(No Model.) 2 Sheets—Sheet 1.

G. T. WOODS.

APPARATUS FOR TRANSMISSION OF MESSAGES BY ELECTRICITY.

No. 315,368. Patented Apr. 7, 1885.

Fig. 1.

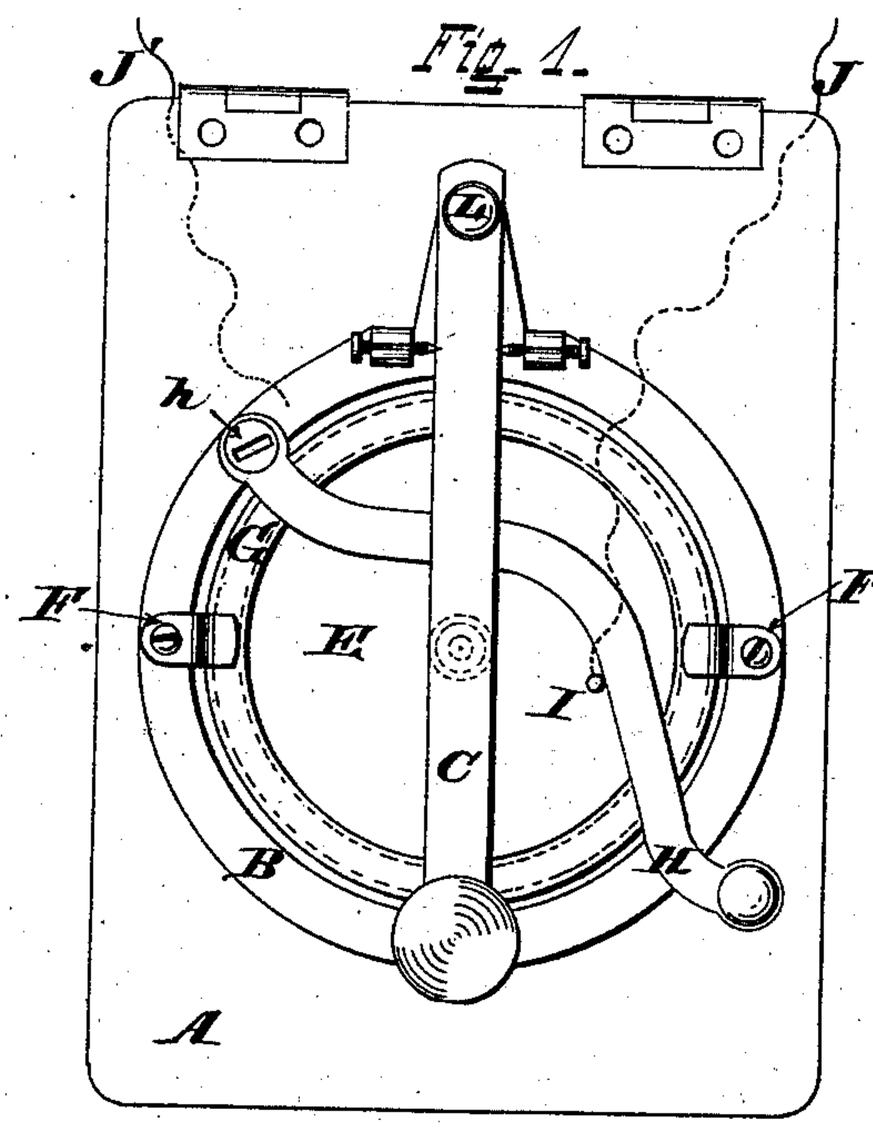


Fig. 2.

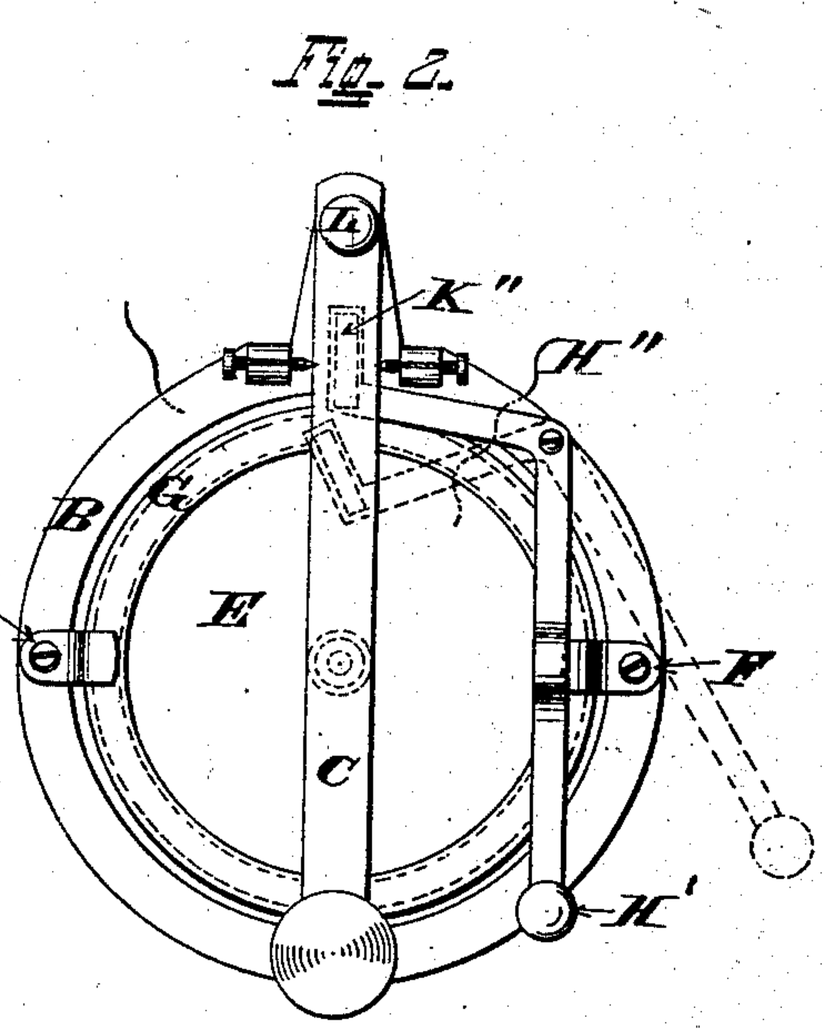


Fig. 3.

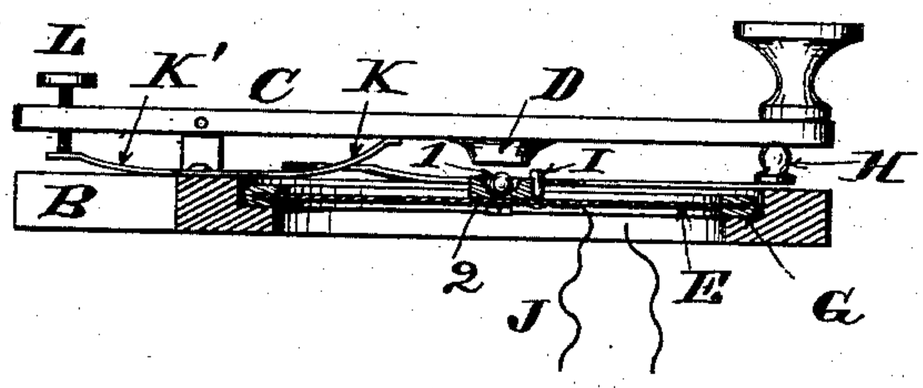


Fig. 4.

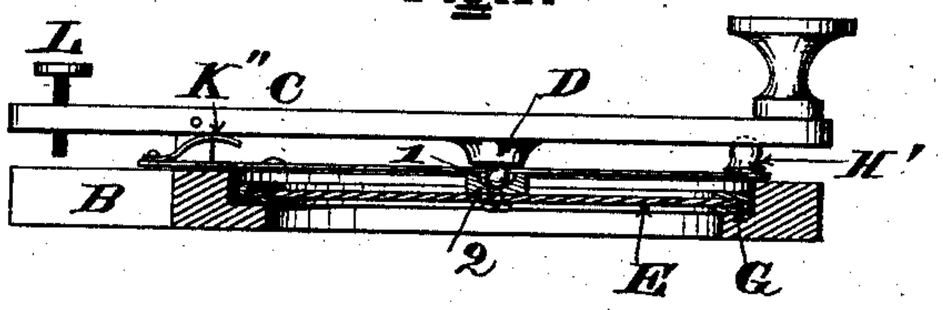
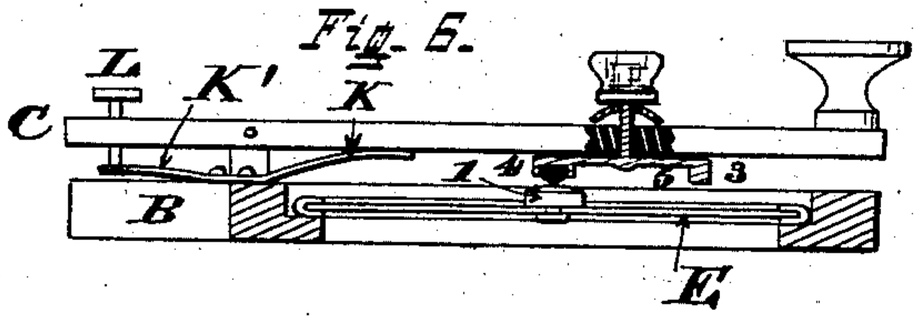


Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

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APPARATUS FOR TRANSMISSION OF MESSAGES BY ELECTRICITY.

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Fig. 7.

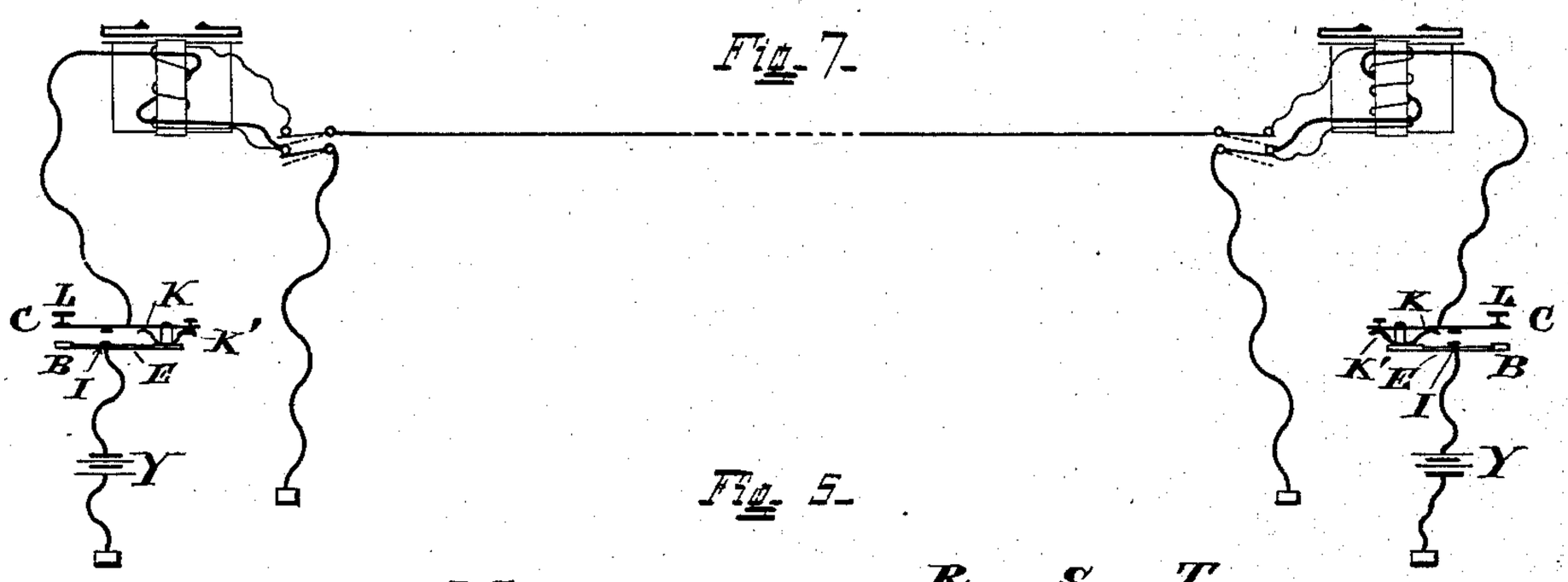
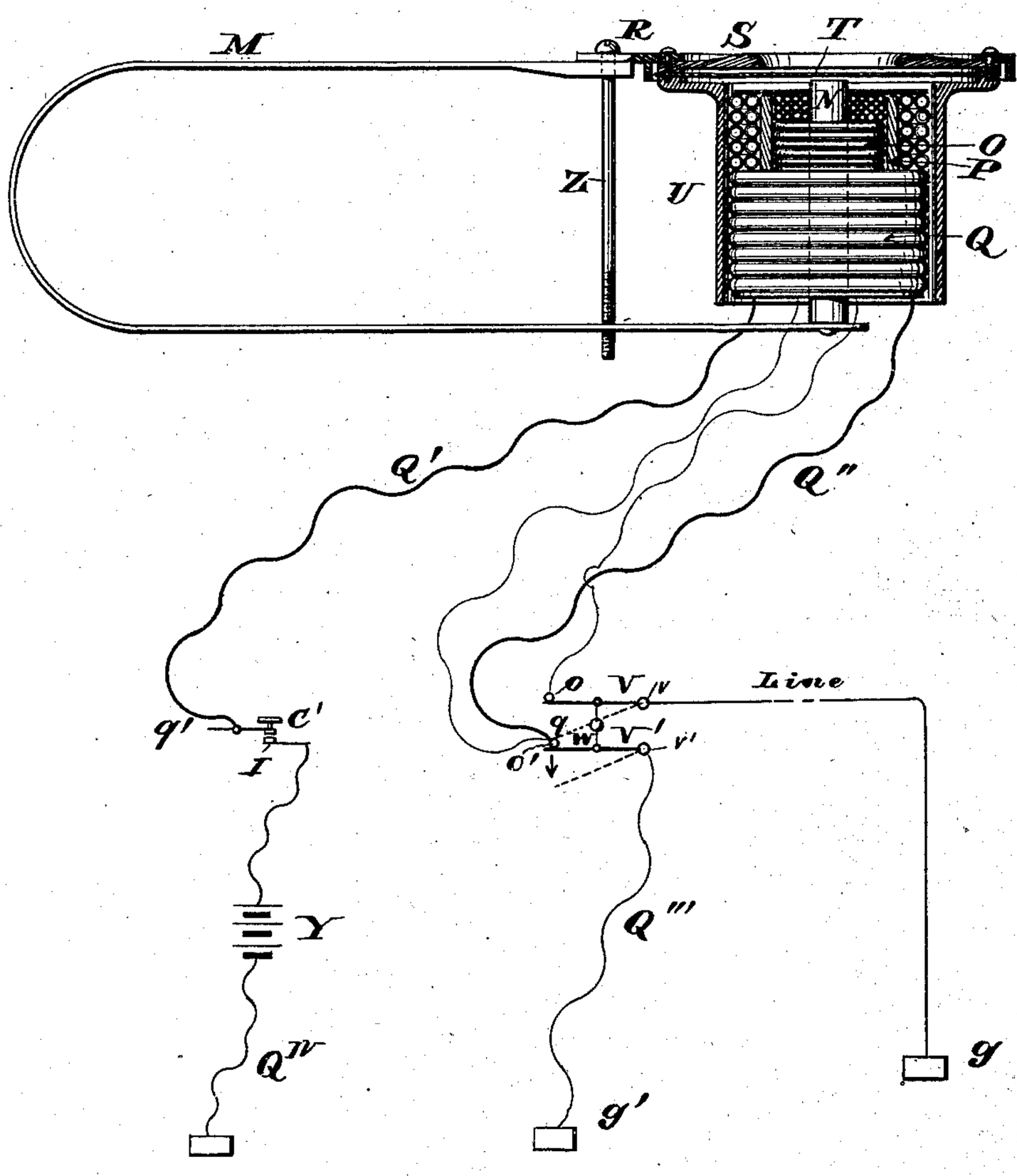


Fig. 5.



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UNITED STATES PATENT OFFICE.

GRANVILLE T. WOODS, OF CINCINNATI, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

APPARATUS FOR TRANSMISSION OF MESSAGES BY ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 315,368, dated April 7, 1885.

Application filed April 9, 1884. (No model.)

To all whom it may concern:

Be it known that I, GRANVILLE T. WOODS, of Cincinnati, Hamilton county, Ohio, have invented a new and useful System and Apparatus for the Transmission and Reception of Messages by Electricity, of which the following is a specification.

In the ordinary mode of sending telegraphic messages the operator uses a "finger-key," whose duties are to irregularly make and break the circuit, or to vary the tension of the electric current traversing the "line-wire," the "key" being operated by the varying pressure of the operator's finger. This key as ordinarily constructed cannot be operated in any other way or for any other purpose than that just mentioned. The message thus transmitted is received by an instrument known as a "receiver" or "sounder," which causes audible atmospheric vibrations in response to the pulsations of the electric current traversing the line-wire.

It is well known that both the sender and the recipient of messages thus transmitted must be skilled operators. It is also well known that such sounder as usually constructed will not respond to very weak electric currents, such as are used in telephony. My system (called by me "Telegraphony") entirely overcomes the failings of the ordinary key and sounder and has a wide range of usefulness, it being capable of use by inexperienced persons, for if, for example, the operator cannot read or write the Morse signals, he has only (by means of a suitable switch) to "cut" the battery out of the main-line circuit and cut it into a local circuit, and then speak near the key. This having been done, the sounder at the receiving-station will cause the air to vibrate in unison with the electric pulsations that traverse the line-wire. The person at the receiving-station will thus receive the message as articulate speech.

This invention may be of great advantage in domestic use, as when two students are practicing the Morse alphabet they can also speak to one another over the same wire and with the same instruments that were used for telegraphic practice.

At telegraph-stations it would be of great advantage to use my system of telegraphing, as both oral and signal messages can be transmitted and over the same line without any change in the instruments.

Having set forth the general advantages of my invention, the same may be fully understood by the following description, reference being had to the accompanying drawings, in which Figure 1 is a rear view of a transmitter embodying certain features of my system. Fig. 2 is a modification of the same. Figs. 3 and 4 are axial sections of the transmitter shown at Figs. 1 and 2, respectively. Fig. 5 is a partly-sectioned side view of the receiver. Fig. 6 is an axial section showing another form of transmitter. Fig. 7 is a general diagram including two stations.

A may represent the door of a box that contains the finger-key. B is the frame or base of the key. C is the key-lever, having a button, D, on its long arm. E is a disk, diaphragm, or tympanum, of soft iron or other suitable material, that carries or constitutes one electrode, the said lever C constituting or carrying the other electrode, which electrode, in the present illustration, is the button D. F are clamps that hold the diaphragm in place upon the frame B.

The diaphragm F, if made of metal, has its periphery incased in a soft-rubber band, G.

H is a circuit-breaker, hinged at *h*. This circuit-breaker, when moved to the left, will close the circuit by striking the stud I, which is in electrical connection with wire J. When the lever H, Fig. 1, is in contact with the stud I, the primary circuit is closed, and it is then ready for the operator at the distant station to send. The lever H in its action is the same as the circuit-closer of an ordinary telegraph-key. When the lever is moved toward the right, the circuit is broken, and if the instrument is then inclined until the ball of carbon is in contact with the electrode on the plate E, and also the electrode on the lever C, it will then be ready for oral messages, provided the switches V V′, hereinafter referred to, are properly connected. The frame B is electrically connected with the wire J. The wires J

and J′ form conductors to the respective poles of a battery, Y. The "contacts" (the place where the electrical communication is varied, broken, or restored) may be of carbon or any other suitable semi-conducting material; or they may be a combination of some such refractory metal as platinum or iridium for one point, with any suitable semi-conductor—such as carbon—for the other point. My preferred forms and materials are a ball or pellet, 1, of carbon or of a refractory metal of suitable conductivity, which may be placed in a little cup or depression, 2, which may be of metal or of carbon, and which is connected to the plate E, while the other contact-point is carried by the lever C. For some purposes—such, for example, as where it is desired to avoid breaking of the current, (as in loud speaking)—the carbon ball 1 may be omitted and the platinum point be allowed to dip into mercury or acidulated water contained in said cup 2.

K K′ are springs, by which, in association with temper-screw L, the lever C is adjusted to give the contacts more or less play or a greater or less pressure, as the case may be. In Fig. 2 the circuit-breaker H′ acts indirectly, the form being that of a bell-crank whose short arm H″ crosses the plate to a point under the lever C near its fulcrum. A spring, K″, is attached to the short arm H″, and operates when non-effective to press under the lever C at its fulcrum. Now, if the long arm of said crank be moved to the right, the spring K″ will be shifted to under a point in the long arm of the lever in front of the fulcrum, so as to force that arm upward, and thus break the circuit. A reverse or retrograde movement of the crank of course, on the contrary, permits the lever to fall, (or be depressed by the counter-spring, as the case may be,) and to thus restore contact and close the circuit. A modification of this device is shown in Fig. 6, which shows two contact points or buttons, 3 4, upon a turn-bar, 5, one point, 3, being of platinum for telegraph use, the other point, 4, being of carbon for telephone use. The illustration shows the device adapted for telephone use, the points 4 and 1 being in contact. When shifted for service as a telegraph-key, the temper-screw L is so regulated as to allow predominant action of the front spring, K, so as to hold the contact-points slightly apart. In Fig. 5, M is a permanent magnet bent so as to bring the ends near together in the form of a U. Through one limb of this magnet is screwed a soft-iron core or pole-piece, N, that extends inward, and is surrounded by two concentric coils of insulated wire, of which coil O, immediately around the core, is of very fine wire, preferably of the grade known as "No. 36." This coil is closely enveloped in a tube, P, of soft iron, which I call the "magnetic sleeve," and that by a coil, Q, of coarser wire, preferably about No. 23 wire. R is a frame attached to the other leg of the magnet. S is a ring, of rubber or other suitable material, placed in or on said frame first, next to which is secured a disk-armature, T, that is fastened over the mouth of a case, U, which holds the coil and sleeve. The armature and pole-piece (core) are adjusted toward or from one another by screw Z, which passes through a hole in one leg of the magnet and screws into a threaded hole in the other leg of the magnet. *o o′ q q′* are terminals of the coils O and Q, respectively. V V′ is a duplex switch or commutator connected with the line at *o o′*, with the ground-lines at *v v′*, and with the ground at *g g′*. W is an insulating-frame that mechanically connects, while electrically insulating, the conductors of the commutator, so that they will both move together. C′ indicates a transmitting-key, and Y the batteries.

The above is a description of the more essential mechanical devices for the transmission and reception of messages according to my system. It now remains briefly to explain its operation. Each station in the circuit having been provided with both a key and a sounder, and being connected as hereinabove set forth, when it is desired to communicate from one station to another, the signals may be made by first moving the commutator V V′ until V connects with point *q*, thus cutting out the terminal *o* of the fine coil O, and also the ground *g′*. This adjustment of the parts operates to connect the battery, through coarse coil Q, with the line, as in ordinary telegraphy, and the signals (which may be "Morse" or any signal agreed upon) may be made by key in the ordinary way, and be received by the sounder, Fig. 5, through the coil Q. Making and breaking of the circuit alternately strengthens and weakens the core magnetism, causing the armature to be alternately attracted and released, and also causing audible atmospheric vibrations in response to the electric pulsations sent over the line-wire. If, now, oral messages are to be transmitted, the operator at the receiving-station having been signaled that that form of communication is desired, the operator at the transmitting-station closes the circuit by bringing the contacts of the transmitter-key, Figs. 3, 4, or 6, together slightly, and so adjusts the commutator as to bring V in contact with the terminal *o*, and V′ in contact with *o′*. This brings fine coil O into the line-circuit and relegates the coil Q to the local circuit. The battery-current is now local, and will traverse the circuit from the battery Y to the key C′, thence over wire Q′ and through helix Q, thence over wire Q″, through conductor V′, and through ground-wires Q‴ Q^{IV}, completing circuit to battery Y, and the main line will be traversed by transient currents induced by the momentary disturbance of the magnetic field in the neighborhood of the helix, when conversation begins near the finger-keys. In an inferior form of my device having some useful applications the magnetic sleeve is omitted and the coarse-wire helix is wound directly around the fine-wire helix.

I claim as new and of my invention—

1. In combination with and forming a part of a system for electric transmission of messages, a key for varying or breaking an electric current, having contacts 1 D, respectively composed of carbon and a refractory metal, arranged and operating as set forth.

2. In a system for electrical transmission of messages, a sounder having a helix of high resistance in the line-circuit, surrounded by a helix of low resistance in circuit with the transmitter and local battery, the line being connected to a switch which is adapted to cut the low-resistance helix into the line, while the high-resistance helix is thrown out of action.

3. A transmitter whose finger-key has a turn-bar having two contact-points of diverse conductibility, substantially as and for the purpose set forth.

In testimony of which invention I hereunto set my hand.

GRANVILLE T. WOODS.

Attest:
GEO. H. KNIGHT,
S. S. CARPENTER.