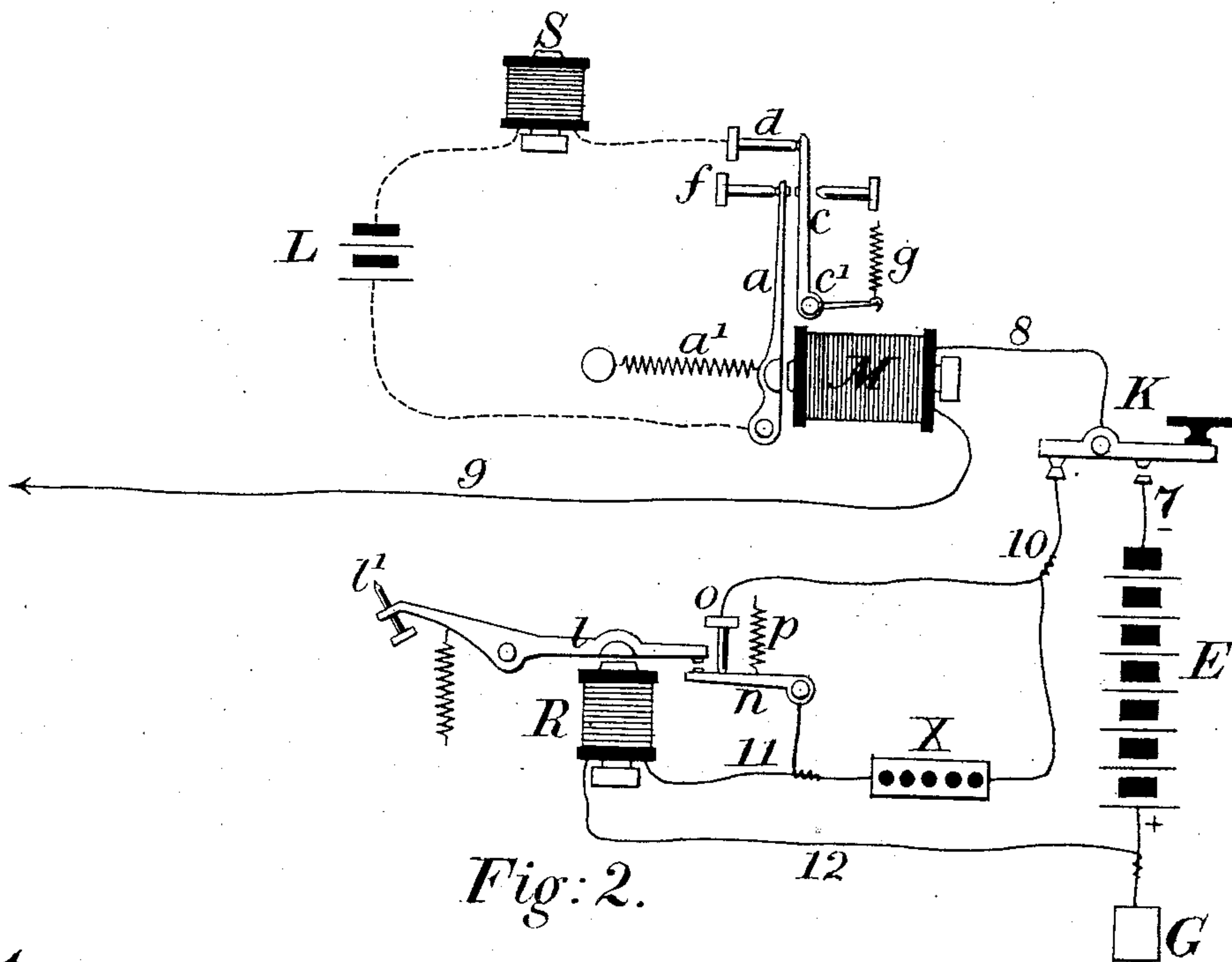
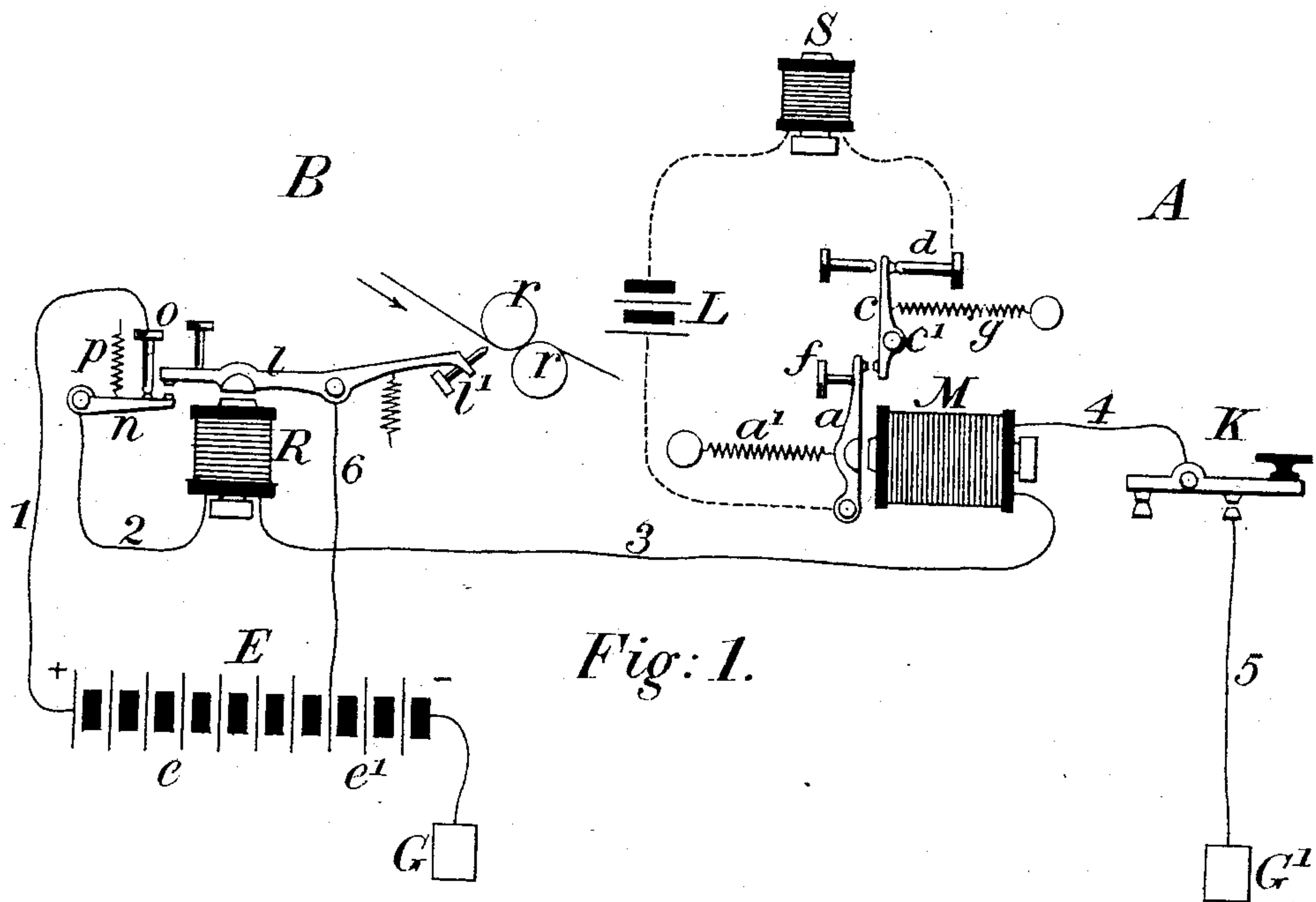


F. L. POPE.
TELEGRAPHIC APPARATUS.

No. 284,481.

Patented Sept. 4, 1883.



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UNITED STATES PATENT OFFICE.

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TELEGRAPHIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 284,481, dated September 4, 1883.

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To all whom it may concern:

Be it known that I, FRANK L. POPE, a citizen of the United States, and a resident of Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Telegraphic Apparatus, of which the following is a specification.

In the application of the well-known "Morse system" of telegraphy to lines having but two stations, one at each end, a registering or recording apparatus is sometimes employed for receiving communications, which is provided with a device known as a "self-starter," by means of which the clock-work or other maintaining power of the recording apparatus is automatically released by the first movement of the marking-lever, and continues to run while the communication is being transmitted and recorded, after which it is automatically stopped. In this manner communications transmitted over the line may be automatically recorded at the receiving-station in the absence of an attendant. A serious objection to the practical use of the apparatus which has heretofore been employed for this purpose arises from the fact that it affords no means whereby the operator transmitting the communication may ascertain with certainty that the same has been properly received and recorded by the apparatus at the distant station. For example, if the line is accidentally in electrical connection with the earth at some intermediate point, or if the receiving-instrument is out of order or improperly adjusted, it frequently happens that no record whatever is made at the receiving-station, although the sender has no means of knowing that such is the case.

My invention consists in the employment of certain mechanism in connection with the marking-lever of the recording apparatus at the distant or receiving station, by means of which the same telegraphic signals are automatically retransmitted over the same line to the home or sending station at the same instant that they are recorded upon the paper, while at the home station a relay of peculiar construction responds to these retransmitted signals in such manner as to actuate a sounder, register, or other receiving-instrument. The reproduction of the transmitted signals upon the instrument at the home or sending station

is therefore wholly dependent upon the proper action of the recording apparatus at the distant or receiving station, and the sending-operator is thus at all times informed whether or not the communication he is sending is being properly recorded at that point.

In the accompanying drawings Figure 1 is a diagram illustrating my invention, which represents a sending-station at one end of the line and a receiving-station at the other. Fig. 2 shows one terminal station arranged for either sending or receiving, and also shows certain modifications in the details of the apparatus.

In Fig. 1, A represents the sending-station, and B the receiving-station. K is an ordinary Morse key, and M is a relay of peculiar construction, both of which are placed at the home or sending station. The relay M is provided with a yielding contact-lever, *c*, which has its fulcrum at *c'*, and is normally held in contact with an adjustable stationary contact-stop, *d*, by the tension of the adjustable spring *g*. The armature-lever *a* is in like manner normally held against its back-stop *f* by the tension of the adjustable spring *a'*; but when drawn forward by the attractive force of the electro-magnet M, exerted upon its armature, it is brought into contact with the short arm of the yielding contact-lever *c*. The electro-magnet S of a suitable receiving-instrument, which may be either a sounder, a register, or an indicator of any kind, is placed in the circuit of a local battery, L, the terminals of which are connected, respectively, with the armature-lever *a* and the contact-stop *d*. Thus it will be understood by an inspection of the diagram that the local circuit, which actuates the electro-magnet S, can be closed only when the armature-lever *a* rests against the short arm of the yielding contact-lever *c*, and the longer arm of the latter at the same time against the contact-stop *d*, in which case the current of the local battery L will successively traverse both the armature-lever and the contact-lever.

In Fig. 1 the main battery E is represented as placed at the distant or receiving station B, and is preferably divided into two unequal sections, *e* and *e'*, of which *e* may with advantage contain the larger number of elements. R is the electro-magnet of the recording or registering apparatus, and *l* is the marking-lever, which, by means of a style or tracer, *l'*,

marks the telegraphic characters upon a strip of paper which passes between the rollers *r r*. The latter are caused to turn in the usual well-known manner by means of a system of clock-work, which should be provided with a suitable self-starting device or attachment capable of being set in action by the movement of the marking-lever *l*. The manner in which a device of this kind may be arranged in connection with registering mechanism is well understood, and need not be described. The yielding contact-lever *n* is normally held against the contact-stop *o* by the tension of the spring *p*, but is so situated with reference to the extremity of the marking-lever *l* that when the latter is caused to descend by the attraction of the magnet *R* it will come in contact with the lever *n* at the same instant that the marking-point *l'* touches the paper strip which is moving above it upon the roller *r*, and therefore whenever the marking-point *l'* is forced into the paper the yielding contact-lever *n* will at the same instant be separated from the fixed contact-stop *o*.

The operation of the apparatus is as follows: When the key *K* is depressed, the current from the entire battery *E* (the latter being connected to the ground at *G*) passes by wire 1, contact-stop *o*, contact-lever *n*, wire 2, electro-magnet *R* of the recording apparatus, line-wire 3, relay-magnet *M*, wire 4, key *K*, and wire 5, to the ground at *G'*. As the current of the whole battery *E* now traverses the electro-magnet *R*, its armature is powerfully attracted, the clock-work of the register is set in motion, and the marking-point *l'* is pressed into the moving strip of paper, while at the same instant the lever *l* simultaneously makes an electrical contact with the yielding lever *n* and interrupts the contact previously existing between said lever and the fixed contact-stop *o*. By this action the greater section, *e*, of the main battery *E* is cut out; but the lesser section, *e'*, still remains in the circuit of the line by the way of the wire 6 and marking-lever *l*, and produces a current having sufficient strength to cause the lever *l* to be maintained in position until interrupted by the opening of the key *K* at the sending-station. The closing of the key *K*, and of the main circuit also, causes the home relay *M* to attract its armature and bring the lever thereof against the yielding contact-lever *c*. If the recording apparatus has properly performed its office, the current traversing the line will be at the same moment weakened by the cutting out of the greater section, *e*, of the main battery *E*, and the short arm of the lever *c*, being held in position by the retractile force of the spring *g*, will act as a stop. The local circuit of the battery *L* will therefore be closed by way of *a*, *c*, and *d*, and hence the receiving-instrument *S* will respond to the movement of the key *K*. If, however, the marking-lever *l* at the receiving-station has from any cause failed to respond to the movement of the key *K*, the full power of the battery *E* will continue to flow through the line

as long as the key remains depressed, and the armature-lever *a* will be so strongly pressed against the shorter arm of the contact-lever *c* as to overcome the tension of the spring *g* and cause it to yield, thus separating the lever *c* from the stop *d*. The local circuit being thus broken, the receiving-instrument *S* cannot respond. It will therefore be obvious that so long as the receiving-instrument *S* responds properly to each movement of the key *K* the sending-operator may be certain that the marking-lever *l* at the distant station is properly performing its office.

The invention may be modified in the manner illustrated in Fig. 2, so as to be available for transmission in either direction. In the drawings a single terminal station is represented, and the apparatus, as arranged, may be used either for sending or receiving. In this case the main battery *E*, by means of which the transmission is effected, is preferably placed at the sending instead of the receiving station, and the weakening of the current upon the line by the movement of the marking-lever is effected through the agency of a rheostat or artificial resistance, *X*, which is inserted in the circuit of the main line at the receiving-station, in lieu of cutting out a portion of the main battery, as in the first instance. The currents transmitted from the battery *E* go to line by way of 7, 8, and 9, passing through the relay *M*, while the received currents, when the other station is sending, come in by the way of 9, 8, 10, 11, and 12, passing through the electro-magnet *R* of the register. When the marking-lever *l* descends, it separates the lever *n* from the stop *o*, and thus causes the main circuit to pass through the rheostat *X*, whereby its strength is diminished and the same effect produced as if a portion of the battery were taken off. In every other respect the operation is precisely the same as in the arrangement hereinbefore described.

When the line to be operated is of considerable length, the recording-instrument may with advantage be operated by a relay and local circuit, in a manner well understood.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a fixed contact-stop, a yielding contact-lever normally held against said stop, a line-wire connected with said contact-lever, an armature-lever actuated by an electro-magnet, which is included in said line-wire, a main battery in two sections, a conductor extending from one terminal of the battery to the earth, a conductor extending from the other terminal of the battery to the fixed contact-stop, and a conductor extending from the armature-lever to a point between the two sections of the battery.

2. The combination, substantially as hereinbefore set forth, of an electro-magnet, armature, and armature-lever, a fixed contact-stop, a yielding contact-lever normally held against said contact-stop, and capable of being sepa-

rated therefrom by the pressure of the armature-lever when in contact therewith, and a local or secondary circuit which traverses the armature-lever, the fixed contact-stop, and the contact-lever, when the contact-lever is simultaneously in contact both with the armature-lever and the fixed contact-stop, and not otherwise.

3. The combination, substantially as hereinbefore set forth, of an electro-magnet, armature, and armature-lever, a fixed contact-stop, a yielding contact-lever normally held against said contact-stop, but capable of being removed therefrom by the pressure of the armature-lever when in contact therewith, a local or sec-

ondary circuit which traverses the armature-lever, the fixed contact-stop, and the contact-lever, when the contact-lever is simultaneously in contact both with the armature-lever and the fixed contact-stop, and not otherwise, and a receiving-instrument included in said local circuit.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

FRANK L. POPE.

Witnesses:

JOS. L. COOMBS,
A. H. NORRIS.