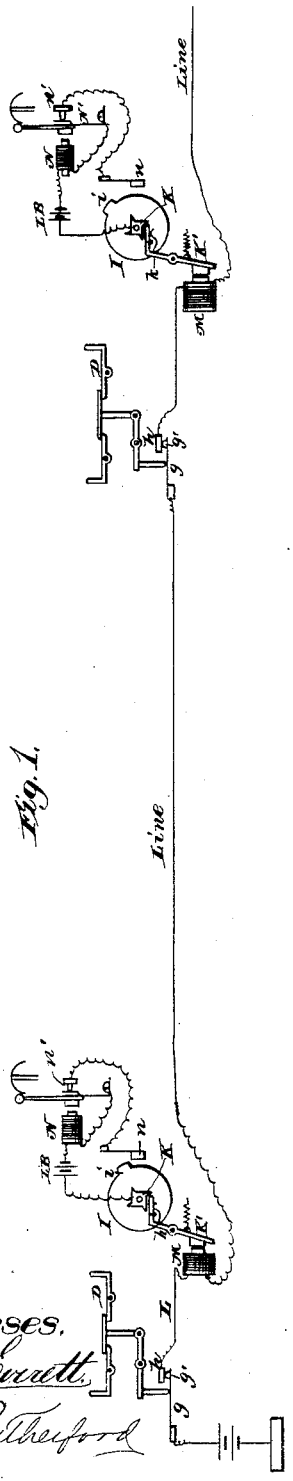
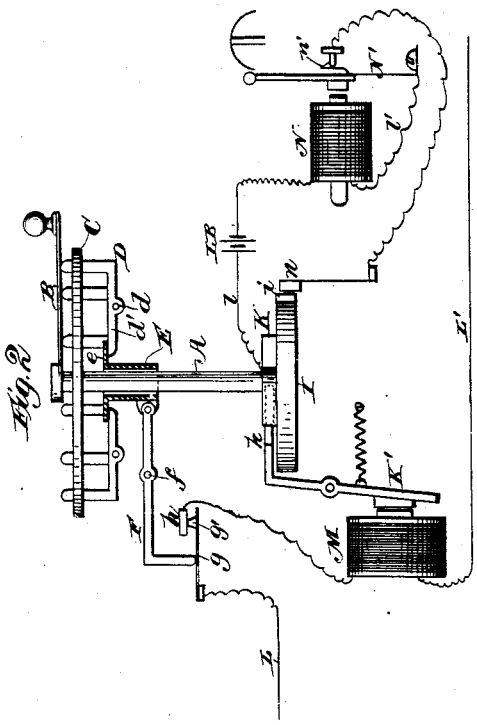
(No Model.) 3 Sheets—Sheet 1.

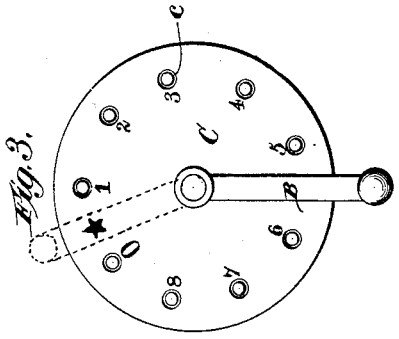
# C. EWING

## TELEPHONE SIGNALING AND RECEIVING APPARATUS.

No. 260,180. Patented June 27, 1882.

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## TELEPHONE SIGNALING AND RECEIVING APPARATUS.

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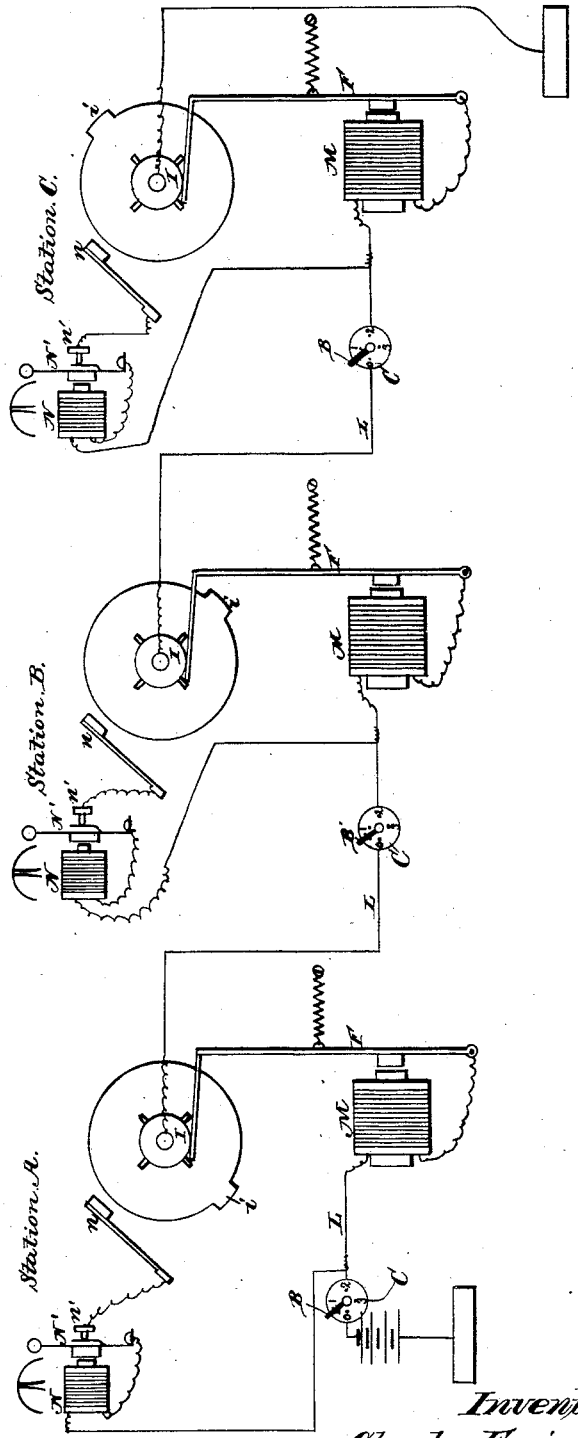
Fig. 4.

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## TELEPHONE SIGNALING AND RECEIVING APPARATUS.

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Fig. 6.

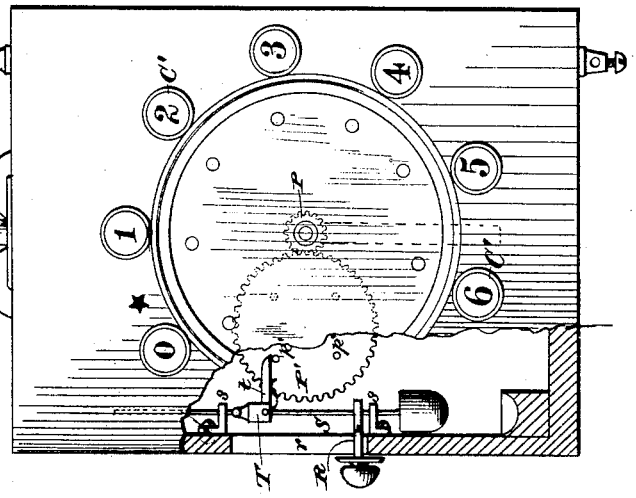



Fig. 7.

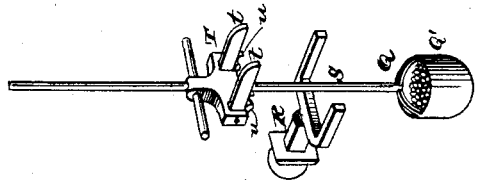
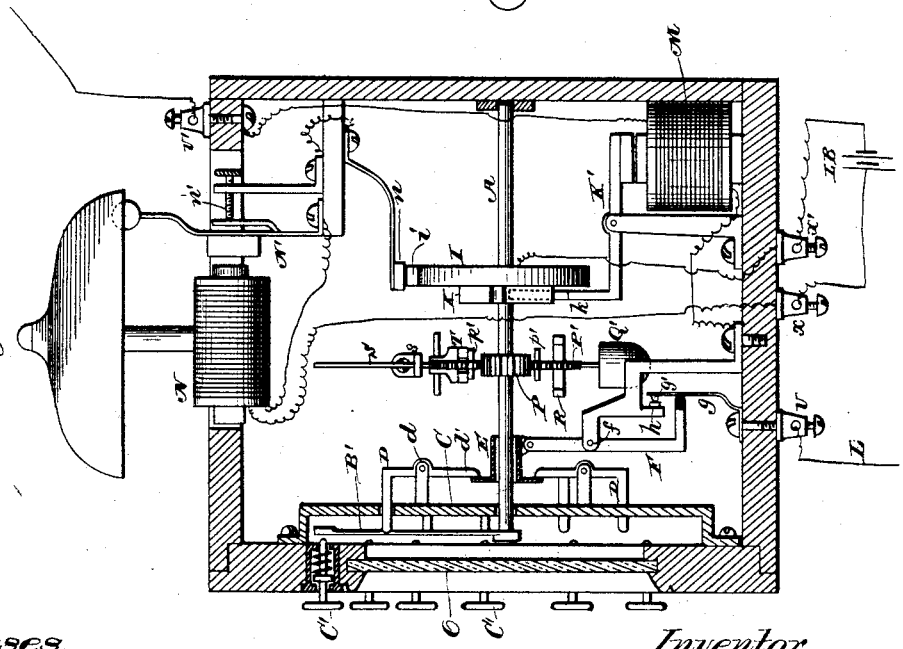


Fig. 5.



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# UNITED STATES PATENT OFFICE.

CHARLES EWING, OF WASHINGTON, DISTRICT OF COLUMBIA.

## TELEPHONE SIGNALING AND RECEIVING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 260,180, dated June 27, 1882.

Application filed March 23, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES EWING, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Telephonic Signaling and Receiving Apparatus, of which the following is a specification.

The object of my invention is to arrange a series of telephonic stations upon a circuit in such manner that the operator at any one station can call and put himself in communication with another station without the aid of a "central office" and without calling up any other station on the circuit. The special arrangement of circuit and station apparatus will be fully described hereinafter.

In the accompanying drawings, Figure 1 is a diagrammatic view, showing two stations arranged on a main-line circuit according to one plan of my invention. Fig. 2 is a view indicating the special apparatus employed at each station. Fig. 3 is a plan view of the switch call-dial; Fig. 4, a diagrammatic view, showing three stations arranged on circuit according to another plan. Fig. 5 is a central vertical section taken in the plane of the shaft *a*. Fig. 6 is a front elevation of the same, partly broken away; and Fig. 7 is a view in perspective, showing the mechanism for operating the call apparatus.

I will first describe the apparatus shown in Figs. 2 and 3, and will then described the operation on circuit.

An upright rotary shaft, A, mounted on suitable supports, carries at its top a switch-lever, B. The shaft passes through the call-dial C, which is firmly held in the casing of the apparatus. This dial is provided with a series of apertures, *c*, placed near its periphery, through which apertures the upper vertical arms of a series of right-angled levers, D, project. These levers are respectively pivoted at *d*, and project sufficiently far above the dial to come in contact with and be depressed or snubbed down when the switch is moved past or over them. The horizontal arms *d'* of these levers extend under a flange, *e*, on a collar, E, which slides freely within proper limits on the shaft A, so that when any one of the levers is depressed by the switch-lever it will raise the sliding collar. A lever, F, pivoted at *f* and connected with the sliding collar, bears upon a spring-arm, *g*, carrying the contact *g'*, and whenever any one of the levers D is depressed and the sliding collar raised the contact between the points *g'* and *h* will be broken and the circuit interrupted. The current from the main line L normally passes through spring-arm *g*, contacts *g'* and *h*, coil of electro-magnet M, and thence to line L'.

A disk, I, secured on the lower end of the shaft A, is connected by wire *l* of a local battery, L B, with the coil of the electro-magnet N, from whence this local circuit extends by wire *l'* to the armature N', armature-stop *n'*, and contact-point *n*. The contact-point *n* is designed to make contact with the projection *i* on the disk, and thus complete the local or bell circuit whenever the signal of that special station is received. The bell is what is known as the "ordinary vibrating bell," and will continue to ring until its local circuit is broken, as will be hereinafter described.

On the upper face of the disk I a ratchet-wheel, K, is secured. This wheel is rotated by a thumb pawl or lever, *k*, carried by the armature-lever K', which armature is attracted by the magnet M whenever the contacts *g' h* complete the circuit, and is drawn back by an ordinary retractile spring when the circuit is broken. Thus when the circuit is completed the armature is attracted, thrusts the lever or pawl *k* forward, and pushes the ratchet-wheel around one tooth, and when the circuit is broken it is drawn away from the magnet by a retractile spring, to be again attracted when the circuit is again completed. The rotation of the ratchet-wheel a given number of teeth will cause the projection *i* to make contact with *n*, thus completing the local circuit and sounding the call-bell.

In Fig. 3 the face of the dial is shown as having eight apertures and projecting levers to be operated by the switch-lever, and one zero-point, where the switch-lever normally rests. It may be noted here that these levers are rounded on their upper ends to facilitate their being snubbed down by the lever. They might, if desired, be beveled on their opposite sides.

The apparatus thus described is identical at all the stations on the circuit. The number of

stations in this instance will be assumed to be eight, in accordance with the numbers on the call-dial. In Fig. 1 a portion of the entire circuit only is shown with two stations, as this is deemed sufficient to illustrate the operation of my improved apparatus. The station apparatus is shown diagrammatically in this figure for convenience of illustration. Thus the disk I and ratchet-wheel are shown as detached from the shaft A and placed in the local circuit. Now, suppose that there are eight stations on this circuit, and that the switch-levers at all the stations are in their normal zero position, as indicated by the dotted lines in Fig. 3, then the main-line circuit will be complete, but all the local bell-circuits will be broken. The position of the projection *i* on each disk I and the number of teeth in the ratchet-wheel are arranged in such relation that when a number of teeth corresponding to the station number of that particular station have been pushed around by the thrust-pawl *k* the projection *i* will make contact with the point *n*, complete the local circuit, and ring the vibrating call-bell at that station. Thus at station 8, when the thrust-pawl has been operated eight times, the local circuit should be completed. In other words, each disk I, provided with a single projection or tooth, *i*, is so arranged that, supposing all the disks upon the line to rotate in the same direction and at the same rate, the projections will make contact successively, no two engaging with the contact-point *n* at the same time. The number of these projections corresponds with the number of the teeth upon the ratchet K, less one, and their arrangement is such that as the thrust-pawl *k* operates said ratchet its successive vibrations will cause the projection *i* upon the disk at station 1 to make contact first. Then as the said disks revolve the projection *i* at station 2 will next close the local circuit. Upon the third stroke of the pawl contact will be made at station 3, &c. The moment contact is made at station 2 the projection *i* at station 1 passes off the contact-point. As contact is made at station 3 it passes off at No. 2, &c., the rotation of the disks at all the stations being simultaneous and equal. Suppose, now, that station No. 1 wants to communicate with station No. 5, the operator at station 1 turns the switch-lever B over the switch-dial from the zero-point, where it normally rests, said lever passing over the projecting levers 1, 2, 3, and 4 in succession and snubbing each one down until the arm just passes lever 5, where it is allowed to dwell just off said lever or between it and lever 6, as shown in Fig. 3. As the arm B passes over lever 1 and depresses it it raises the sleeve E, depresses lever F, and breaks the line-circuit at every station, allowing the lever K′ to be retracted. As the arm moves past lever 1 the circuit is restored at each station, and the magnet M attracts its armature and the thrust-pawl *k* is operated, thereby moving all the ratchet-wheels K one tooth each, the disks I rotating with them. As already explained, when lever No. 1 is snubbed down contact is made at station 1 between the projection *i* on the disk K at that station and the contact-point *n*, and the local circuit is thereby closed, and this would ring the bell there, but the operator moves the switch rapidly on, and the bell is so adjusted that it will not be affected by the very brief contact between *i* and *n*, as will be stated hereinafter. As the operator at the calling-station continues to move his switch-lever around it snubs down lever 2 and then lets it rise, the circuit is again made and broken at each station, and each ratchet-wheel has been moved another tooth. This completes the local circuit at station 2, but the bell will not ring, as the operator promptly moves his switch-lever on. The operation is exactly the same as the switch-lever is moved around the board and snubs down the other levers, the local circuit at each corresponding station being completed when the lever having its number is snubbed down, and each local circuit being thereby closed and broken in succession at the several stations on the line, and the contact at each being made and broken almost in the same instant of time, the bells at the stations not called will not ring, because the armatures N′ of the bell-magnet are so adjusted by springs, or their inertia may be so adjusted that they will not move or respond to a quick contact or completion of the circuit, but will only be influenced by a prolonged completion of the local circuit, as above mentioned, which is effected by arresting the switch-lever B after it has passed the pin of the called station, as already described. As the ratchet-wheel and disk at each station are moved synchronously or step by step in response to the movement of the switch at the calling-station the shaft A and switch-lever are also moved, so that as the switch-lever at station No. 1 is moved the switch-levers of all the other stations will be similarly moved over their call-dials. As it is desired to call station No. 8, the switch-lever at station No. 1 should be moved until it passes over and just beyond lever-point 8, whereby the line-circuit is broken and completed at each station in succession, thereby rotating the disks I until the local circuit is closed at station 8 in the manner already described. This brings the projection *i* into contact with the contact-point *n* and completes the local circuit at station No. 8, and by holding the switch-lever for a time in this position the local circuit at station 8 will ring the bell and continue to ring it until some one comes to answer it. When the operator at calling-station No. 1 has held his lever just off of pin 8 a sufficient time to give a prolonged ring of the bell at station No. 8 he continues to move the lever rapidly around to the zero-point again, and the line will then be ready for communication between the two stations. In this manner any station on the circuit may call and communicate with any other station without disturbing or sounding the call at any of the other stations on the line,

the operation in every case being identical with that above described.

In Fig. 4 I have illustrated diagrammatically three stations, A, B, and C, or 1, 2, and 3, arranged on a circuit somewhat differently from those shown in Fig. 1. In this arrangement the rotation of the disk I serves to complete a bifurcated, split, or branch circuit, through which a portion of the current on the line flows, thus operating the call-bell. The main circuit L runs through the contacts *g'* and *h* of the signaling apparatus, (not shown in Fig. 4,) through coil of magnet M, armature F, and disk K to line again. The split of bifurcated circuit commences at some point between the signaling apparatus and magnet M and runs through coil of bell-magnet N, armature-lever N' to contact *n*.

Each station is provided with signaling apparatus like that described, and the operation is substantially the same as that of the organization shown in Fig. 1. The split circuit at a station is only completed when the ratchet-wheel has been moved a sufficient number of teeth to bring the projection *i* and contact-point *n* together, and then the bell is rung, as already described.

My improved apparatus is designed more especially for telephonic signaling or calling, and receivers and transmitters of any usual construction may be connected in the circuit in any suitable manner.

Figs. 5 and 6 represent the apparatus shown in Fig. 2 mounted in a case and with certain modifications of detail, the other parts being the same in all respects as those already described in Fig. 2. This case is adapted to be used at each station, and contains both the signaling and receiving apparatus.

In order to avoid errors that may arise from a hasty use of the switch-lever B, or such as might arise from a hurried turning and snubbing of the levers D, or a miscount, I have in this instance replaced the lever shown in Figs. 2 and 3 by an indicator-hand, B', which normally just snubs the end of each of the levers D. A glass plate, O, covers the dial C and allows the movements of hand B' to be seen, as well as the apertures *c* in the dial, through which project the ends of levers D.

In order to hold hand B' and cause it to snub permanently any one of the levers D, I place around the periphery of the glass window push-buttons C', corresponding to each lever D in the dial. These push-buttons C' work in slots, and, when depressed, engage with and arrest the movement of the hand B', the push-buttons being so arranged that when driven in they arrest the movement of the hand B' just after it passes off the lever-pin corresponding with said push-button in position on the dial. The push-button stops the arm at such a point as to leave the local circuit closed at the called station a sufficient length of time to actuate the bell-signal.

These buttons are numbered or lettered to correspond to the signal of the station called by each, as shown in Fig. 6. To turn the rotary shaft A, I have devised mechanism, part of which is shown in Fig. 7, and which I will now proceed to describe.

On shaft A, I mount a pinion, P, rigidly attached to the shaft. Into this is geared a second pinion, P', the number of whose teeth may be a multiple of those on pinion P. They are four times as many in this instance. Pins *p' p'*, equidistant from each other, are placed near the circumference and on each side of pinion P'. With these pins *p'* a weighted rod, S, engages in its descent or fall and carries the pinion P' around a fourth of a revolution, where, as in this instance, the pins are four in number, thus causing shaft A, and with it hand B', to complete an entire revolution at each descent or fall of weight Q. A forked button, R, working in the slot *r* in the side of the case, lifts the weighted rod S into engagement with pinion P. The device referred to consists of a rod, S, traveling through slots in the brackets *s s*. At its lower end hangs a cup, Q', weighted with shot, so that the rapidity of its fall may be regulated by varying the weight in the cup.

Firmly attached to rod, S and between the brackets *s s*, is a cross-piece, T, into which are pivoted pawls *t t*. These pawls are of a sufficient length to engage with pins *p'* on each side of pinion P' when the weight Q has been raised or lifted into place by the button R, across the fork of which the cross-rod T rests for this purpose. The pawls *t* have their projecting ends beveled on the upper side, and have under them springs *u*, projecting from the slot in which the pawls are pivoted, which slot is large enough for the pawls to allow them little play, but forms a square shoulder above, holding the pawls out at a right angle to the cross-piece. By these means pawls *t t* yield and pass beyond pins *p'* when the weight is lifted, are thrown out into engagement with the pins by the springs *u* when they have been carried above pinion P', and when button R is released the pawls *t t*, resting against the pins *p' p'*, in their fall carry pinion P' around a greater portion of a revolution. The other instrumentalities being the same, the mode of operation is this: Supposing station 8 to be called, push-button 8 is depressed with one hand and weight Q lifted by button R until the pawls *t t* engage with the pins *p'* of the gear P'. The weight is then released and falls by its own gravity, rotating the gear P', and through it the pinion P, thereby carrying the shaft A around until the hand B', in its revolution snubbing each of levers D in succession, finally abuts against push-button 8, and thus snubs the corresponding lever under it, signaling to the required station by closing station 8's local circuit. The circuits in Fig. 5 run as follows: Main line L enters at binding-screw *v*, passes through spring-arm *g*, contacts *g'* and *h*, coils of electro-magnet M, thence to binding-screw *v'* and out to line. Local circuit passes from battery L B through binding-screw *x*, coils of

electro-magnet N, spring on armature N′, contact-stops *n n′*, projection *i* on disk I, disk I, binding-screw *x′*, back to battery.

The circuit-breaking levers F are supported by the collar E, which slides on the shaft A, as the latter furnishes a convenient support therefor, and because the series of elbow-levers D must be arranged radially from the axis on which the arm B′ turns.

The purpose of mounting the circuit-breaking arms B′ and the disks I upon the same shaft A is as follows: The apparatus being constructed as shown in Figs. 5 and 6, it is extremely desirable to indicate at every station whether the line is in use or not, and is also desirable to show at each station what station is called. The front, O, of the box being made of glass, gives a clear view of the rotation of the arm B′, which, being mounted on the shaft A, revolves with the disk I, and thereby shows at once whether the line is in use and with which station communication is desired. It also permits the operator to see by a glance when the call has ceased by the return of the arm to the zero-point.

It has already been shown that the breaking of the line-circuit retracts the thrust-pawls *k* and the completion thereof actuates them, thereby giving motion to the disks I at each station.

What I claim is—

1. The signaling-instrument, substantially as hereinbefore set forth, consisting in the combination of the shaft, the movable collar, the circuit-breaking lever pivoted thereto, the pivoted levers for actuating the collar when snubbed, and mechanism for snubbing them.

2. The station-signaling apparatus, substantially as hereinbefore described, consisting in the combination of a disk having a contact point or projection for closing the local circuit, a pawl rotating said disk, an electro-magnet operating the pawl, a circuit breaker and closer, a rotating arm by which it is operated, a local circuit, and a series of independent stops arranged within the circle of rotation of said arm, adapted to arrest its movement after the required number of makes and breaks for closing the local circuit.

3. The combination, substantially as herein set forth, of the shaft, the movable collar mounted thereon, the circuit-breaking lever pivoted thereto, the levers actuating the collar, means for snubbing said levers, the ratchet-wheel mounted on the shaft, and an electro-magnet and armature for causing the shaft to revolve.

4. The combination, as hereinbefore set forth, of the main shaft, a device for giving one complete revolution to the same, a circuit-breaker operated thereby to make and break a local circuit, a device for arresting temporarily the revolution of the shaft at any point of its movement, a lever mounted on the shaft and turning with it in sight of the operator, and mechanism operated by said lever to make and break the main line a given number of times at each revolution of the shaft.

5. In a signaling-instrument, the combination, with the operating-gear, of the weighted rod carrying the pawls which engage with said gear.

6. The combination, substantially as hereinbefore set forth, of the shaft, the adjustable weight and mechanism operated thereby to revolve the shaft, the hand carried by the shaft, the circuit-breaking mechanism mounted on the shaft, and the push-button for arresting the hand and thereby leaving the completed local circuit unbroken until the station-call is operated.

7. The combination of the shaft, the weight and mechanism to revolve it, the circuit-breaking mechanism, the hand for operating it, the push-buttons, and the dial.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES EWING.

Witnesses:

JAMES L. NORRIS,

J. A. RUTHERFORD.