(Model.) 5 Sheets—Sheet 1.

W. W. LE GRANDE.

TELEGRAPH AND TELEPHONE SIGNAL.

No. 262,063. Patented Aug. 1, 1882.

Fig. 1.

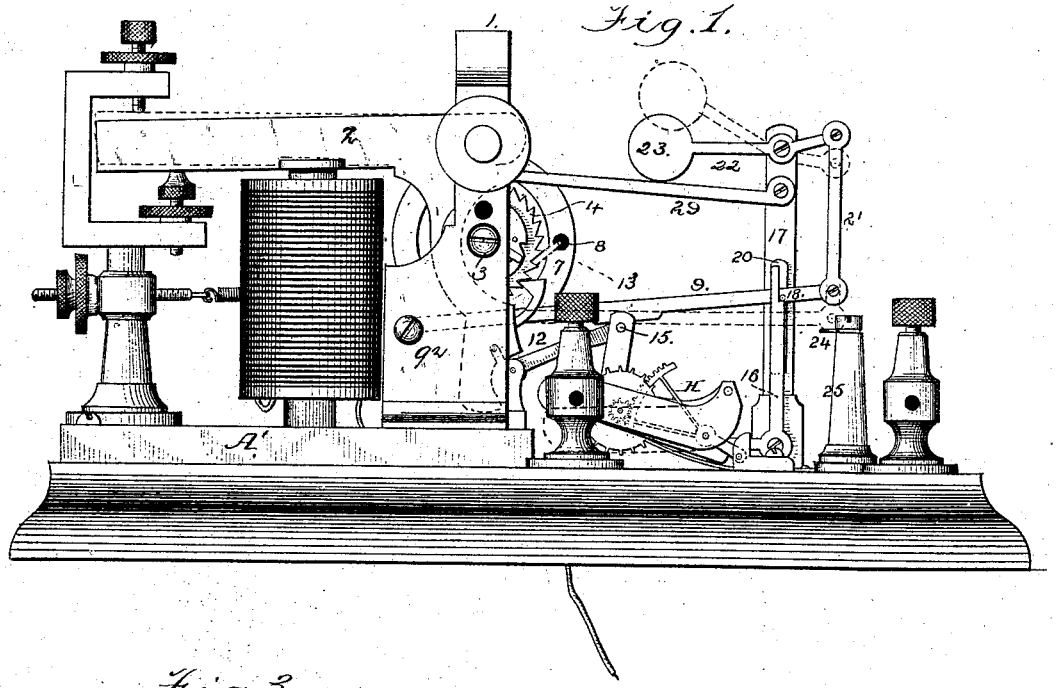


Fig. 3.

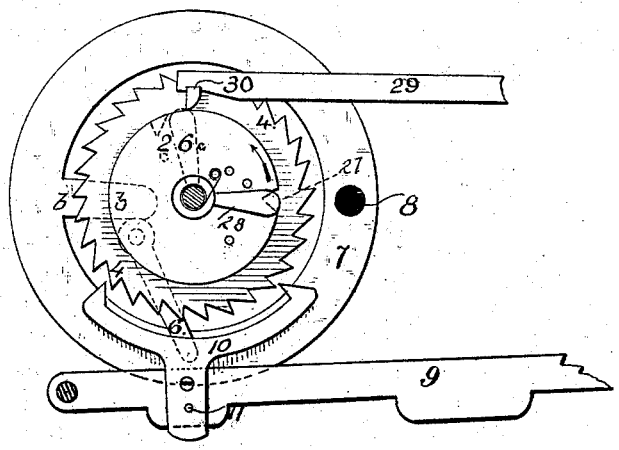
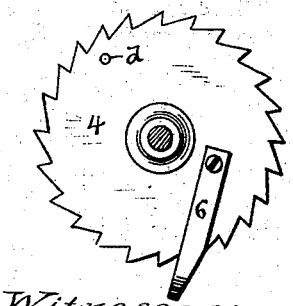


Fig. 3½.



Witnesses;

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(Model.) 5 Sheets—Sheet 2.

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TELEGRAPH AND TELEPHONE SIGNAL.

No. 262,063. Patented Aug. 1, 1882.

Fig. 2.

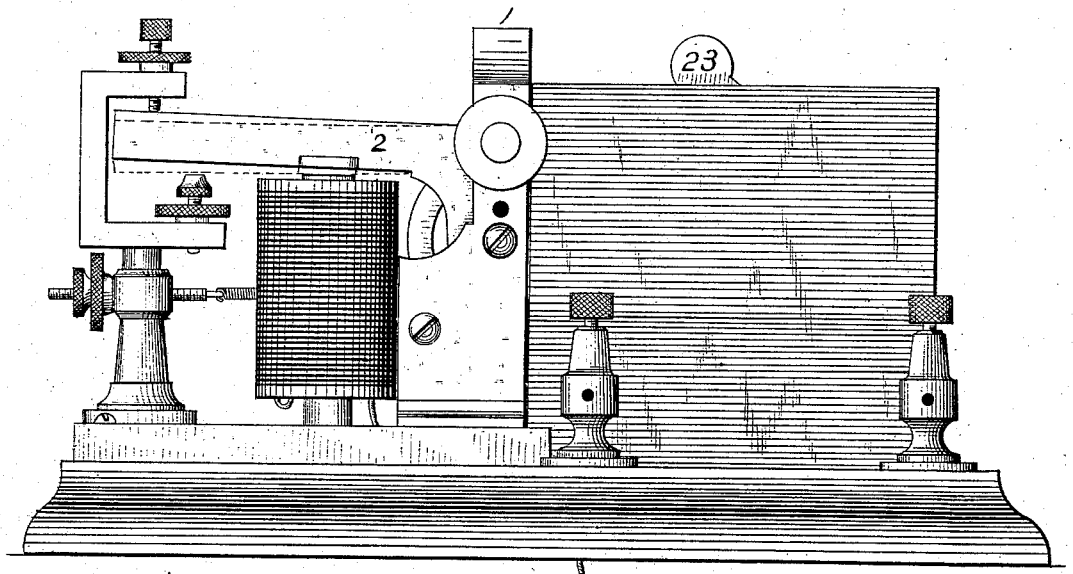


Fig. 4.

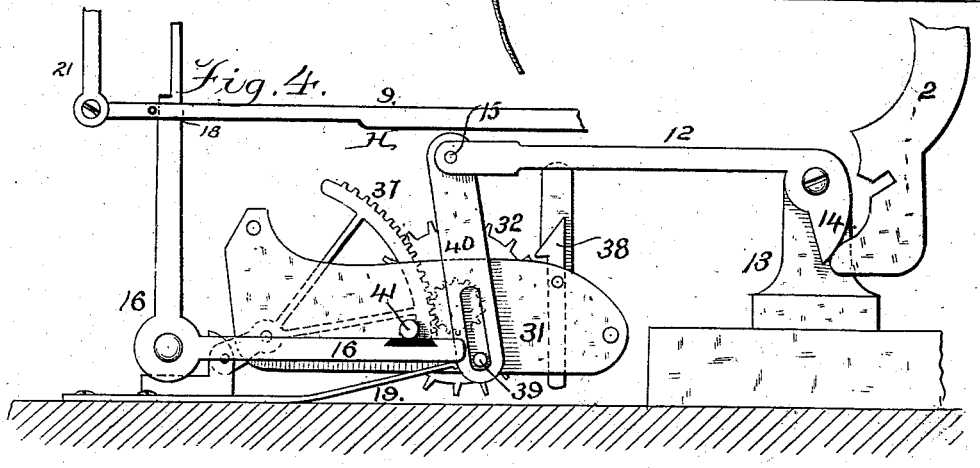
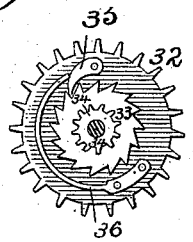


Fig. 5.



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TELEGRAPH AND TELEPHONE SIGNAL.

No. 262,063. Patented Aug. 1, 1882.

Fig. 6.

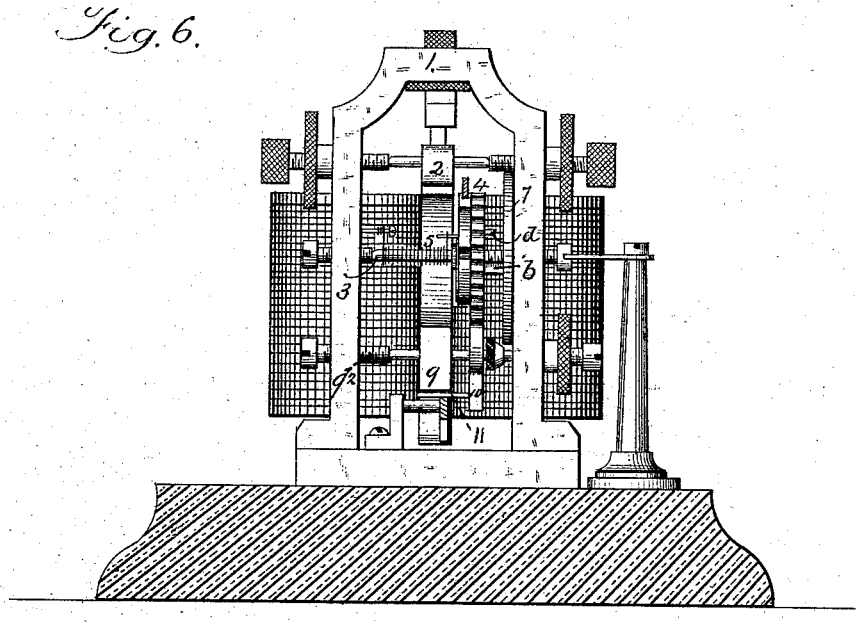
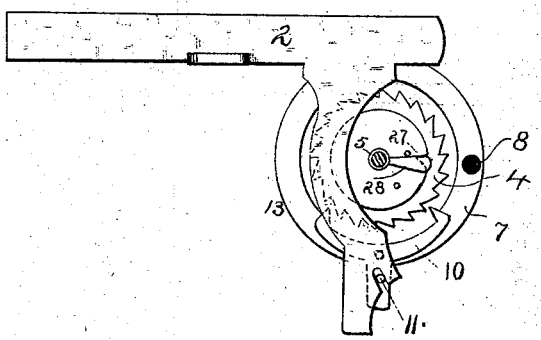


Fig. 7



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(Model.) 5 Sheets—Sheet 4.

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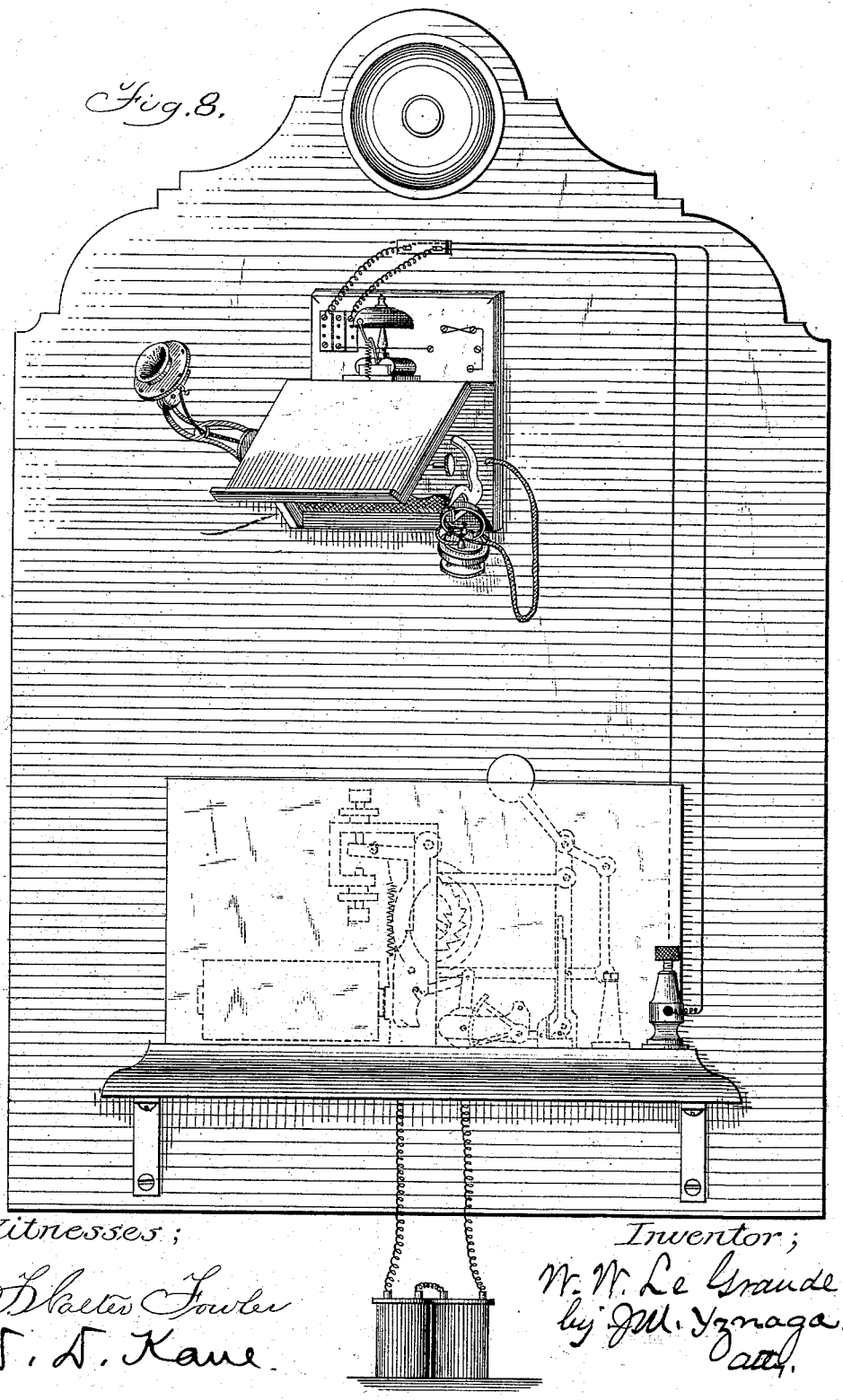
TELEGRAPH AND TELEPHONE SIGNAL.

No. 262,063. Patented Aug. 1, 1882.

Fig. 8.



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TELEGRAPH AND TELEPHONE SIGNAL.

No. 262,063. Patented Aug. 1, 1882.

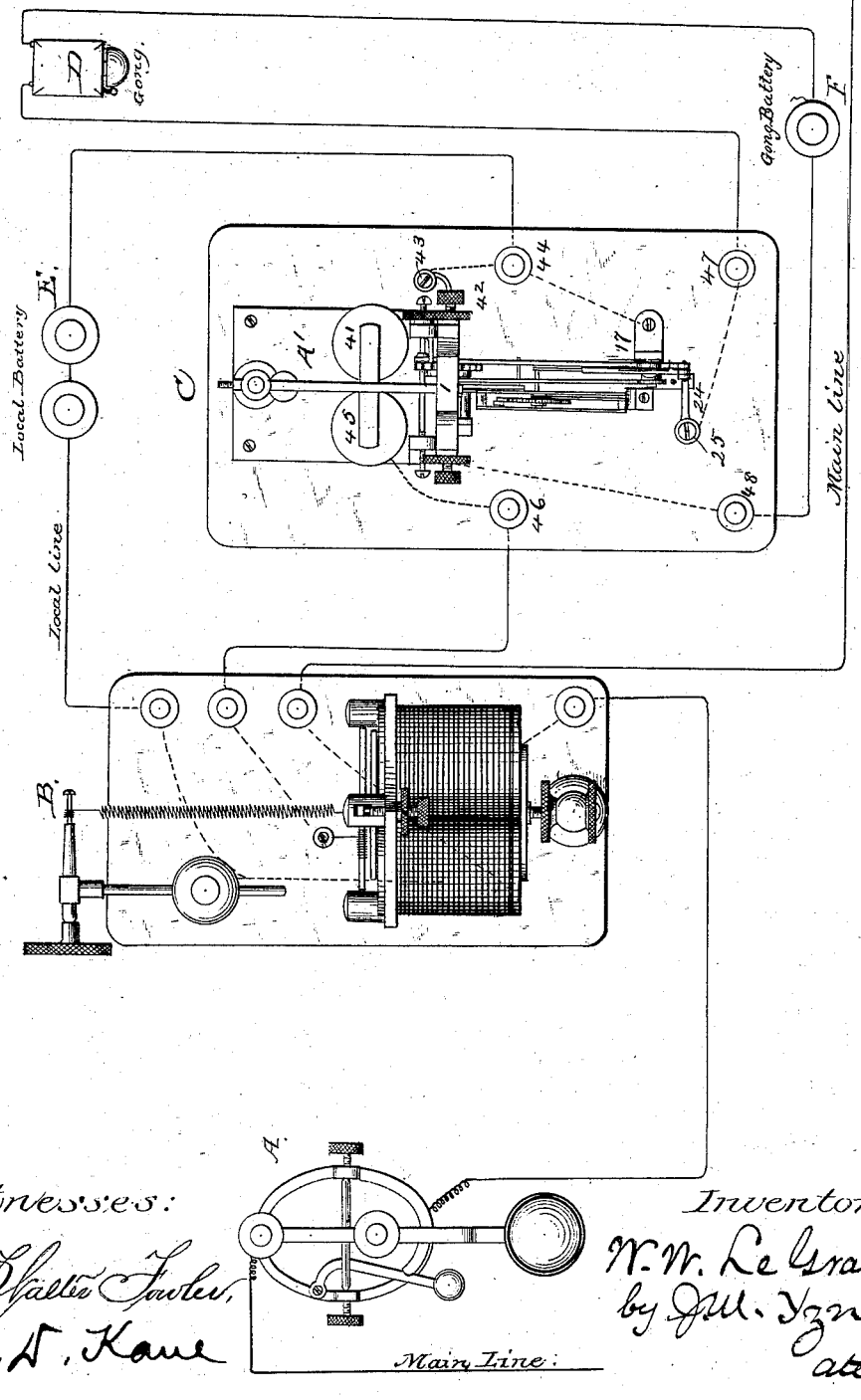

Fig. 9.

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W. W. Le Grande
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atty.

UNITED STATES PATENT OFFICE.

WILLIAM W. LE GRANDE, OF LOUISVILLE, KENTUCKY.

TELEGRAPH AND TELEPHONE SIGNAL.

SPECIFICATION forming part of Letters Patent No. 262,063, dated August 1, 1882.

Application filed November 14, 1881. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM W. LE GRANDE, a citizen of the United States of America, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Telegraph and Telephone Signals, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a side elevation of the instrument employed in my system. Fig. 2 is a similar view, showing a portion of the mechanism boxed or cased, with the signal device displayed. Fig. 3 is a side elevation of the rim with the insulated plug, the ratchet-wheel with its attachments, the dog and lever, and pallet. Fig. 3½ is a view of the opposite side of the ratchet-wheel 4, so as to more fully show the attachment of the finger 6. Fig. 4 is a side elevation of the retarding device, consisting of the gravity-escapement and the connecting devices of the signal, and also the lower portion of the armature. Fig. 5 is a detail view of a portion of the gravity-escapement. Fig. 6 is a transverse sectional view, looking in front of the arch 1. Fig. 7 is a side view of the rim with the insulated plug, ratchet-wheel with its operating-pallet, and armature. Fig. 8 is a view showing my improvements applied to the telephone system; and Fig. 9 is a plan view of the instrument and its connections in the telegraph system.

This invention relates to the novel art or method of and means for signaling or sounding an alarm, or both at the same time, in telegraphing and telephoning, when any office, station, or subscriber is wanted, without calling any other station on the line, and which automatically disconnects itself from the circuit of the local battery.

Operators are at times necessarily absent from their offices, especially railroad-station officers, when called from other stations, and under the present system of telegraphy there is no way for them to know on their return whether they have been called. Hence it often happens that a train-dispatcher or an operator at any point on the line has to frequently call for some time to get an answer, and often fails.

In telephoning the continuous ringing of the call-bell is a source of great annoyance to subscribers when several are on the same line, as their call has to be determined by the number of strokes on their bell. Yet when a call is made it is sounded on each subscriber's bell, irrespective of the party called, so that each subscriber on the line must divert his attention from his books or business to count the different strokes on the bell in order to ascertain whether his number is struck.

The principal object of my invention is to overcome these and other objections to the present system both in telegraphing and telephoning.

My invention possesses the following distinctive characteristics:

First. To display a visible call-signal in any office called, which signal will remain visibly displayed until the operator returns to his post and releases the signal.

Second. To ring a gong or vibrating bell in the office called until the operator returns. This bell or gong may be placed elsewhere at any desired distance from the office.

Third. For automatically cutting out of circuit the called office with the local battery, so that no subsequent message or call will interfere with it in any way, thus saving wear and tear of the instrument during the operator's absence.

To enable those skilled in the art to make and use my invention, I have prepared the following clear and exact description thereof, reference being had to the accompanying drawings, showing a practical way of carrying out the invention, and in which Fig. 9 represents a telegraph-key, a relay, a sounder with signal attachment, alarm, and batteries in circuit.

In the accompanying drawings, (see Fig. 9,) the letter A represents an ordinary telegraph-key; B, an ordinary relay; C, a sounder with my signal and alarm attachments; D, a vibrating bell or gong; E, a local battery, and F the battery for the vibrating bell or gong.

By reference to Figs. 1 and 2 it will be seen that I construct an instrument similar to the receiving-instrument or sounder now used in telegraphy so far as it relates to working as such.

To the upright standard or arch 1, which supports the armature-lever 2, is journaled a shaft, 3, carrying the ratchet or scape wheel 4 and spiral spring 5. This shaft is insulated by suitable material from the standard or arch 1.

The scape-wheel 4 (see Fig. 3) has attached to one side a spring or spring-finger, 6, which forms a metallic connection with annulus or rim 7, which is secured to one of the standards of the arch 1. This metallic rim is provided with a rubber or other non-conducting plug at 8, as seen in Figs. 1 and 3 of the drawings. The pin or screw that fastens the spring-finger 6 to the scape-wheel 4 acts as a stop-pin in connection with an inward projection, *b*, forward on the rim 7. This scape-wheel is also provided with a stop-pin, *d*, which prevents the scape-wheel making an entire revolution by coming in contact with the upper surface of the projection *b*.

The lever 9 is adjusted on the arbor 9^2 of the standard or arch 1, and its front end supported on the shoulder of the vibrating lever 16 by means of a transverse pin, 18, as seen in Fig. 1. Near the rear end of this lever 9 (see Fig. 3) is pivotally attached, so as to vibrate, the pallet 10, provided with a transverse pin, 11, which latter works in the diagonal slot in the lower end of the armature-lever, as seen in Fig. 7 of the drawings. To the outer end of lever 9 (see Fig. 1) is pivoted a vertical connecting-arm, 21, and to the upper end of this arm is pivoted a horizontal, or nearly so, arm, 22, having an insulated fulcrum in the upper end of the standard 17. The free end of this arm 22 is formed or provided with a signal device, 23, which may be of any desired shape or color suitable for the purpose.

The cardinal 12 (see Fig. 4) represents a lever working on a journal-bearing located at the upper end of the bracket 13, the rear end of said lever being formed with a downward-extending eccentric lift, 14, which engages with the lower end of the armature-lever 2, and the forward end of this lever, which is pivotally connected to the slotted vertical arm 40 of the gravity-escapement, is provided with a transverse pin, 15, which pin, when the lever 12 is actuated by the lower portion of the armature-lever 2 coming in contact with the lift 14, strikes the under side of the lever 9 when said lever is down, as shown by the dotted lines in Fig. 1, and lifts the forward end of this lever 9 to its shoulder support or rest on the L-shaped lever 16. This armature-lever also, during its movement, brings the pallet 10 through the connecting slot and pin 11 within the "field" of the ratchet-wheel 4 for actuating the same, as indicated in Figs. 1 and 7 of the drawings. When the armature is attracted the lower end of lever 2, being thrown forward, strikes the lift 14 and raises the forward end of lever 12, which, through the link 40, holds the gravity-escapement up, and this escapement will be held in this position so long as the armature is attracted. Now, when the armature vibrates, the lever 2 is not at any time in its rearward position for as long a time as the gravity-escapement requires to fall, so that before it at any time descends to its lowest position the end of lever 2 will again strike the lift 14 after being removed therefrom and raise the escapement again to its highest position.

The L-shaped lever 16 is pivoted at or near the base of the standard 17, and has formed at or near its upper end a notch or shoulder to receive a pin, 18, fixed in the lever 9, as shown in Fig. 1. The office of this notch in the L-shaped lever is to serve as a pawl to hold up the lever 9 while the armature is vibrating. The horizontal arm of the L-shaped lever rests on a spring or cushion, 19, as seen in Fig. 4, which aids to throw the notched shoulder under the pin 18 when the lever is raised. Whenever the lever 9 is down, as indicated by the dotted lines in Fig. 1, it is supported upon a spring-arm, 24, attached to the upper end of the connecting-post 25.

There is also attached to the standard 17 a flat spring, 20, for the purpose of making a rubbing metallic connection.

To one side of the scape-wheel 4 is suitably secured a disk, 26, formed with a notch, 27, so arranged as to correspond with the number of the station in which the instrument is placed, this notch having a different position in each instrument. This disk is also provided with a finger, 28, which moves between two fixed pins arranged on opposite sides of the notch 27, as seen in Fig. 3 of the drawings. The cardinal 29 represents a drop-lever pivoted to the standard 17 and insulated at the point of attachment, and provided at its forward end with a dog, 30.

The office of the notched disk, in connection with the dogging-lever 29, is that when a call is made on an instrument whose operator is absent or away from his post, and the proper number of pulsations or breaks made by the calling operator are responded to or reproduced on the called instrument on account of the instrument being in circuit, it will cause the fall of the dog 30 of the dogging-lever 29 into the notch of the disk 26, which disk has been carried forward by its ratchet-wheel 4, actuated by the pallet 10 and the connecting means for the operating-pallet, and display and maintain the signal in position for the observance of the absent operator on his return to his office, thus giving notice that his instrument has been called and he is wanted.

It will readily be seen by those skilled in the art that the ratchet or scape wheel moves one tooth at each break of the electric circuit, and that it will be thrown back by the recoil-spring 5 when the instrument is not in circuit.

The letter H (see Figs. 1, 4, and 5) represents a gravity-escapement composed of the pivoted frame 31, pallet-wheel 32, ratchet-wheel 33, pinion 34, dog 35, dog-spring 36,

toothed sector 37, and pallet 38. To one side of the pivoted frame 31 is fixed a pin, 39, engaging in a slot in the vertical arm or link 40, which is pivotally connected to the forward arm of the lever 12, as seen in Fig. 4 of the drawings. The pivoted frame 31 is also formed with a side pin, 41, which engages with the insulated portion of the L-shaped lever 16.

As hereinbefore stated, the metallic rim 7 of the standard or arch 1 has a rubber or other non-conducting plug at a point, 8—say eight teeth from where the wheel rests when outside of the field of the pallet or the normal starting-point of the ratchet-wheel. The position of this plug on each instrument determines the number of the instrument, as 1, 2, 3, 4, and upward.

The outer terminal of the spool 41 of the magnet is in metallic connection with the arch 1, and the metallic bearing 42 of the shaft 3 is electrically connected to the post 43, which in turn is electrically connected to the binding-post 44, and this binding-post is connected with the metallic bracket 17, upon which is pivoted the L-shaped lever 16.

It will now be observed that from binding-post 44 the current may take two routes to spool 41, one of these routes being as follows: from binding-post 44 over the intermediate connection to post 43, thence to the bearing-screw 42, thence through shaft 3 and ratchet-wheel 4, and thence over spring 6 to the metal rim 7, which is metallically connected to the arch 1, and through said arch to the connected terminal of the spool 41. The other route is as follows: from the binding-post 44 to the metallic bracket 17, over the intermediate connection from bracket 17 to the L-shaped lever 16, through the metallic pivot which supports said lever, and from the lever 16 over lever 9 to shaft 9^2, and thence over the arch 1 to the connected terminal of the magnet, one pole of the local battery being connected to the post 44. It will be obvious that when both of these routes are completed the local-battery current will divide at said post, a portion of the current following each route, and if one of said routes be broken, then the whole of the current will travel the other route. The object of establishing these two routes is to provide against the cutting out of circuit of instruments having a lower number when an instrument having a higher number is called. For instance, if an instrument numbered 10 should be called, the spring 6 will traverse the metallic rim 7 of the instrument until it reaches the insulating-plug 8, and at the same time the similar springs of all other instruments in circuit will also traverse the metallic rims of their instruments. The spring of instrument numbered 8, for instance, would reach its insulating-plug before the instrument called would be placed in condition to be cut out of circuit, and therefore the instrument numbered 8 would be cut out of circuit when it was not intended to be called, and such would be the case of all the other instruments having a designated number less than 10. But as the instrument is constructed, although the springs of the instruments of lower number may rest on their insulating-plugs, and one route from binding-post 44 to the spool 41 be thus broken, still the other route will be preserved as long as the L-shaped lever 16 is in contact with the pin 18 projecting from the lever 9, and the instrument will remain in an operative connection with the local battery.

It will be remembered that lever 16 cannot be disengaged from the pin 18 of lever 9 until the operation of the called instrument is stopped, as only then can the gravity-escapement descend far enough to disengage said lever, and this can only occur when the called instrument is stopped in the proper position, as heretofore explained. As soon as the spring 6 of the called instrument rests upon its insulating-plug and the instrument is stopped with the circuit open the gravity-escapement descends, disengaging the lever 16 from the pin 18, and thus both routes from the post 44 to the spool 41 are broken and the instrument is cut out of operative connection with the local battery. As the lever 9 descends, after being released, it rests upon the spring 24, carried by post 25, which is in connection with another post, 47, from which a wire leads through the gong D, and thence to one pole of the gong-battery F, the other pole of which is in electrical connection with the metallic base A′, so that a battery-circuit is completed through the gong as follows: from one pole of the battery through the gong to post 47, and thence to post 25, over spring 24, lever 9, shaft 9^2, arch 1, and base A′, and connection-wire to post 48, which is connected to the other pole of the battery F, the arch 1 and base A′ short-circuiting the gong-battery from the spool 41. As long as the instrument remains in this position the gong will continue to ring.

As each instrument on the line has a different number, the finger 28 on the disk 26 of each instrument below the called number will serve to prevent permanent engagement of the dog 30 of the lever 29 into the notch 27. The finger 28 is pivoted at its inner end and plays between the pins indicated. When the disk turns in the direction of the arrow the dog 30 first falls into the notch 27, and then rides up the inclined side of said notch and throws the finger 28 against the right-hand pin, at the same time riding over the end of said finger. When, now, the operation of the sending or calling key is stopped and the circuit left open for an instant, the ratchet-wheels of all the instruments not called fly back, the tips of the dogs strike the ends of the fingers 28 and move said fingers to the opposite pins and in coincidence with the notches, so that the end edges of said fingers bridge said notches and prevent the dogs from falling therein. The L-shaped lever 16 is moved from under the lever 9 (see Fig. 1) by means of the gravity-escape-

ment H, which is fully illustrated in enlarged detail drawings, Figs. 4 and 5, in the manner hereinafter stated.

The signal for indicating the call obtains its motion to display itself by means of its connection with the lever 9, as shown in Fig. 1 of the drawings. The dotted lines show its position when set on the call. The dropping of the lever 9 when the instrument is called closes automatically the circuit that operates the gong or vibrating bell D by the outer end of this lever coming in contact with the spring 24 on post 25 in circuit with the other side of the gong-battery. The binding-posts 25 and 47 are intended for this circuit.

From the foregoing description it will readily be seen that when telegraph-offices on a line are provided each with one of the instruments, in order to display a signal, sound an alarm, and cut out the instrument in any office wanted from all others, it will be only necessary for the operator to make the call once, which call consists in sending over the wire the necessary number of pulsations or breaks corresponding with the number of the office called, and if not answered the operator proceeds with other business, thus saving the great loss of time and the enormous waste of battery that are consumed under the present system.

Operation: All the instruments on the line working on a closed circuit have their signal devices 23 down, as indicated by the full lines in Fig. 1 of the drawings. Now, if an operator on the line wishes to call an office or station—for example, No. 8—he first opens the switch on his key, which opens the circuit, makes the usual telegraph-call, and, if not answered promptly, he then pauses a sufficient period of time to allow the ratchet or scape wheels 4 on all the instruments in circuit with his line to return to the starting or unison point, which is accomplished by the recoil-springs 5 and through the agency of the vibratory action of the armature-lever 2, the oscillating motion of the pallet 10 actuating the scape-wheel 4 and its adjuncts, and the downward motion of the gravity-escapement H withdrawing the L-shaped lever 16 from under the supporting-pin 18 of the lever 9. All the scape-wheels of the instruments not called are allowed to turn back, as will presently be explained, until they are arrested by a stop device, in this case by the pin or screw which secures the spring-finger 6 coming in contact with the projection *b* in the metal rim 7. In this position all the instruments are in unison or at the starting-point, ready for operation. The office wanted may now be called, which is accomplished by the calling operator depressing the telegraph-key a proper number of times or making characters representing the necessary number of strokes in the usual way. This movement brings all the scape-wheels on all the instruments on the line forward by the vibratory motion of the armature and its lever 2 and the oscillating motion of the pallet. By stopping at the proper point the connected gravity movement on the called instrument will run down and cut this instrument out, as before explained, and the scape-wheels of all instruments not called are set back by the recoil-springs 5 to unison. The disk 26 attached to the ratchet-wheel 4 of the called instrument will be caught on account of the registry by the dog 30 on drop-lever 29 by dropping into the notch 27 thereof. This dropping of the drop-lever arrests the scape-wheel 4 and causes the spring-finger thereof to rest on the insulated plug 8 in the metal rim 7, thus cutting the magnet out. Now, if the operator closes his switch or proceeds with business with other offices on the line, he will find the signals of the other instruments in the position shown in full lines, Fig. 1, and engaged by means of the mechanism above described and shown.

When an operator returns to his instrument and finds the signal displayed he can, by simply depressing the armature-lever once by hand, move the ratchet-wheel so as to throw the dog 30 out of its notch in disk 26, when the ratchet-wheel, with its attachments, will fly back to unison, moving the spring-finger 6 off of the insulated plug 8, and also by connecting the levers 9 and 16 by means of pin 18, thus dropping the signal 23 and closing the circuit again through the instrument. This result can be accomplished by the operator pressing down on the armature.

It will be noticed that the instrument embodying the results of an ordinary sounder or receiving-instrument at the same time embodies elements and principles (controlled in the same way as sounders now in use are) for displaying a signal, sounding an alarm, and disconnecting itself from the local battery.

The same instrument I intend for use in telephoning. (See Fig. 8.) For this purpose all the elements above described are used; but I do not deem it necessary to construct the instrument to make the sharp clicking noise required for a sounder as used in telegraphing. It may be constructed very light, so that the vibrations will not be heard, but arranged, as for the telegraph, to display a signal and ring an alarm, or do either alone, as may be desired.

In lieu of the gravity-escapement, a small escapement actuated by a spring or weight may be used for producing substantially the same results; but I prefer the employment of the gravity-escapement on account of its simplicity and accuracy. Should the wire break or become grounded at any point along the line, the signal on each instrument will immediately display itself, thus indicating a break of the circuit.

I reserve the right to vary the construction and arrangement of parts without departing from the spirit of the invention, and also claim the mechanical equivalents thereof.

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

1. The combination, with a telegraphic or

telephonic receiving-instrument and an electric circuit in which said instrument is arranged to be connected, of a signal arranged to be operated by the movement of said instrument in response to a predetermined number of electrical impulses when connected in said circuit, and a shunt or cut-out mechanism operated by the instrument for cutting itself out of circuit simultaneously with the operation of the signal, substantially as described.

2. The combination, with a telegraphic sounder and an electric circuit in which said sounder is arranged to be connected, of a visual signal and a circuit-breaker arranged to break said circuit, and devices for causing the operation of said signal and circuit-breaker in response to a predetermined number of movements of the sounder, substantially as described.

3. The combination, with a telegraphic receiving-instrument or sounder and a local circuit in which it is connected, of a circuit-breaker or cut-out arranged to disconnect said instrument from the local circuit, and mechanism controlled by said instrument for operating said circuit-breaker in response to a predetermined number of electrical impulses passing over the local circuit, substantially as described.

4. In an electro-telegraphing instrument, the armature-lever 2, formed with the rear downward extension, provided with a diagonal slot, substantially as and for the purpose set forth.

5. The upright standard or arch 1, formed or provided with the metallic rim 7, having an insulated plug, 8, substantially as described.

6. The combination, with the upright standard or arch 1, formed or provided with the metallic rim 7, having the insulated plug 8, of a scape-wheel, 4, carrying a spring-finger, 6, and an electro-magnet and armature, substantially as described.

7. The combination, with an electro-magnet and armature, of the lever 9, connecting-arm 21, signal 23, and operating means, substantially as described.

8. The combination, with an electro-magnet and armature, of an insulated shaft carrying a scape-wheel, 4, with a spring-finger, 6, forming an electrical connection with the metallic rim 7, provided with insulated plug and notched disk 26, and a drop-lever, 29, operating substantially as described.

9. The combination, with an electro-magnet and armature, of the actuated ratchet-wheel 4, carrying the notched disk 26, provided with a movable finger, 28, operating in conjunction with the dog 30 on lever 29, substantially in the manner as described.

10. The combination, with an electro-magnet and an armature formed with an extension at its rear end, of the lever 12, with lift 14 and transverse pin 15, engaging with the lower end of the armature-lever for actuating the lever 9 of the signal device, substantially as described.

11. The combination, with an electro-magnet and an armature-lever formed with a slot at its rear lower end, of the pallet 10, attached to lever 9, formed or provided with a transverse pin, engaging with the slot of the armature-lever, substantially as described.

12. The combination, with an electro-magnet and an armature-lever formed with a slot at its rear lower end, of the pallet 10, attached to lever 9, with transverse pin working in slot of the armature-lever, and the scape-wheel 4, substantially as described.

13. The combination, with an electro-magnet and an armature, constructed substantially as described, of lever 12, with lift 14 and transverse pin 15, and lever 9, with pallet 10 and transverse pin, substantially as described, and for the purposes set forth.

14. The combination, with an electro-magnet and armature for actuating the lever 9, of a pawl-lever, 16, for sustaining the signal in an uncalled position, substantially as described.

15. In combination with an electro-magnet and armature, a gravity-escapement composed essentially of frame 31, escapement-wheel 32, ratchet devices, pinion 34, sector 37, and pallet 38, substantially as described.

16. The combination, with an electro-magnet and armature, a gravity-escapement, constructed substantially as described, connecting slotted bar 40 and actuating-lever 12, substantially as described.

17. The combination of an electro-magnet and armature, a gravity-escapement constructed substantially as described, means for connecting the armature and escapement, and L-shaped lever 16 for supporting the signal in an uncalled position, substantially as described.

18. The combination, with an electro-magnet, an armature, and the means, substantially as described, for displaying a signal, of the conducting-post 25, with spring 24 at its upper end, and a vibrating bell or gong, substantially as described.

19. The combination, with a telegraphic or telephonic receiving-instrument and a circuit in which the same is arranged to be connected, of a circuit-breaker, operated by the instrument for breaking said circuit, and a branch circuit connected around said circuit-breaker and including a second circuit-breaker, arranged to break said branch circuit in response to a predetermined number of electric impulses, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. LE GRANDE.

Witnesses:

F. WALTER FOWLER,

D. D. KANE.