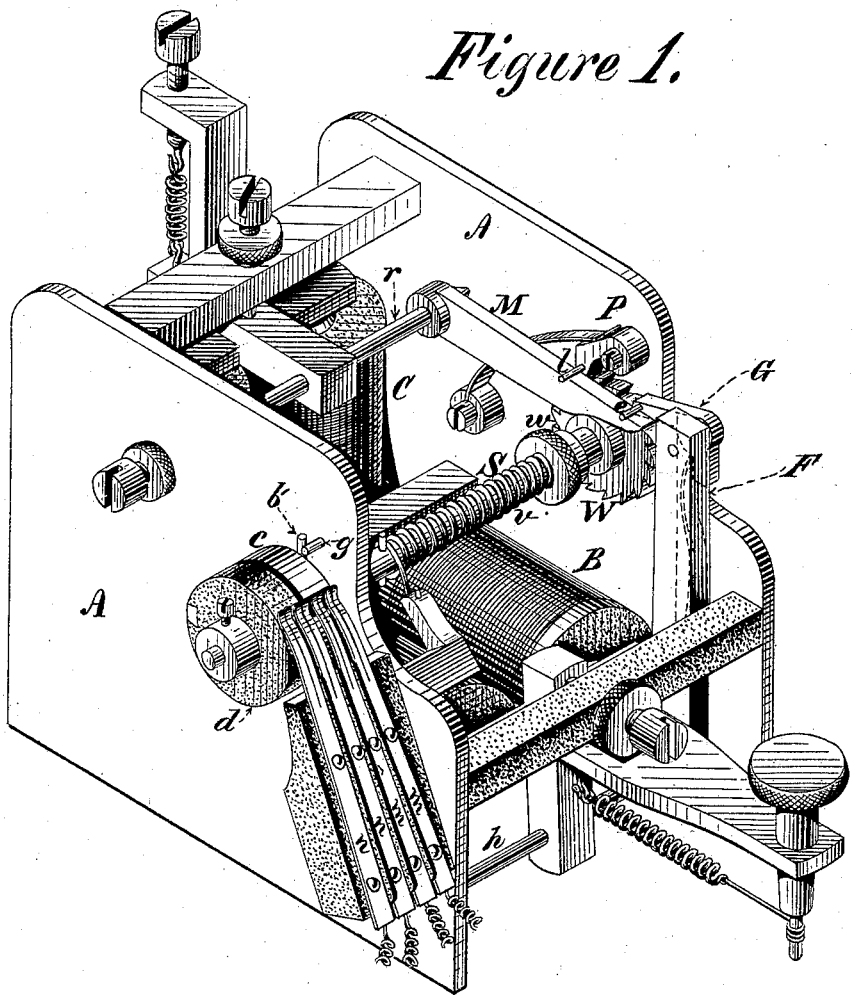
4 Sheets—Sheet 1.

E. N. DICKERSON, Jr.

Electric-Signaling Apparatus.

No. 212,792. Patented Mar. 4, 1879.

Figure 1.



Witnesses:
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S. J. Sullivan

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4 Sheets—Sheet 2.

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Electric-Signaling Apparatus.

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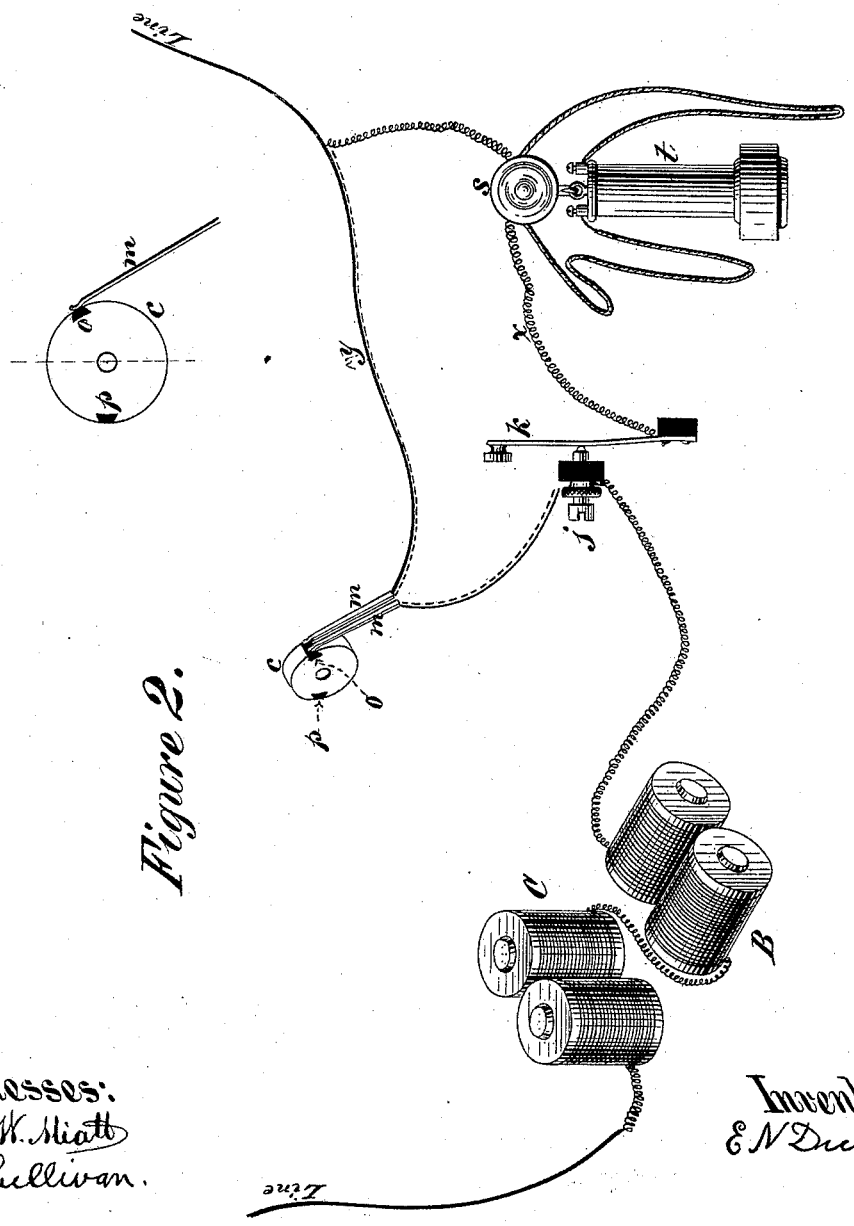

Figure 2.

Witnesses:
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4 Sheets—Sheet 3.

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Electric-Signaling Apparatus.

No. 212,792. Patented Mar. 4, 1879.

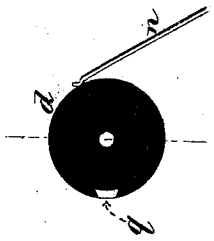
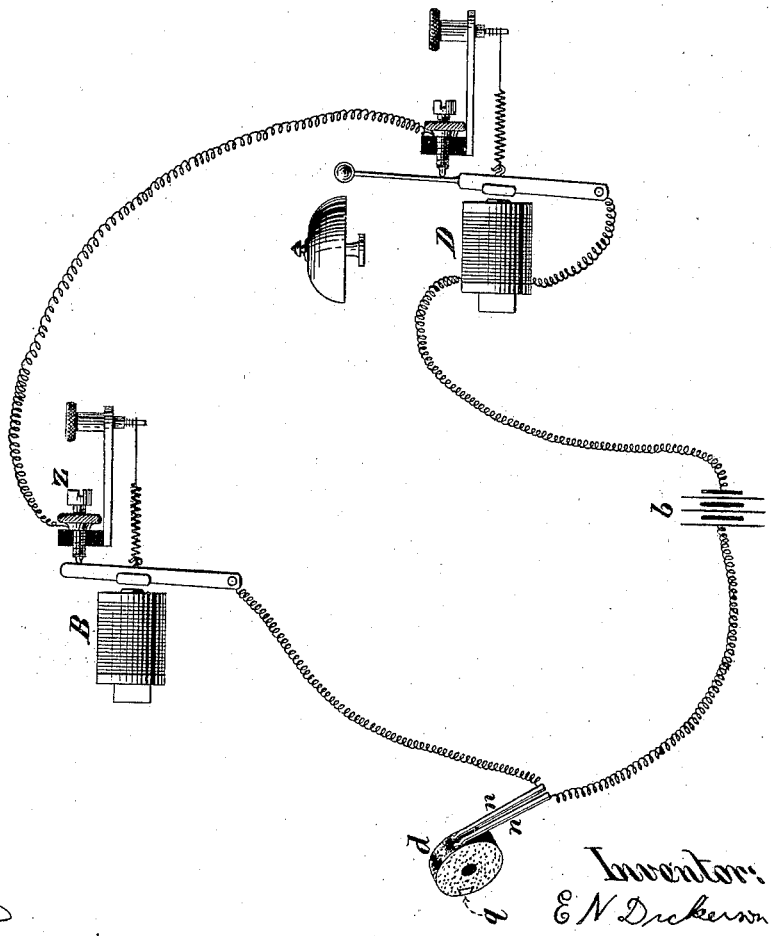


Figure 3.



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4 Sheets—Sheet 4.

E. N. DICKERSON, Jr.

Electric-Signaling Apparatus.

No. 212,792. Patented Mar. 4, 1879.

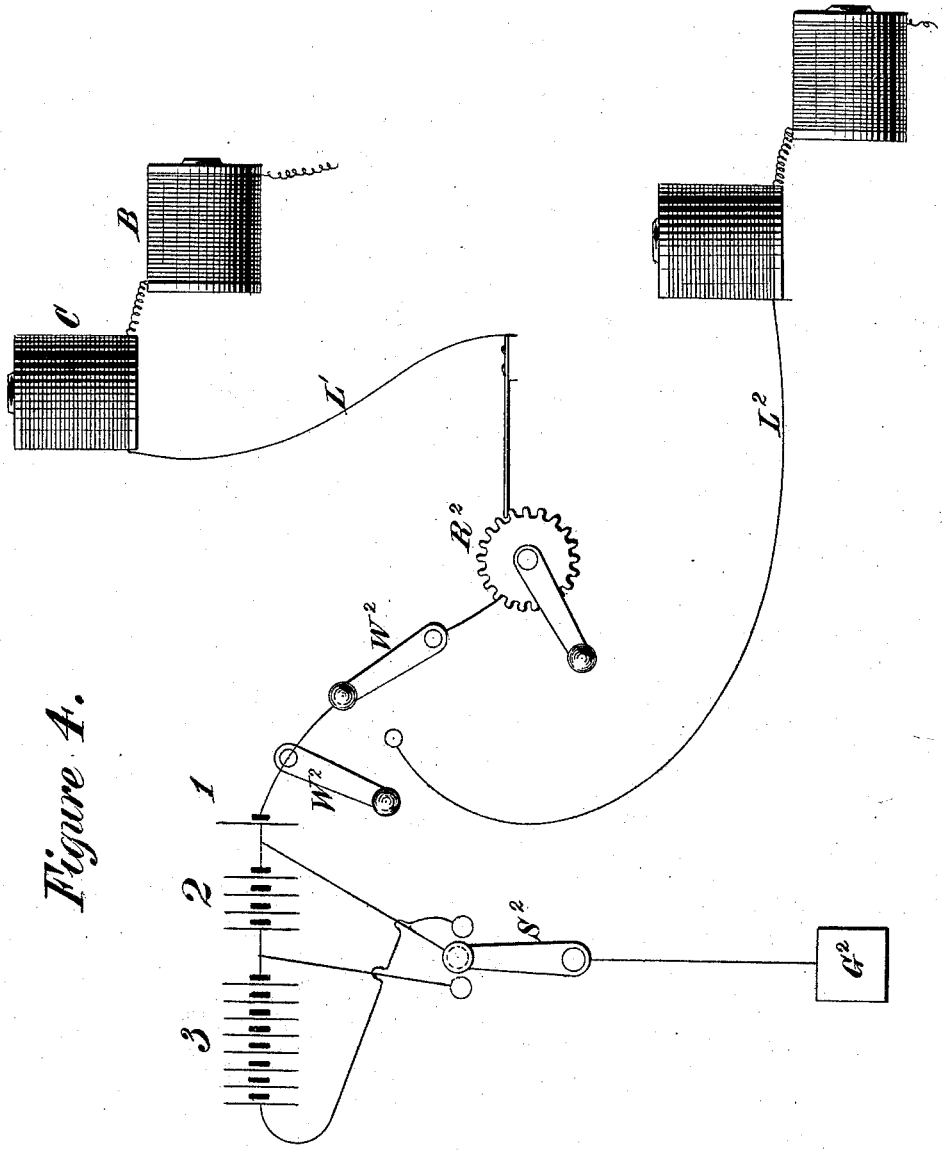

Figure 4.

Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

EDWARD N. DICKERSON, JR., OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRIC SIGNALING APPARATUS.

Specification forming part of Letters Patent No. **212,792**, dated March 4, 1879; application filed January 29, 1879.

To all whom it may concern:

Be it known that I, EDWARD N. DICKERSON, Jr., of the city, county, and State of New York, have invented a new and useful Improvement in Signaling Apparatus, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

In the practical operation of what is known as the "district telegraph system," or other systems in which a series of instruments is placed upon a wire connecting with a central office, the different instruments of the series being distributed in localities where there are no experienced operators it is important and desirable to possess an instrument which can be controlled from the main office, and will signal at any one of the line-offices without disturbing or signaling any of the others.

The usual and most convenient method of signaling is by means of an electric bell or gong; and one of the objects of my invention is to provide a series of signaling instruments placed upon one wire, and so constructed that the controlling operator can cause the bell connected with any one of them to sound, while all the other bells will be silent. It is also important that any one of the line-offices has the power to signal the central office at any time when the apparatuses are in their normal condition, or at the time when the central office is signaling the office in question, but shall not have the power to interrupt a message or signal passing between the main office and any one of the local offices.

My apparatus also accomplishes this result, and enables a line-office to signal the central office in the normal position before movement of any of the apparatuses, and also in that position when communication is maintained with it from the central office.

It is important that no office except the one called from the central office have the power to overhear messages being transmitted between any other offices. My apparatus accomplishes this result.

My apparatus is also constructed to operate with or without a local battery at the line-stations.

My apparatus consists, generally, of a ratchet-wheel controlling a circuit-wheel or two circuit-wheels, and making or breaking circuit at given points of the revolution of such circuit-wheels. Its operation and construction will be readily understood from the accompanying drawings, in which—

Figure 1 represents a general perspective view of my apparatus. Fig. 2 represents a detail of the line-circuits; Fig. 3, a detail of the local or bell circuit. Fig. 4 represents a view of my battery and transmitting apparatus.

I will first describe the apparatus and circuits of Fig. 1.

A represents parallel sides or frame-work supporting the various parts of the apparatus, as is clearly shown. Two horseshoe-magnets, B and C, are shown, B being horizontal and C vertical in this arrangement. The insulating parts in this figure are represented in dotted surfaces. The armature of B is pivoted on the arbor *h*. The armature C is pivoted on the arbor *r*. The armature of B vibrates a lever, F, carrying on its upper end a pawl, G, which engages with a ratchet-wheel, W. This ratchet-wheel revolves the shaft S. This shaft is constantly rotated toward the right or in the direction of the hands of a clock by means of the adjustable coil-spring *v*, made adjustable by means of the set-nut *w*, or in any other convenient way. It is plain that a light weight supported on a cord running in the periphery of a wheel would accomplish the same result, the purpose being to give the shaft S a constant tendency to rotate toward the right against the pawls. Supported on the frame-work is another pawl, P, which also acts against the ratchet-wheel W and prevents its revolution.

The armature C is provided with the trip-arm M, which trips the pawls G and P by means of the pins *e* and *l* thereto attached, as clearly shown. Whenever the armature C is depressed, *e* and *l* are thrown up, and the ratchet-wheel is freed and revolves toward the right by means of the spring or weight until the spring *b'*, attached to it, brings up against a stop-pin, 9.

Attached to the shaft S are two circuit-wheels, *c* and *d*. (Shown in section at Figs. 2 and 3.) Upon the surfaces of the circuit-wheels rest four springs, *m m* and *n n*, which control

the main and local circuits, as shown in Figs. 2 and 3.

In the working of this apparatus, which is particularly applicable for use with telephones, three batteries, or parts of batteries, are required at the main office—one, a very light battery, sufficient to operate a high-resistance magnet at the main office, but insufficient to operate any of the magnets of the signaling apparatuses; second, a working battery for the purpose of revolving the circuit-wheels, which must have sufficient strength to cause the magnets B of the signaling apparatus to vibrate; and, third, a battery sufficiently strong to operate the magnet C, the armatures of which are adjusted to a higher tension than the armatures of the magnets B, so that they will only be operated by a higher current than that which is sufficient to operate the magnets B.

It is plain that these may be different parts of one battery, or that a constant-current battery for the light circuit may be employed, while an open-circuit battery can be employed for operating the magnets. These batteries are denominated 1 2 3, beginning with the weakest.

A simple arrangement of the transmitting apparatus is shown at Fig. 4, in which R^2 represents a general view of a transmitting apparatus, which apparatus should preferably be run by clock-work and have an arrangement for leaving the circuit open or closed at will. S^2 represents a switch communicating with the ground G^2, enabling any one of the batteries 1 2 3 to be sent to the line. W^2 represents a switch by means of which another line, L^2, may be put in communication with the line L^1.

In connecting a series of lines at the central office of course a proper arrangement of switch-boards and connecting-wires is necessary, which is not here shown in detail, but will be readily supplied in any of the well-known ways.

A small permanent battery is maintained constantly on each line, enabling communication with the central office through a receiving-instrument. (Not shown.)

The circuits of this apparatus are shown clearly in Fig. 2, where the wheel *c* is also shown in detail. This wheel, the surface of which is generally of a conducting material, is provided with two insulating-strips, *o* and *p*. This wheel is adjustable on the shaft S, as is also the wheel *d*, and is so adjusted that when the apparatus is in the normal position, as shown in Fig. 1, the springs *m m* rest upon one of the insulating-strips, *o*. The other insulating-strip, *p*, is arranged at a distance around the circumference of the wheel *c* different for each apparatus, and regulated according to the number of impulses which it is desired such wheel should receive before signaling its office.

In Fig. 2 the line-circuit passes through the magnets C and B to the signaling-key *k*, provided with the back point *j*. Of course, any other suitable key could be used. From the point *j* two circuits are presented—one through the springs *m m* and wire *y* to line, the other through the key *k*, wire *x*, switch *s*, or telephone *t* to line.

In the normal condition shown in Fig. 2, the circuit through *m m* is broken by the rubber strip. Therefore, the only path for the current is through the key *k*, wire *x*, and the switch *s* to line. Where telephones are used, as shown in Fig. 2, they should be provided with connecting-switches *s*, which are so contrived that when the telephone is not in use the circuit does not pass through it, but when raised from the hook the circuit passes through the telephone itself.

In the normal condition of the line a movement of the key *k* will break the circuit, because the other branch of the circuit through wire *y* is broken by strip *o* of wheel *c*.

In the normal condition of the line and instrument battery 1 is acting, and by means of this battery any office can signal the central office, and, receiving an answer, can readily communicate by the telephone *t* or other signaling apparatus. An additional magnet might be used to receive the answer from the main office, or the answer might be received on the telephone, which is the better plan, or a district-telegraph instrument sending a particular number might be substituted for the key *k;* but these contrivances are unnecessary and undesirable where telephones are used.

As soon, however, as a current from battery 2 is sent out from the main office on the line, the ratchets are all advanced one step or tooth by their magnets B, thereby rotating the circuit-wheels *c* and *d*. The springs *m* rest after the first movement upon the metallic surfaces of wheel *c*, and thereby a shunt-circuit is provided through springs *m* and wire *y*, which cuts out the telephones *t* and key *k*, and prevents any interruption on the line by any office after the first impulse has been given. This continues until the strip *p* comes under the springs *m*, when the key and telephone can once more be operated. The position of this strip *p* and of the strip *q* of wheel *d* is predetermined and different for each signaling instrument, so that these strips will rest under the springs *m m n n* after a definite number of impulses.

Suppose the number of this apparatus to be eight, then it will happen that after the battery 2 of the main office has been closed and opened eight times the springs *m* will rest on the insulating-strip *p*, and the springs *n* (shown in Fig. 3) will rest on the conducting-strip *q* of the wheel *d*. Then the following result will take place: the wheel *c* has advanced until its strip *p* is under the springs *m;* the wheel *d* has advanced until its strip *q* is under the springs *n;* then the local circuit will be as shown in Fig. 3, where D represents a reverberating bell, and *b* represents the local battery. The circuit of this battery is through

springs *n n* and strip *q*, through armature of B, through insulated back point *z*, through bell D, back to itself.

It will be noticed that the magnet of reverbating bell D is closed on the back movement of the armature of magnet B. The reason of this arrangement is as follows: Suppose a station having a higher number than the one here shown was summoned from the main office, then the circuit-wheel would revolve until the strip *q* had passed under and beyond the springs *n*, and in the moment of passage it might happen that a single stroke would be heard upon the bell of the instrument shown in the figure.

It is therefore desirable that this instant of contact be as short as possible, and no contact will be made until after the armature of magnet B has rested against its back stop. This secures the shortest possible interval of circuit during the operation of the machine, and I have found in practice that the magnet B can be operated with sufficient rapidity to prevent any sound upon the bell on a short circuit; but should it be found under any particular circumstances that there was a liability of this bell sounding, the difficulty is readily avoided by interposing between the circuit which is closed by the wheel *d* and the circuit which operates the bell an intermediate circuit—in other words, so arranging the apparatus that a magnet is operated by the circuit-wheel and this magnet closes the bell-circuit. There are many such devices in use, familiarly known as "bug-traps," which will be found in connection with the quadruplex telegraph-instruments.

The transmitter at the main office should, preferably, be a clock-work transmitter, which is provided with a revolving circuit-wheel capable of being stopped at any number. A very good one was patented by Charles T. Chester on the 20th day of October, 1863, in combination with his dial instrument. The switches and main-office connections are not shown, since they will be easily supplied by any expert electrician. This bell will continue to ring by means of its local battery until an answer is returned to the main office. The main office, after having operated battery 2 eight times, as shown, has thrown battery 1 upon the line, and the local office answers back to the main office by means of its key *k* and this battery 1, which does not affect any signaling instrument on the line. Communication is then maintained by means of the telephone, and it will be observed that all other keys on the line are shunted out by means of the shunt-circuit shown in Fig. 2. At the end of the communication the main office sends out upon the line the battery 3, which trips the pawls and allows every apparatus to return to its normal position, which is determined by means of the stop-pin *b'*.

The proportions of the apparatus shown are of course not the best ones for practice, being much too heavy, and I do not limit myself to this precise arrangement.

The teeth of the ratchet-wheel are somewhat too much slanted, and might slightly interfere with the elevation of the pawls. A very low tooth is amply sufficient. These apparatuses are interchangeable, and if one should get out of order another could be substituted, merely retaining the circuit-wheel *c*.

If desired, a circuit-wheel constantly advancing in one direction with a unison stop-motion might be employed; but I prefer the present method of obtaining unison.

The converging wires of the system hereinbefore described are arranged to be suitably connected one with the other, so that any office on any line may be privately connected with any other office on any other line.

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

1. In an instrument constructed to give a signal after a definite number of electric impulses, the mechanism, substantially as specified, for cutting out a key or circuit-breaker after the instrument has begun to move, whereby the movement of the instrument consequent upon the first electric impulse prevents the breaking or alteration of the current, thereby preventing any office from interfering with the signals sent out from the controlling office from and after the first electric impulse, substantially as described.

2. In an instrument constructed to give a signal after a definite number of electric impulses, the mechanism, substantially as specified, for cutting out a key or circuit-breaker after the instrument has begun to move, and cutting it in again when the instrument has arrived at the position at which the signal is given, substantially as described.

3. In combination with a circuit-wheel operating from a definite point and against a constant force by means of an electro-magnet, a trip-movement controlled by an independent mechanism for the purpose of releasing said circuit-wheel and allowing the return force to restore it to its normal condition, substantially as and for the purposes described.

4. In an electric signaling apparatus, a ratchet-movement controlling two independent circuit making and breaking apparatuses, one of which controls the local circuit, and the other the main circuit, substantially as and for the purposes described.

5. The combination, in a telephone-circuit, of a telephone and controlling-key in one branch of the circuit, and a circuit-wheel constructed to switch or shunt out the key and telephone at a definite point of revolution, and to switch them in again after a definite number of electric impulses, thereby preventing the opening or closing of the circuit, except at a definite point of revolution of the circuit-wheel, substantially as described.

6. In an electric signaling apparatus, the combination of a circuit-wheel closing a local

circuit at a definite point in its revolution, a local battery, an electric bell, and the actuating mechanism shown, the local circuit being arranged through the battery, the circuit-wheel, the bell, and the back point of the armature of the actuating-magnet, substantially as and for the purposes described.

7. A circuit-wheel operated by an actuating-magnet and a ratchet, which ratchet is provided with two pawls, one of which is attached to the vibrating actuating-armature, the other of which is fixed and constructed to prevent the return of the circuit-wheel, except when tripped by an independent movement, substantially as described.

8. In an electric signaling apparatus, the combination of two polarized magnets, one of which operates the circuit-controlling mechanism, the other of which operates a bell, and a third magnet operated by an increase in the electric current for the purpose of returning the apparatus to its normal position, substantially as and for the purposes described.

9. In an electric circuit which has located upon it a number of signaling apparatuses and a controlling office, the combination, with such signaling apparatus, of three batteries of different powers, the first of which is used to maintain communication without operating any of the signaling apparatuses, the second of which is used to operate the signaling apparatuses, the third of which is used to return the signaling apparatuses to their normal position, substantially as and for the purposes described.

10. The method hereinbefore described of arranging two or more offices on each of two or more lines converging to a central controlling-office, each of said offices being provided with a cut-out mechanism controlled from said central office, and of privately connecting any office on any line with any office on any other line, thereby enabling private communication to be maintained between any number of offices situated on converging wires, and dispensing with the necessity of having an independent wire for each office, substantially as described.

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Witnesses:

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S. T. SULLIVAN.