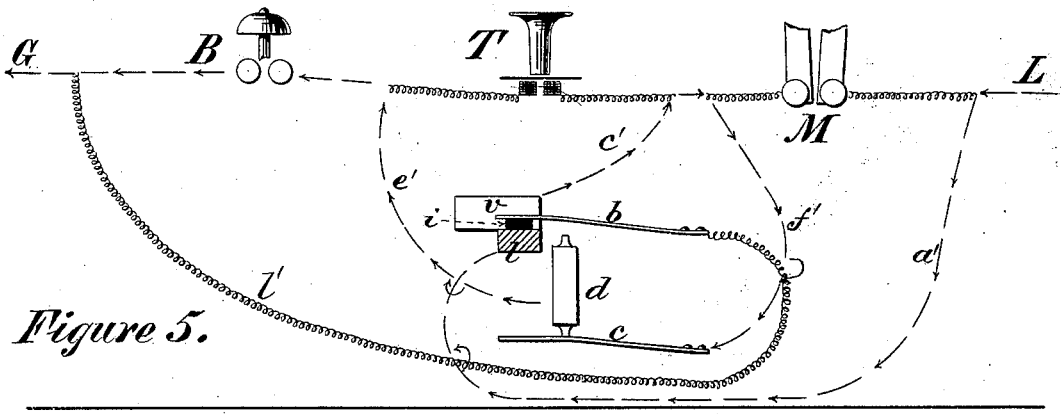

Figure 5.

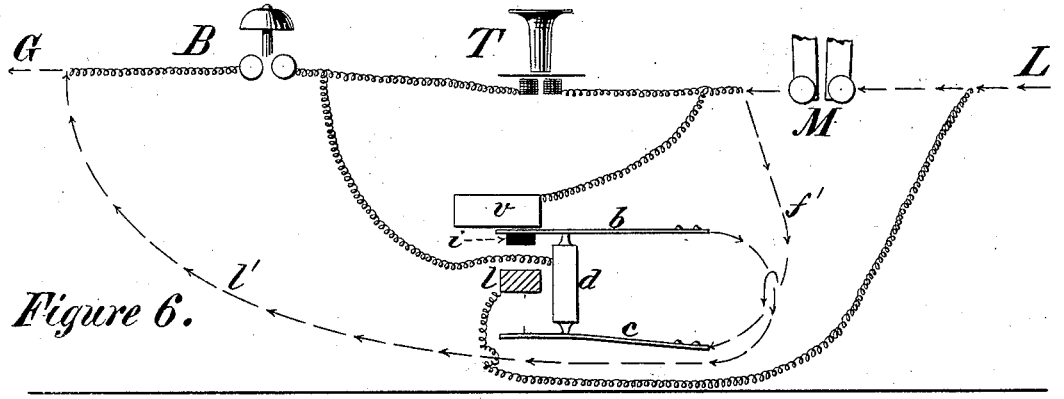

Figure 6.

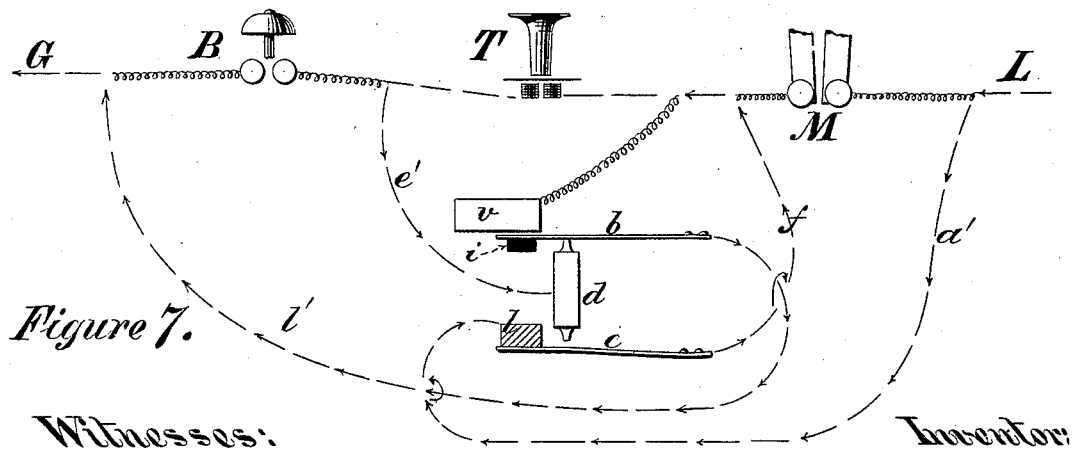

Figure 7.

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Figure 8.

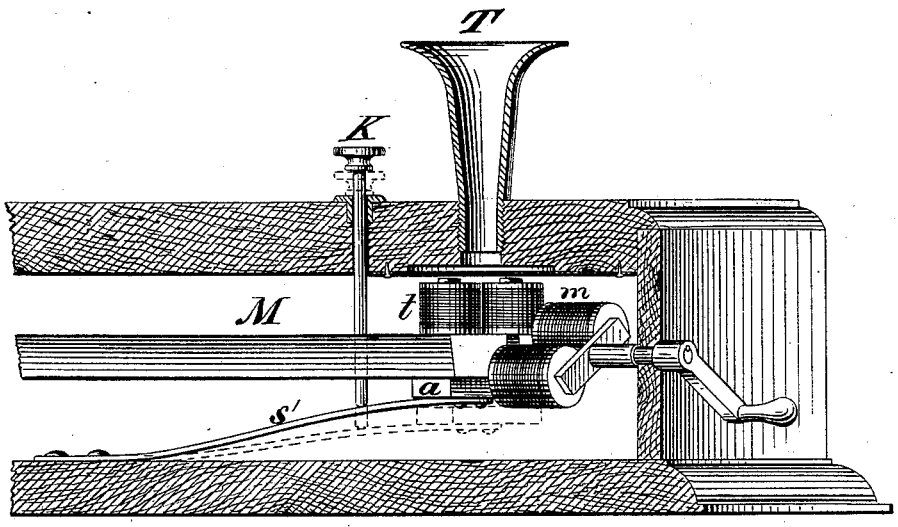

Figure 9.

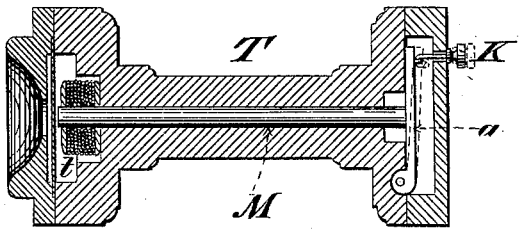

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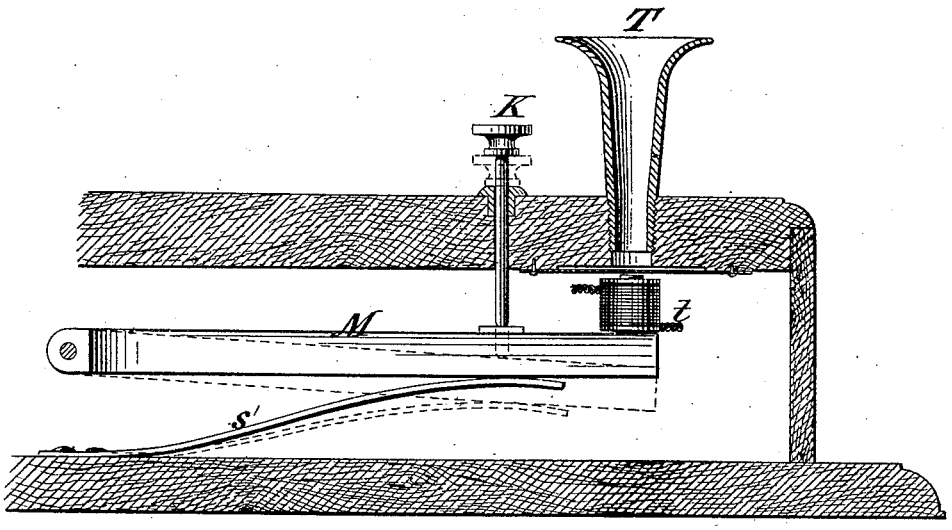
Figure 10.



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UNITED STATES PATENT OFFICE.

HILBORNE L. ROOSEVELT, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRIC TELEPHONES.

Specification forming part of Letters Patent No. **218,776**, dated August 19, 1879; application filed November 22, 1878.

To all whom it may concern:

Be it known that I, HILBORNE L. ROOSEVELT, of the city of New York, county of New York, State of New York, have invented a new and useful Improvement in Combination-Telephones, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

My invention has relation to what I call "combination-telephones," which consist of a combination of what is called the "magneto-machine and the telephone."

In the practical operation of the telephone it is necessary to employ some signaling apparatus for the purpose of calling the attention of the operator at the other end of the line. In practice it has been found very advantageous to dispense with a current from a permanent battery for the purpose of accomplishing this result, and recourse has been had to the induced or magneto currents from what are known as "magneto-machines." In these machines the lines of force of the magnetic field of a permanent magnet in which a coil of wire is placed being suddenly altered, a current is set up in such coil, which current is utilized for the purpose of ringing a bell or similar contrivance at the other end of the line.

In the telephone also a permanent magnet is employed, and in my invention I use the same permanent magnet for the purpose of operating the telephone and the magneto-machine.

It has been found necessary to employ permanent magnets of considerable strength in order to successfully operate magnetic calls over lines of considerable length, and it has been found that such magnets, unless they are protected by a keeper, are apt to run down or decrease in strength; but when protected by a keeper they are not useful for the purpose designed, and therefore it becomes necessary to remove the keeper before utilizing the magnet. This removal is one of the objects of my invention.

It is also important, owing to the necessarily high resistance of the instruments used in working with magneto-machines, to reduce the entire resistance of the line as much as possible, and to cut out or shut out from the line all the instruments not actually employed.

In my improvement, therefore, there is in circuit at the same time only one of the three instruments—either the bell, the magneto-machine, or the telephone—but not more than one.

In my machine, likewise, the pressing of a single button operates switches in such a manner as to cut in and out the three different instruments last named, and also to operate the magneto-machine, and also to remove the keeper from the magnet, so that it may produce its best results.

My invention is clearly shown in the accompanying drawings, in which—

Figure 1 represents a general view of my apparatus, the case being partially broken away to show the interior mechanism. Figs. 2, 3, 4, 5, 6, and 7 represent different views of circuits which may be used in connection with the apparatus shown in Fig. 1. Figs. 8, 9, and 10 represent modifications of my invention.

My apparatus, as shown in Fig. 1, consists, generally, in a case, C, adapted to contain and support the various parts of the mechanism. Within this case is the permanent magnet M, preferably a permanent steel magnet, though manifestly an electro-magnet would serve the same purpose. This magnet serves both as the telephone-magnet and as the magnet for the magneto-machine. Placed above this magnet are the telephone-coils *t*, having their cores in contact with the poles of the magnet M. Above these coils is the telephone-plate *p* and the mouth-piece T. Below the poles of the magnet M are the magneto-coils *m*, having their cores also in contact with the poles of the magnet. Below this again is the keeper *a*, supported on the bent lever *l*, pivoted at *e*. This lever is raised by the spring *s'*.

When the armature *a* is thrown away from the coils *m* a current is set up in these coils, which is utilized for the transmission of signals.

Supported in the case C is the push-button K, which serves to break away the armature *a* from the magneto-machine. This button does not act directly against the lever *l*, but

first against the spring *s*, which spring, yielding, allows the stem of the push-button to act directly against the lever *l* and break away the armature *a* from the magnet *m*, and in so doing to excite in the magnets *m* an induced current, which is sent out on the wire, as presently described. The purpose of this spring is to insure a more sudden and sharp breaking away of the armature from the magnets, and therefore a better induced current; but it is also useful in the operation of the switches, as will be presently described. The depression of the push-button K not only breaks away the armature from the magnet, but also serves to operate the switches controlling the circuits of the machine.

Attached to the frame of the machine are two springs, *b* and *c*, which, when undisturbed, rest, respectively, upon the top and bottom of a metallic plate, *d*. The spring *s*, electrically connected with the lever *l*, rests against a metallic plate, *v*, connected, as will be presently shown, so that the first result of depressing the push-button K is to break the contact between the spring *s* and the metallic plate *v;* secondly, to allow the spring *b* to come in contact with the plate *d*, the spring *b* being ordinarily supported on the top of the spring *s* by the insulating-piece *i;* thirdly, the armature *a* is broken away from the magnet, thereby allowing the end of the lever *l* to come in contact with the spring *c*, breaking the contact between said spring and the plate *d*, its further downward motion being resisted by the frame of the machine.

In Figs. 2, 3, and 4 are shown the circuits during these operations when the circuits are arranged for direct closing and breaking.

In Figs. 5, 6, and 7 are shown what I call my "shunt-circuits." M represents the magneto-coils; B, the bell; T, the telephone; L, the line-connection, and G the ground. In these drawings the spring *s* is not shown above the lever *l*, but its operation will be readily understood.

The ordinary position of the apparatus is shown in Fig. 2, when it is desired that both magnets and telephone shall be cut out and the bell alone in circuit. The dead-circuits are shown by looped lines, and connected circuits showing the course of the currents by broken lines. A current coming in on the line L would pass through the lever *l*, plate *v*, bell B, to the ground G. As the lever *l* begins to descend it first breaks the contact between *l* and *v;* second, the spring *b* comes in contact with the connector *d;* and, lastly, a current is set up in the magneto-machine by the breaking away of the armature from the coils. During this operation it is desirable that the bell and telephone be cut out and the magnets in circuit. This is clearly shown in Fig. 3, where the circuit is through the line L, spring *c*, connector *d*, spring *b*, magnets M, to ground. When the button is pushed all the way down it is desired that the telephone alone be in circuit, the magnets and bell being cut out, and the keeper away from the magnet. This is shown in Fig. 4, where the lever *l* has come in contact with the spring *c* and broken it away from the connector *d* and brought it in contact with the point *b'* below. The current passes through line L, spring *c*, button *b'*, telephone T, to ground.

Further explanations of these circuits are unnecessary, as they will be readily understood by persons skilled in electricity.

The circuits shown in Figs. 5, 6, and 7 are what are known as "shunt-circuits," in which a shunt-circuit is made for the currents around each instrument, except when it is desired to have it in circuit. The button *b'* and its connections are likewise dispensed with. In the first position the circuit is from line through wire *a'* and lever *l*, through plate *v*, line *c'*, line *f'*, spring *c*, connection *d*, line *e'*, and bell B, to ground G. These circuits form a shunt past the magnet and telephone.

In the second position, Fig. 6, the circuit is from the line L, through magnets M, wire *f'*, spring *c*, connector *d*, spring *b*, wire *l'*, to ground, the magnets alone being in circuit.

In the third position, Fig. 7, the circuit is from the line L, wire *a'*, lever *l*, spring *c*, wire *f'*, through the telephone T to wire *e'*, connector *d*, spring *b*, wire *l'*, to ground, the telephone alone being in circuit.

It is obvious that many other arrangements of circuits could be employed. Two are shown as specimens.

It is also obvious that independent buttons could be employed to actuate the circuits, instead of using the same button and movement which actuates the magneto-machine.

In the practical operation of this machine the operator signals by depressing the knob sharply, and then allows the knob to rise and waits for a reply, and in conversation keeps the knob depressed to its full extent.

The bell B (shown clearly in Fig. 1) consists of only two metallic parts in addition to the screws and pivot. The bell-standard *f* and frame *g* are made in one. To the cross-piece *g'* are fastened the coils R. The frame *g* is carried to the front of the coils, where it is provided with a pivot, *k*. Upon this pivot vibrates the yoke-frame *h*, carrying the hammer of the bell, and provided with an adjusting-screw, *r*, and the lower arm of the frame provided with an armature, *u*. No retractile spring is necessary in this bell, the hammer and overhanging end of the frame *h* serving instead.

The bell is cheap and easily constructed, and very certain in its action, and is thereby adapted for a magneto call.

In Fig. 8 is shown a modification of my apparatus, the circuits being omitted. Here the telephone-coils are represented by *t*, the magneto-coils by *m*. *a* represents the keeper of the magnet. By means of the revolving magnet *m* a repeated stroke is given to the bell. The circuit should be operated by the push-button K, or some similar contrivance.

In Fig. 9 is shown a hand-telephone having but one coil, *t*, which is adapted both to be used as a telephone-coil and as a magneto-coil. The armature *a* is pivoted at the back of the telephone, and is detached by the button K from the magnet *m*. This operation sets up a current in the coil *t* and signals the operator at the other end of the line.

In Fig. 10 is shown a similar arrangement applied to a box-telephone, where the magnet M is pivoted and depressed by the push-knob K and elevated by the spring *s*. When depressed a current is set up in the coil T, which serves to signal the operator at the other end of the line.

Independent arrangements may be employed in connection with Figs. 9 and 10 for cutting out the receiving-instrument when the telephone is in use.

It is plain that compound magnets could be used instead of simple ones.

It is plain that several of the inventions hereinbefore specified would be equally applicable, whether the magnets and telephone were within the same casing or not, and whether the bell were situated upon that casing or elsewhere.

I do not claim in this application the combination of a magneto-electric machine and a speaking-telephone having a single permanent magnet common to both; nor do I claim the combination, with a single permanent magnet, of the stationary telephone-coils and revolving mageto-coils, inasmuch as an application for Letters Patent for such improvement was made by me on the 29th day of May, 1878, and is now pending.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a telephone and magneto-machine with a single movable armature, which serves both as the keeper of the telephone and as the operating-armature of the magneto machine, substantially as described.

2. A magneto-machine electrically connected with a telephone and provided with means for operating the magneto-machine, and subsequently cutting out the magneto-machine from the main circuit and cutting in the telephone, said operations being all effected by a single movement of the operating-handle, substantially as described.

3. The combination of a magneto-machine and telephone and a bell, either separate or combined, with the means, substantially as specified, for switching the line-circuit through either the telephone, the magneto-machine, or the bell, but no two simultaneously.

4. A combination-telephone which is provided with one magnet and one coil, the said coil being used both as a magneto-coil to send a magneto-current and as a telephone-coil to send and receive a telephone-current, substantially as described.

5. The combination of a telephone and magneto-machine with a push-button or equivalent mechanism, the movement of which cuts out the bell, cuts in the magneto-machine, operates the magneto-machine, cuts out the magneto-machine, and cuts in the telephone, substantially as described.

6. In a magneto-machine operated by a push-button, a spring, *s*, which serves the purpose of a switch, cutting out the bell, and also serves to render the detachment of the armature from the magneto-coils more sudden, substantially as described.

7. In a combination-telephone consisting of a telephone, magneto-machine, and a bell, the cut-out circuits shown in Figs. 2, 3, and 4.

8. In a combination-telephone consisting of a telephone, a magneto-machine, and a bell, the shunt-circuits shown in Figs. 5, 6, and 7, substantially as described.

9. A magneto-machine which is operated by the breaking away of an armature or magnet from the coils by means of the depression of a push-button or equivalent mechanism, a spring interposed between the magnet or armature and the power for the purpose of insuring a more sudden detachment, substantially as described.

10. The combination of a magneto-machine and a telephone operated by a push-button or equivalent mechanism, the movement of which both operates the magneto-machine and removes the keeper from the telephone-magnet, substantially as described.

11. In a combination-telephone, a lever, *l*, provided with spring *s* and two springs, *b* and *c*, which are operated by the movement of the lever *l* and spring *s*, all connected and combined together substantially as and for the purposes described.

HILBORNE L. ROOSEVELT.

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