(No Model.) 2 Sheets—Sheet 1.

C. G. CURTIS & F. B. CROCKER.

Telephone Call System.

No. 230,530. Patented July 27, 1880.

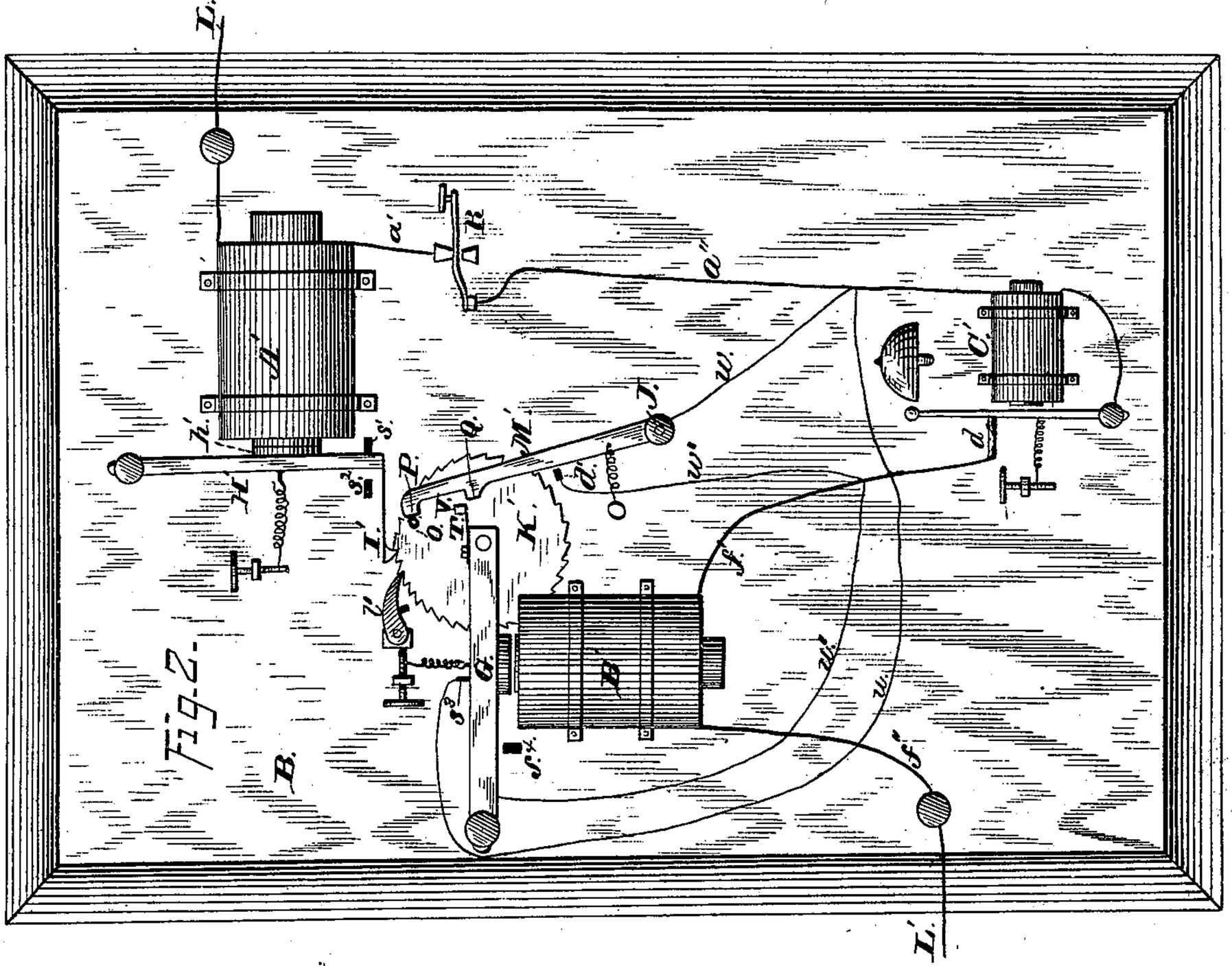

Fig. 2.

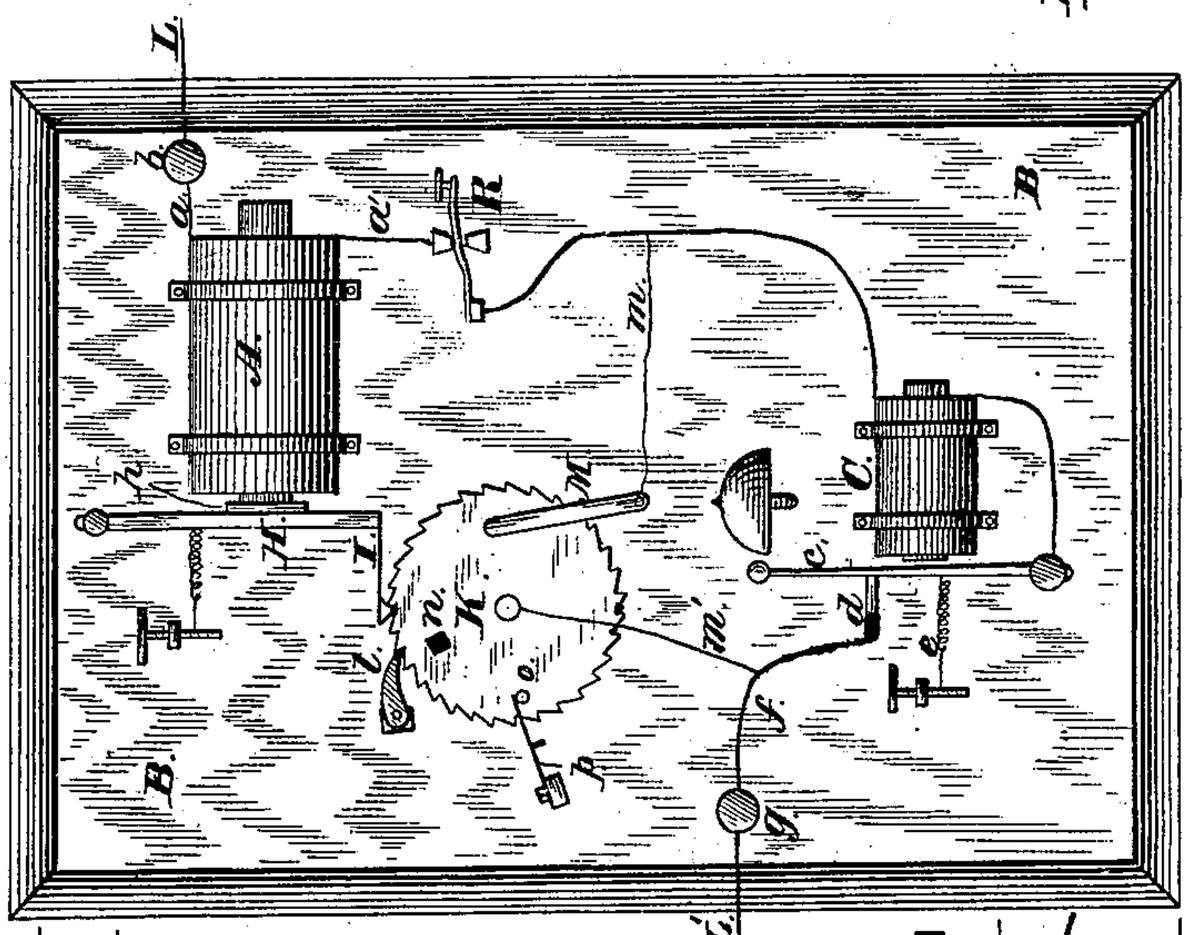

Fig. 1.

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

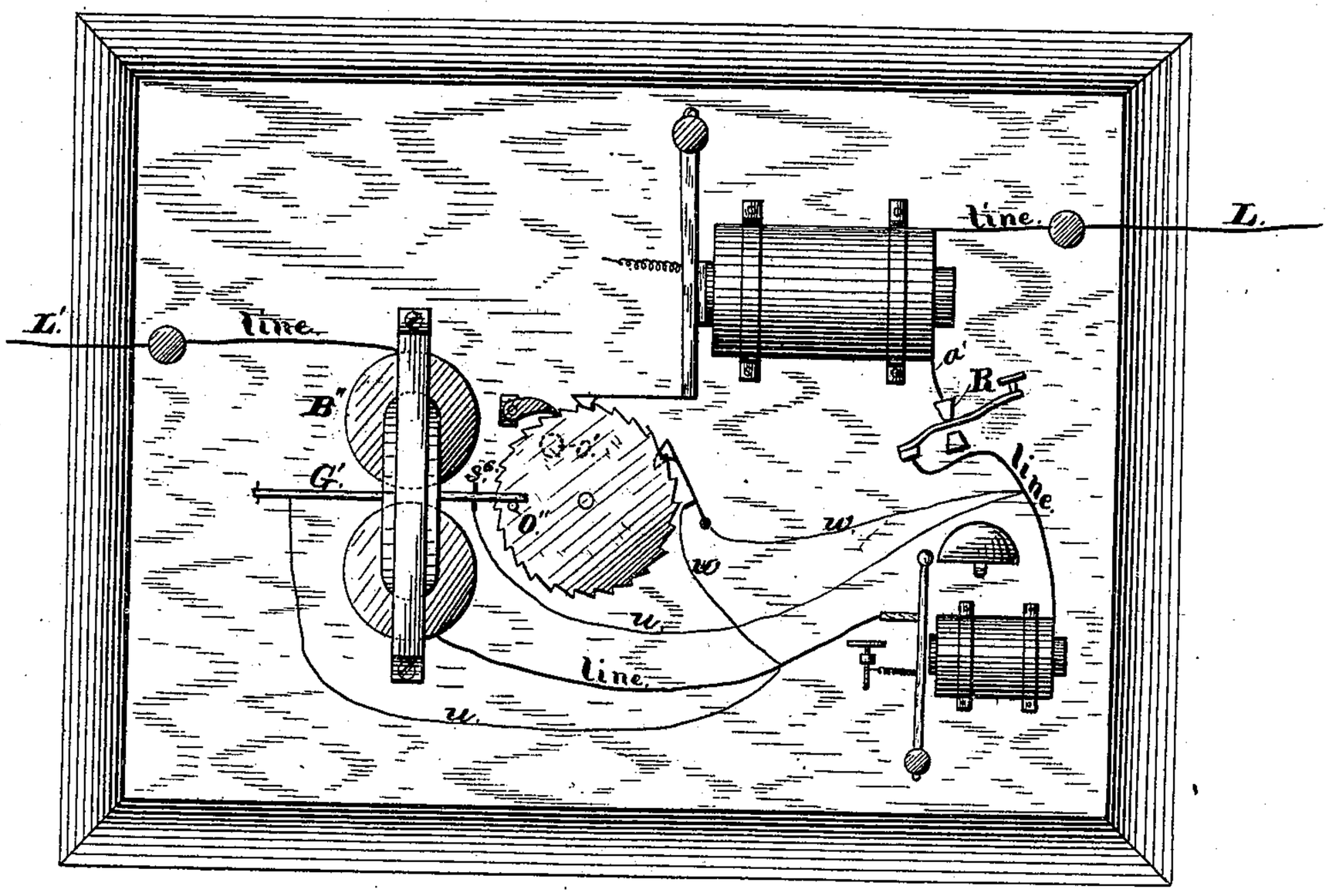
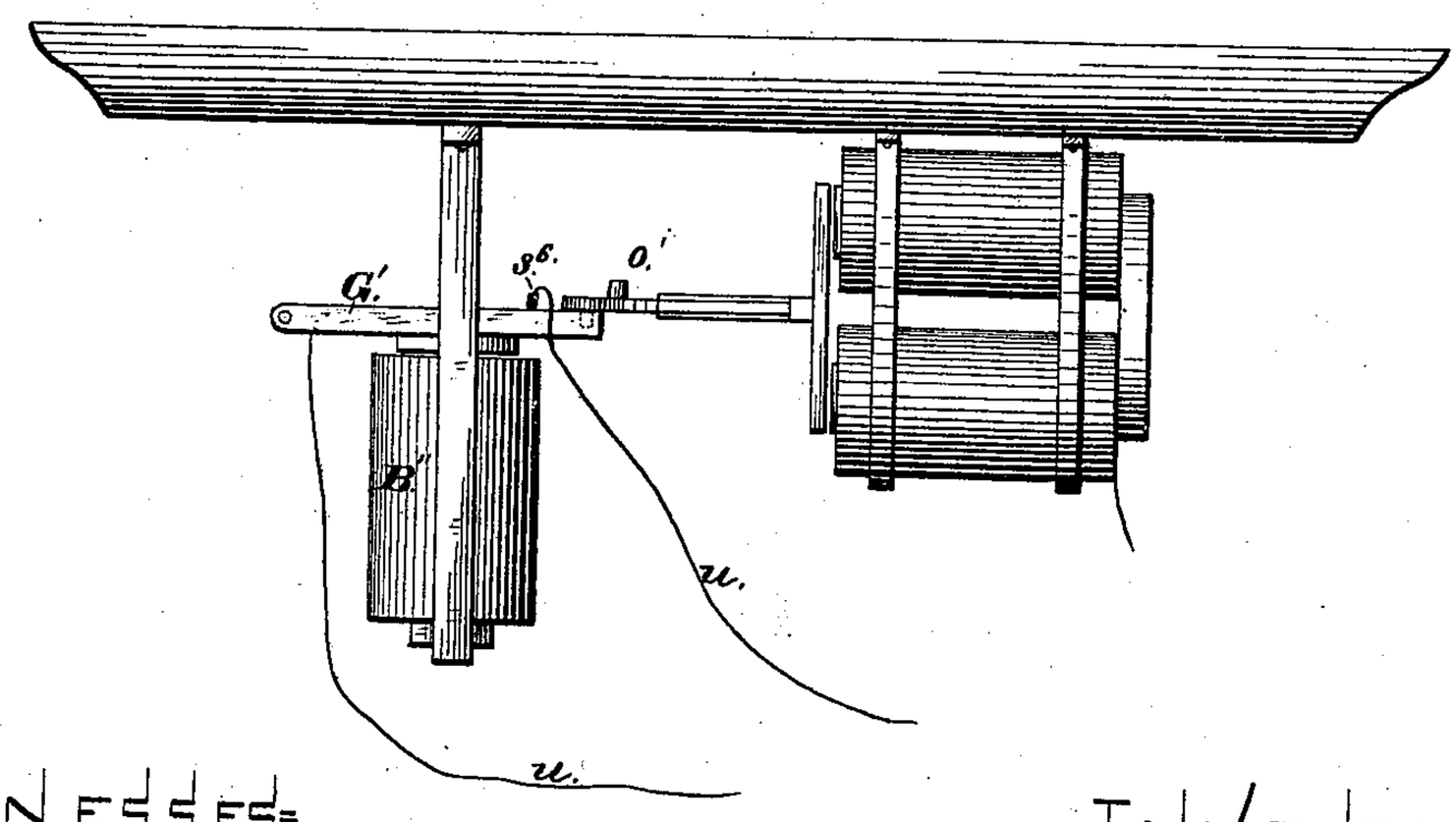


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES G. CURTIS AND FRANK B. CROCKER, OF NEW YORK, N. Y.

TELEPHONE CALL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 230,530, dated July 27, 1880.

Application filed March 9, 1880 (No model.)

To all whom it may concern:

Be it known that we, CHARLES G. CURTIS and FRANK B. CROCKER, citizens of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Telephone Call Systems, of which the following is a specification.

This invention relates to a call or signal system and apparatus for use in telephonic or other circuits in which a series of stations are called from a central station, its object being to provide means for calling from the central station any particular one of the series of stations without signaling or producing any effect at any of the others comprised in the same circuit, and without the aid of local batteries or clock-work requiring to be wound up at the stations.

It consists, mainly, in a series of electrical signals arranged at separate stations on a main line connecting with a central station, in combination with devices at each station for normally short-circuiting each of said signals from the main line, and mechanism at each station for shunting the entire current from the main line through any one of said signals separately, as desired, by means of a predetermined number of electrical impulses sent over the main line from the central station, as more particularly hereinafter described.

In the accompanying drawings, Figure 1 is a view, in elevation, of a call apparatus constructed according to our invention. Fig. 2 illustrates a modification of the same. Fig. 3 illustrates another modification, and Fig. 4 is a plan view of the same.

The letter A, Fig. 1, designates an electro-magnet secured to a suitable base, B, and having one of its coil-terminals, *a*, connected with a binding-post, *b*, from which leads the main-line wire L, while its other coil-terminal is connected, by a wire, *a'*, with the coils of a bell-magnet, C, said bell-magnet being also connected with the metallic bell-hammer arm *c*, which is normally drawn against a contact-plate, *d*, by means of an adjustable spring, *e*. The contact-plate *d* is connected by a wire, *f*, with a binding-post, *g*, from which leads main-line wire L'.

The letter H indicates a lever mounted upon base B and carrying an armature, *h*, in front of the poles of magnet A. From the lower end of the lever H projects a hooked spring-pawl, I, which engages with ratchet-teeth formed on the periphery of rotary metallic disk K, mounted upon a stud projecting from base B, and *l* is a retaining-pawl pivoted to the base and also engaging with the teeth of said disk.

The letter M indicates a contact-spring which bears against the flat face of disk K, and is connected, by a wire, *m*, with the wire *a'* at a point between the two magnets A and C, and a wire, *m'*, connects the metallic stud upon which disk K is mounted with wire *f* at a point between contact-plate *d* and binding-post *g*. The wire *m*, spring M, disk K, its supporting-stud, and wire *m'* form a short circuit, over which the electric current flowing from the main line is normally diverted from the bell-magnet C.

In the face of the metallic disk K is sunk flush a plate, *n*, of hard rubber or other suitable insulating material, in position to come under the entire contact-surface of spring M once in every revolution of the disk, thus breaking the short circuit before referred to.

The letter *o* indicates a pin or stud projecting from the face of disk K, and *p* is a leaf-spring secured to a stud, *q*, and projecting above and in the path of pin *o*.

Each station in the circuit is provided with a signal or call apparatus, as now described, and which may be arranged in proper relation with the telephone apparatus and main line by means of any well-known or suitable connections and switches.

The disks K at all the stations are normally in position to short-circuit the call-bell, and the insulating-plates *n* are at different distances from the springs M in all said stations, so that the pawl I, taking one tooth at a time, will require to make a different number of movements to carry plate *n* under spring M at each station, such movements being produced by electrical impulses over the main line and magnets A, operating-armature *h*, and lever H.

When, now, it is desired to call a certain station from the central station, the proper number of impulses are sent over the line to bring the insulating-plate *n* of the station to be called under its contact-spring M. The short circuit

through the disk is then broken, the current flows through magnet C, and the bell will ring. At no other station is the short circuit through the disk broken, because each station requires a different number of impulses to produce such effect, and therefore at only the station called will the bell be rung, the others being unannoyed by calls not intended for them.

It is true that when the disks K are being moved step by step in order to place in condition to be called a station requiring a larger number of impulses the bell will ring as the plate *n* passes the spring M at the stations requiring smaller numbers; but only one or two taps will be sounded, and even this may be prevented by so adjusting the tension of the retractile spring *e* of the bell-hammer that an extra or stronger battery-current than is used to move the disk K must be sent over the main line in order to ring the bell after the disk has been so turned as to break the short circuit and place the bell in circuit with the main line.

The pin *o* and spring *p* constitute a unison-stop, by means of which the disks at all the stations may be set to a proper starting-point when from any cause they have become disarranged or confused in such manner that the operator at the central station finds that by the prearranged number of impulses for a particular station he cannot call said station.

The spring *p* is of such stiffness that it cannot be forced aside by the pin *o* when the disk K is driven by the ordinary current which is used to drive said disk, and therefore if, when the stations are found to be out of unison, a number of ordinary impulses corresponding to the number of teeth in each disk are sent over the main line and magnet A, the pins *o* of all the disks will be caught by the springs *p*, and the disks retained in a position from which it is known just how many impulses are required to move each sufficiently to break the short circuit which cuts out the bell. In order, however, to move the disk so that pin *o* will pass springs *p*, an extra or stronger than ordinary battery-current must be sent over the main line. The increased strength of battery required is readily secured by adding more cells to the ordinary main battery in any well-known or suitable manner.

In each case, after the line has been used, the instruments must be all restored to the initial unison-point—that is, with the studs in contact with the springs and the first impulse over the line must be sent from the normal and extra battery combined in order to carry the studs past the springs.

In the modification shown in Fig. 2, the letters A′ and B′ designate electro-magnets on the main circuit, as is also the bell-magnet C′, which operates a continuously-ringing electric bell. This bell is short-circuited from the main-line connections *a″* and *f′* by means of wires *w w′* and *u u′*, and so prevented from ringing under ordinary circumstances.

H′ is a lever, to which is attached the armature *h′* of the electro-magnet A′, and I′ is a hooked spring-pawl fixed to the lower end of lever H′, the movement of which is limited by stops S′ S². The stop S² limits the movement of pawl I toward ratchet-wheel K′. There is a spring (not indicated in the figure) which tends to revolve the wheel K′ in the opposite direction to that in which it is moved by the pawl. The wheel K′ is mounted on the end of a lever, G, the other end of which is pivoted to the base, and to the lever is attached the armature of the electro-magnet B′. The motion of lever G is limited on back stroke by electric contact-point S³ and on forward stroke by stop S⁴.

M′ indicates a third lever, pivoted at J, and on which are projections P and Q. The movement of this lever is limited in the direction to the left by electric contact-plate *d′*, which is connected with one of the short-circuit wires *w′*, the other of which connects with the pivoted end of lever M′.

O is a stud projecting from the face of wheel K′.

T is a spring fixed to lever G, terminating in the little block *v*. The three levers are acted upon by adjustable retractile springs in the usual manner. The ratchet-wheel K′ is moved forward one tooth by the pawl I′ every time the circuit is closed, backward motion being prevented by pawl *l′*, limited in its forward motion by a suitable stop.

The apparatus is represented as having just received a sufficient number of electrical impulses (the number corresponding to the station) to bring the stud O against the projection P, thereby displacing the lever M′ and breaking electrical contact at *d′*. The electric bell-magnet C′ is now only short-circuited through S³ and wires *u w′*. The electrical contact at S³ may now be broken by sending through the electro-magnet B′ (whose armature will not respond to the ordinary current on account of extra tension on its spring) a current of extraordinary strength. The bell then rings. When lever G is thus drawn down the wheel K′ is released from the pawls and returned to its original position. Before, however, the wheel K′ is released from the pawls the little block *v* comes in front of the projection Q, and so prevents the lever M′ from short-circuiting the bell through *d′* when the stud O recedes from projection P. In this condition the bell continues to ring until the extra current is removed, when the lever G returns to back-stop S³, thus again short-circuiting the bell, and also removing the block *v* from in front of the projection Q, and so allowing the lever M′ to return to contact-point *d′*. When this is not the station called—that is to say, when too few or too many impulses have been sent to bring the stud O at rest against and not beyond the projection P, and the extra current acts upon the lever G—the bell still remains cut out through *d′*, which is not broken, as the stud O is not against projection P, and the bell will not therefore ring. In this case the block *v* strikes upon the up-

per surface of Q, and the flat spring T bends sufficiently to allow lever G to reach the forward stop, S^4. It is evident that in this case, as in the case where it is intended to call up this station, this ratchet-wheel F will return to its original position and the stud O will pass below the projection P.

The same effect may be produced by omitting the spring T and block *v*, and also the circuit through S^3. In this case the bell C′ is rung by the ordinary current when the stud O is pressing against P. This, though simpler, is not so safe, because the bells at all the offices may ring while stud O is passing the projection P, unless a slow-ringing bell and rapid impulses are employed. To obviate this objection any simple mechanical contrivance may be introduced to prevent the bell from ringing the instant the stud O strikes the projection P.

Another method, as illustrated in Figs. 3 and 4, is to have the revolution of the ratchet-wheel completed in the same direction by a sufficient number of further electrical impulses. These figures will be readily understood from the foregoing explanations without a detailed description. In this case it will not be necessary to release the wheel from the pawls, and the lever G′ of the electro-magnet B″ need only be employed to break the circuit through S^6 by its forward motion. The only objection to this method is the inability of the central office to bring all the wheels into unison when from any cause they have got out of unison. This difficulty may be surmounted by having a second stud, O″, on the ratchet-disk K″, which shall strike against the armature-lever of the electro-magnet B″, as shown in Fig. 3, when the armature is against the back stop S^6, which prevents further revolution of the wheel. This method is shown in plan in Fig. 4.

When the extra current is sent through the electro-magnet B″ the armature G is withdrawn from in front of the stop O″ and the impelling-pawl is allowed to act as before.

It is manifest that in this manner all the ratchet-wheels may be brought into unison from the central office.

By an extension of the principles heretofore described and explained each station in a single circuit may also be supplied with an apparatus for calling all of the other stations, respectively, similar to that furnished to the central station in the above-mentioned systems, thereby dispensing with the necessity of having a central office in a single circuit, and putting each station in direct communication with every other, as, for example, in a private telephone-line. A very convenient way of accomplishing this would be to have an index-hand fixed on the end of the axle of the ratchet-wheel in the receiving apparatus, pointing to figures corresponding to the stations on a dial-plate.

The impulses may be sent over the wire by a spring-key closing on the back contact, as shown at R, or any suitable circuit-breaker.

It will be understood that each station may also be provided with a battery, which may, by any suitable means, be connected with the line-wire, to add strength to the current for overcoming the unison stop spring heretofore described. When the central station is dispensed with the normal-line battery must be located at one of the line-stations.

Now suppose station No. 2 desires to communicate with station 8, for example. Then station 2 presses the key eight times, which brings all the index-hands to 8 on the dial-plate, and also rings the bell of office 8. Office 8 then answers by pressing its key a sufficient number of times to bring each index back to its normal position. If the ratchet-wheels get out of unison, as shown by the indices, they may be all returned to their normal positions by turning the index-hands.

Having now described our invention and explained the operation thereof, we claim—

1. A series of electrical signals arranged at separate stations on a main line connecting with a central station, in combination with devices at each station for normally short-circuiting each of said signals from the main line, and mechanism at each station for shunting the entire current from the main line through any one of said signals, respectively, as desired, by means of a predetermined number of electrical impulses sent over the main line from the central station, substantially as described.

2. The combination, in a combined electrical signal and shunting apparatus, of a main-line wire, an electro-magnetic bell, the magnet of which is connected with said main-line wire, a short circuit arranged to normally cut the bell-magnet out of the main circuit, a shunting mechanism operated by an electro-magnet in the main line and arranged to break said short circuit when actuated by a predetermined number of impulses sent over said main line, substantially as described.

3. The combination, in a system of electro-magnetic signal devices arranged at separate stations, of a common main-line wire connecting all the stations with a central station, a shunting mechanism at each station, consisting of a metallic ratchet-disk in electrical connection with the main line on one side of the signal-magnet by means of a short-circuit wire, a contact lever or spring normally in electrical contact with said wheel and in electrical connection with the main line on the opposite side of the signal-magnet by a similar short-circuit wire, an electro-magnet in the main line arranged to move the ratchet-disk step by step, or the space of one tooth at a time, and mechanism for automatically breaking electrical connection between the ratchet-disk and one of the short-circuit wires when a predetermined number of electrical impulses have been sent over the main line and the disk has moved a corresponding distance, whereby the short circuit is broken and the signal shunted into the main circuit, substantially as described.

4. The combination of the magnet A, arranged in the main line, the metallic disk K, having the insulating-plate *n* in its face, and arranged to be moved step by step by a pawl operated by magnet A, the signal-magnet C, connected with the main line, the short-circuit wire *m'*, connecting the disk with the main line on one side of the signal-magnet, and the spring M and short-circuit wire connected with the main line on the other side of said signal-magnet, the said spring pressing upon the disk in the path of the insulating-plate *n*, substantially as and for the purpose set forth.

5. The combination, with the metal ratchet-disk K, having the insulating-plate *n* and stud *o*, the main line including the bell, the short circuit including said ratchet-disk, and having one terminal formed by the spring M pressing upon the disk, of a suitable propelling-magnet and pawl acting on the disk, a retaining-pawl, and the unison-spring *p*, extending in the path of the stud *o*, substantially as described, and for the purpose set forth.

6. A series of electrical signals arranged at separate stations on a main line, in combination with devices at each station for normally short-circuiting each of said signals from main line, and mechanism at each station for shunting the entire current from the main line through any one of said signals, respectively, as desired, by means of a predetermined number of electrical impulses, and also a device at each of said stations for sending over the line any desired number of said electrical impulses, thereby enabling said stations each to call any station on the same circuit without calling the others, substantially as and for the purposes described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

CHARLES G. CURTIS.
FRANK B. CROCKER.

Witnesses:
SCHUYLER S. WHEELER,
E. D. GRANT.