

(No Model.)

3 Sheets—Sheet 1.

F. B. HERZOG.

TELEPHONE SIGNALING APPARATUS.

No. 289,834.

Patented Dec. 11, 1883.

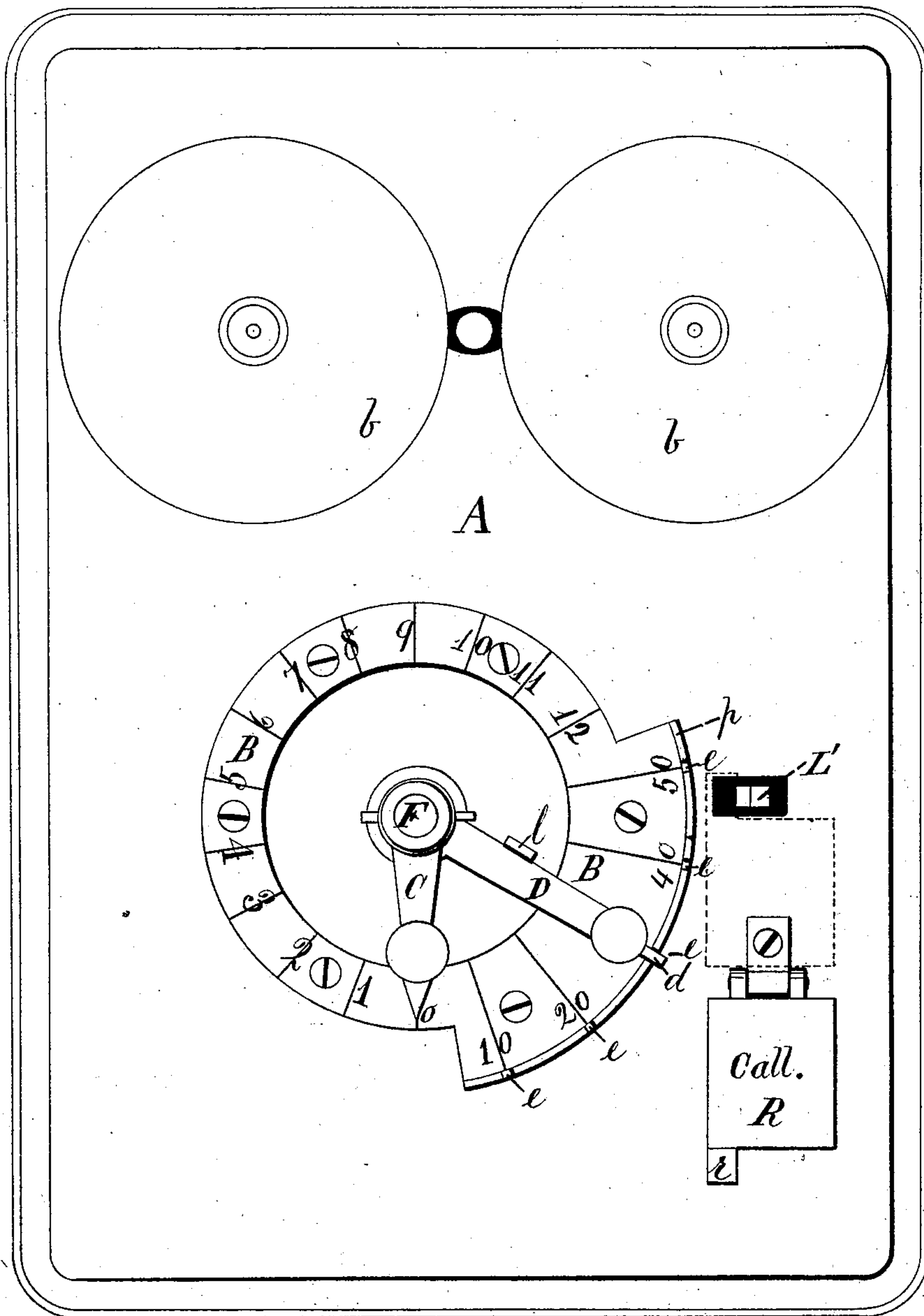


Fig. 1.

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Curtis & Crocker

(No Model.)

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Fig. 2.

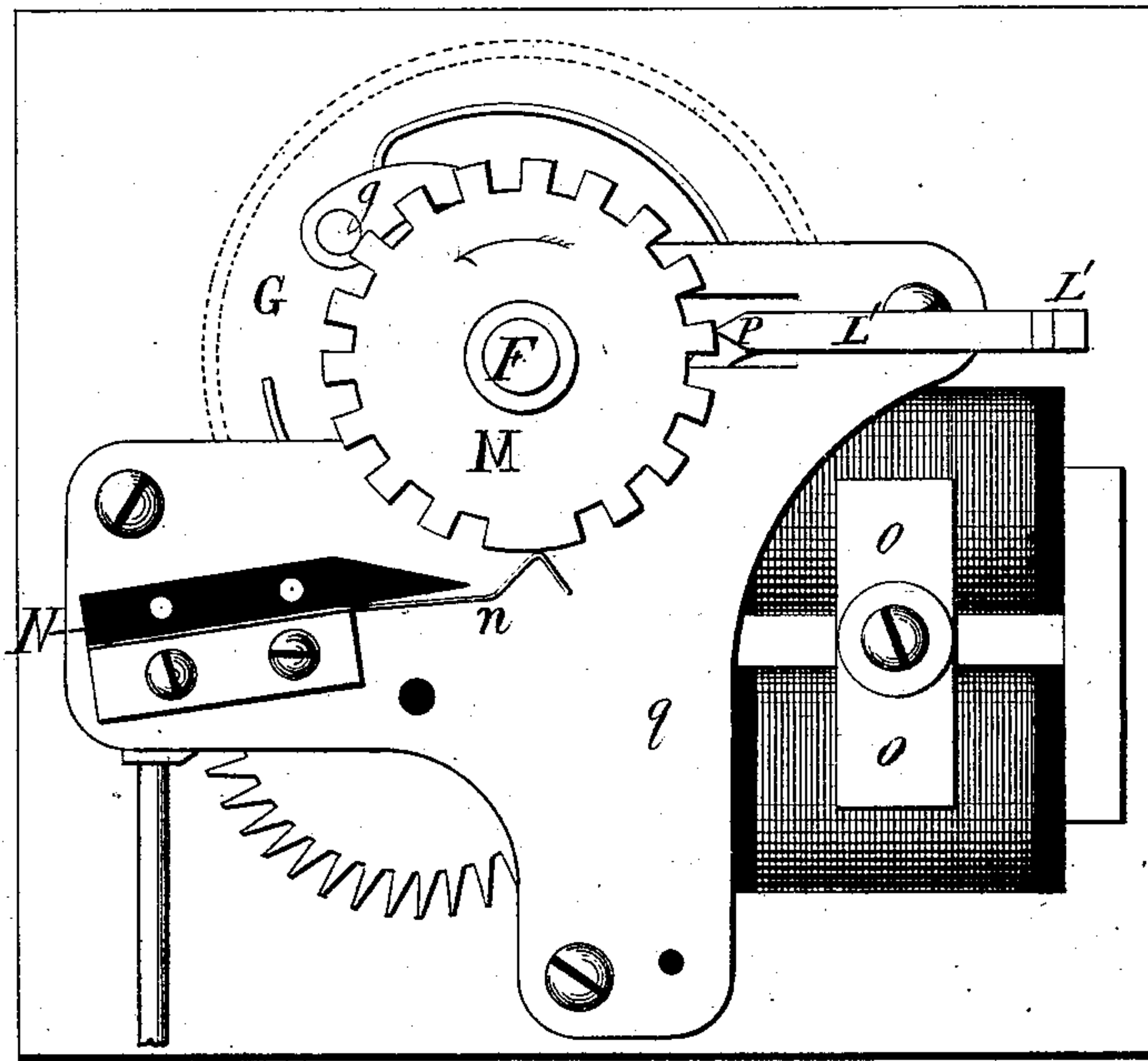
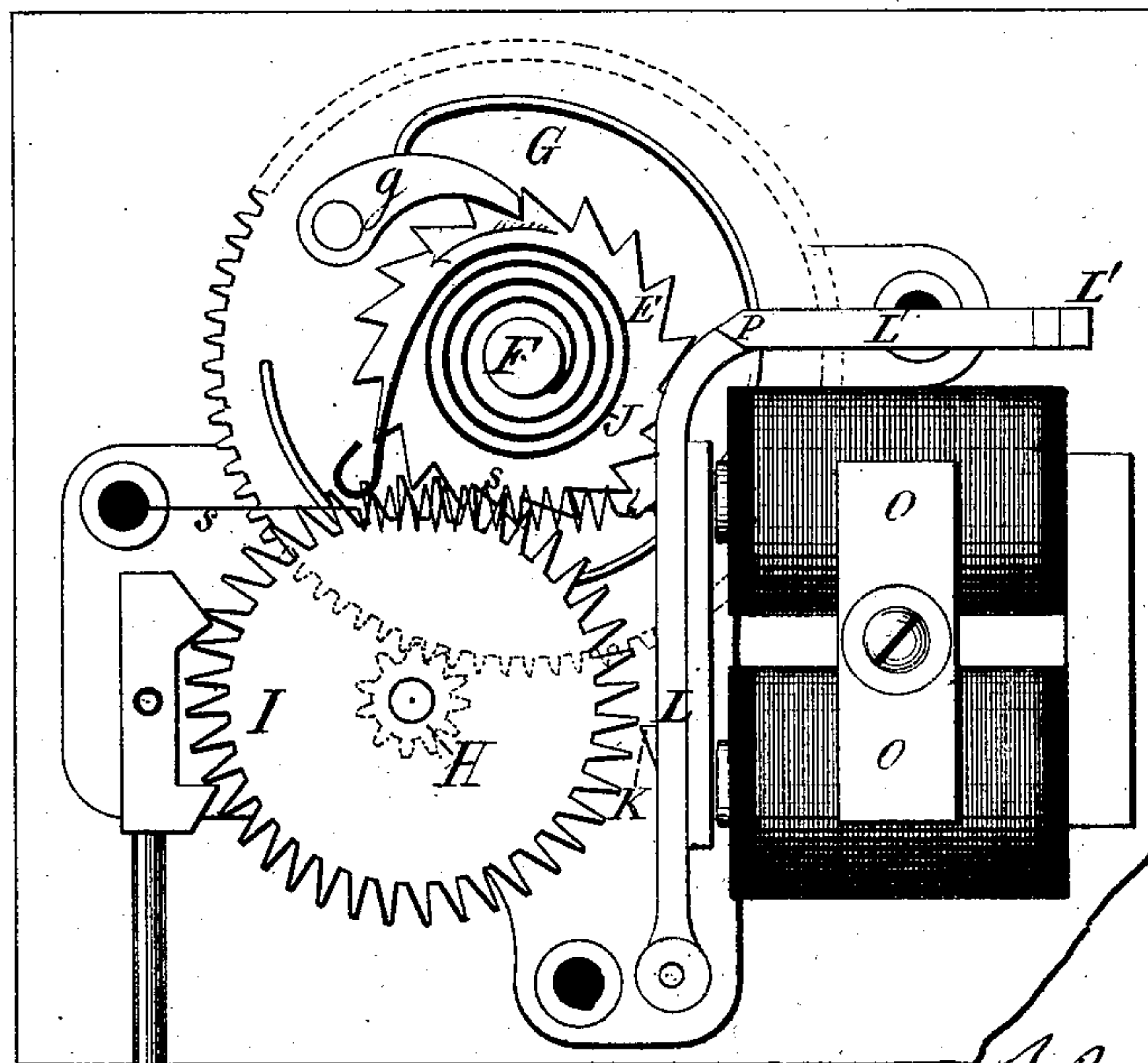


Fig. 3.



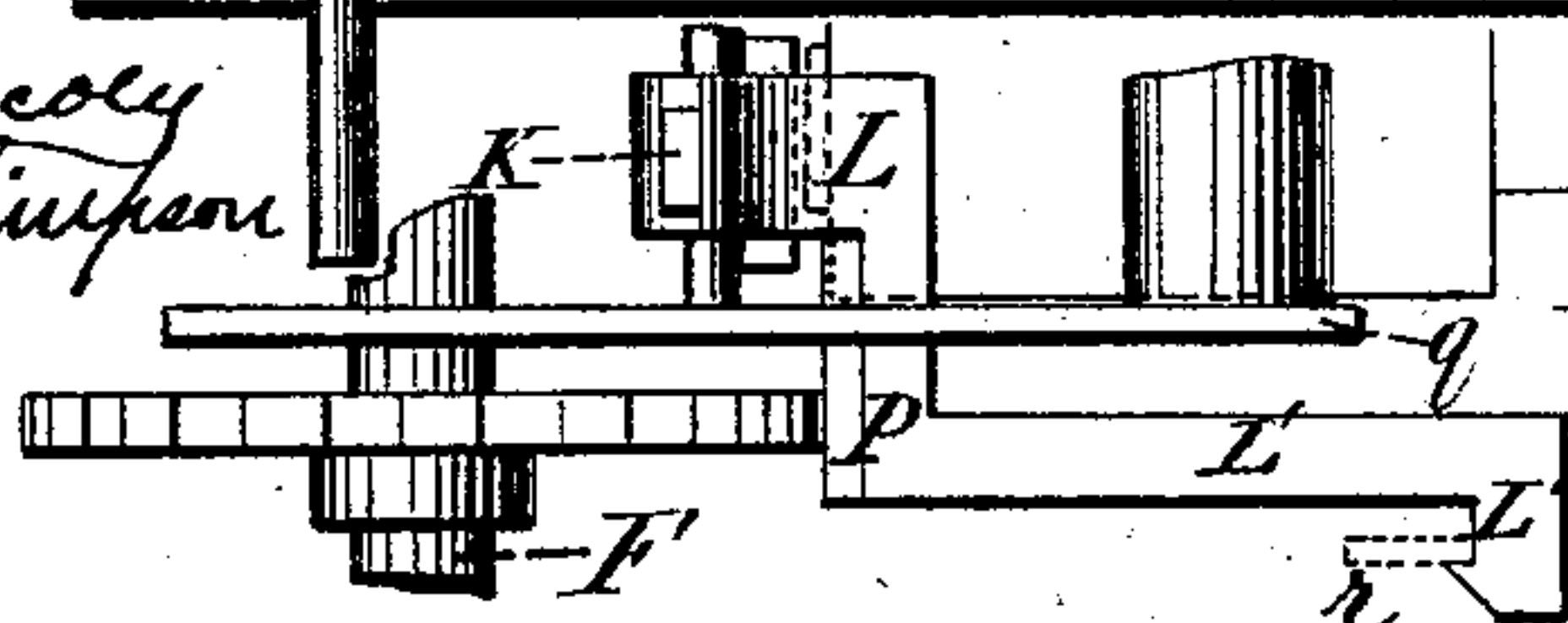
Witnesses

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Fig. 4. by Curtis & Crocker  
Attys.



(No Model.)

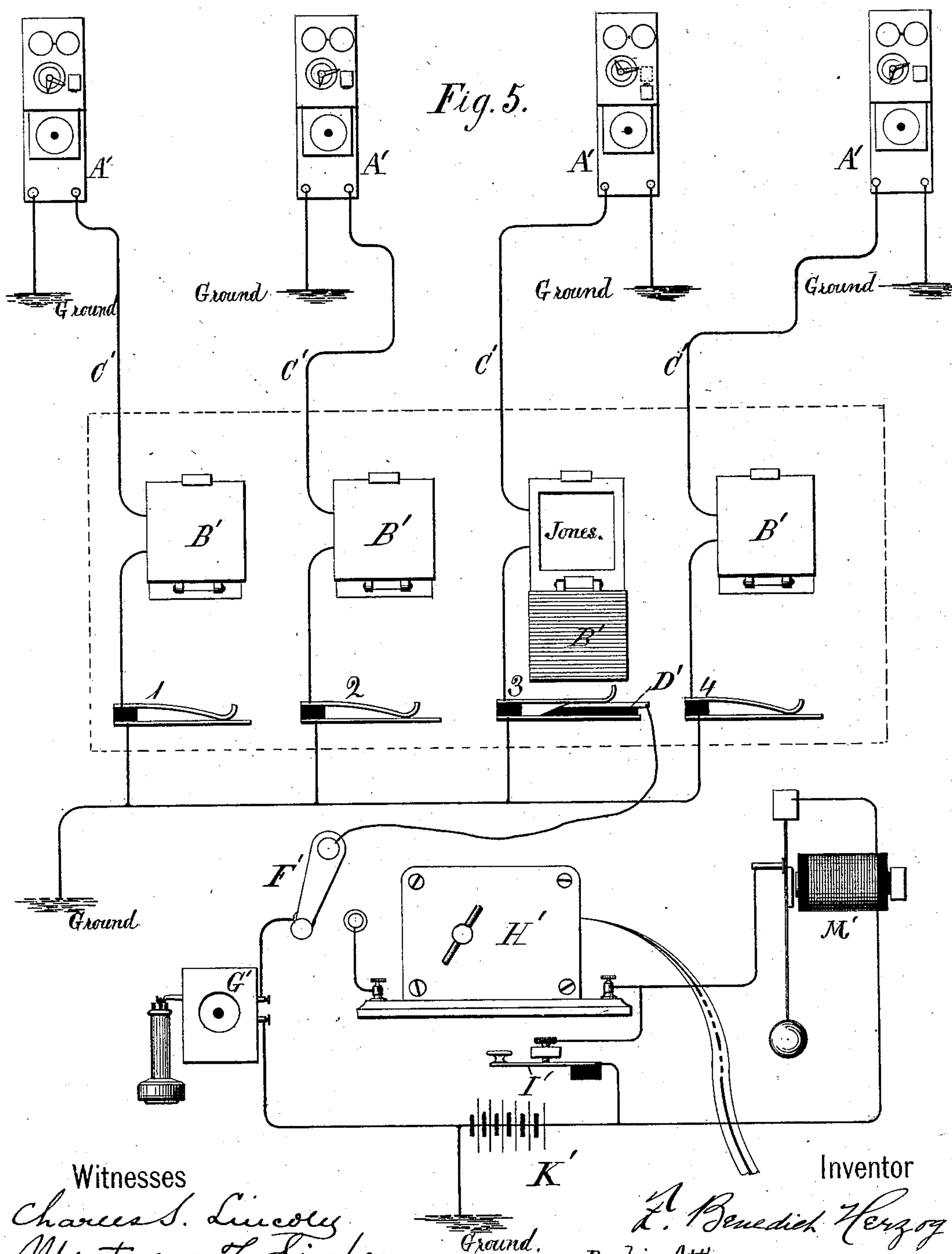
3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

F. BENEDICT HERZOG, OF NEW YORK, N. Y.

## TELEPHONE SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 289,834, dated December 11, 1883.

Application filed September 5, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, F. BENEDICT HERZOG, of the city, county, and State of New York, have invented a new and useful Improvement in Telephone Signaling Apparatus, of which the following is a specification.

In telephone-exchange systems where the individual subscribers are "called up" and put into communication with each other by a central office, and also in private telephone-lines where the offices call each other directly, it is very desirable that a subscriber should be able to leave his office with no one in charge, and that if he be then called up the calling-office may have some means of knowing at what hour he intends to return, or where he has gone, and may, also, without being obliged to wait, find out immediately if he is not at his office or ready to respond. It is also very desirable that when the subscriber returns to his office he should have some means of knowing if he has been called up, so that he can communicate with the central or calling office and ascertain who has called him.

The object of my invention is to accomplish these results. I do this by providing the office of each subscriber (or, in the case of a private wire, each private office) with an apparatus which may be properly set by the subscriber before he leaves his office, and which, when it is released or caused to operate from the calling-office, will automatically transmit a signal prearranged to indicate the hour of the subscriber's return, the place at which he may be found until a specified hour, or any other predetermined information. I further provide each office with a device arranged to be operated from a calling-office, and to indicate, until it is reset, that that office has been called, so as to enable the person called up to find out who has called him.

In the accompanying drawings, which illustrate what I consider the best means of carrying out my invention, Figure 1 is a front view of the box containing the usual calling apparatus at a subscriber's office, together with my time signaling or indicating apparatus. Fig. 2 is a front view of my time-signaling contrivance or transmitter. Fig. 3 shows the same with a portion of the frame removed. Fig. 4 is a top view, showing part of the mechanism.

Fig. 5 represents a telephone-exchange system with the subscribers' offices provided with automatic time-indicating contrivances, and arranged to be operated according to my invention.

The same letters of reference indicate identical parts in all the figures except Fig. 5.

In Figs. 1, 2, 3, and 4, which represent my time-indicating contrivance, A represents the ordinary box containing the signaling apparatus now in common use, consisting of two small bells, *b b*, between which a clapper is made to vibrate by a pulsatory current sent over the wire from the calling-office. Upon the front of this box I fix a dial-plate, B, the circumference of which is divided into eighteen equal arcs, which are numbered from 0 to 12 on one side to correspond to the hours, and from 10 to 50 on the other to correspond to the minutes.

In the middle of the dial B, upon the front A, is mounted or pivoted the minute-hand D, which may be moved over the dial and locked at any desired division thereof by the projection *d*, which springs into the notches *e e e*, cut in the metal arc *p*, corresponding to the division of the minutes. The hour-hand C is fixed to the spindle F, which projects through the center of the minute-hand D, so that the two hands are independent of each other.

Behind the front of the box A is fixed the clock-work transmitter, Figs. 2 and 3, which consists of the spindle F, mounted in a suitable frame, and having secured to it the clock-spring J and ratchet-disk E, and carrying the toothed wheel G, which gears into the pinion H on the spindle of the escapement-wheel I. The ratchet-disk E has exactly eighteen teeth, so that as the hour-hand C is turned to the left in setting it, the pawl *g* drops behind a new tooth each time the hand passes over one of the hour-divisions, so that when the hand is let go, the spring J tends to revolve the spindle F, and, consequently, the toothed wheel G, in the direction indicated by the arrow, but actual revolution is prevented by the pawl K on the armature L, which, when the armature is drawn back, engages with the teeth of the escapement-wheel I and thereby prevents its revolution.

The signal-transmitting device consists of a



circular metallic disk, M, attached to the spindle F, the periphery of which is serrated or notched to correspond to the desired signal, and has bearing upon it the leaf-spring *n*, mounted on the insulated support N. The disk M may of course be formed to transmit any desired signal; but for simplicity I divide its circumference into eighteen equal parts and cut seventeen notches or spaces, leaving the eighteenth blank, as shown, so that when the disk arrives at that point in its revolution it will omit to break the circuit and transmit any impulse. Of these seventeen notches cut in the disk M, twelve, on one side of the blank space, are to indicate the hours, and the remaining five, on the other side, are to indicate the intervals of ten minutes, and since the main-line circuit is formed through the spring *n* and the periphery of the disk, the circuit will be broken seventeen times in one complete revolution of the disk. The hour-hand C is so attached to the shaft F, with respect to the disk M, that, when the hand points to zero on the dial, the blank notch is under the spring *n*, the disk occupying the position shown. The clock-spring J is already wound up sufficiently to carry the hour-hand C through about one complete revolution, so that the revolution of the hand C continues after passing the 0-point until the said hand meets with some obstruction which prevents further revolution.

It will now be readily understood that when the hour-hand C is turned to the left to any desired hour on the dial, it will carry the disk M around with it and wind up the clock-spring J, the toothed wheel G remaining stationary, and its pawl *g* dropping behind a new tooth of the ratchet E as the hand passes over each division of the dial. The hour-hand is then let go, and remains stationary until the projection K is withdrawn from the escapement-teeth I by the electro-magnet O, (the armature L being normally drawn back by the spiral springs *s*,) whereupon the clock-work is released, and the disk M and hand C continue to revolve, after passing 0, (in the direction of the arrow,) until the hand C fetches up against the stop *l*, formed on the minute-hand D, so that the revolution of the disk M ceases as the hour-hand arrives at the division of the dial at which the minute-hand has been set. Thus, if the hour-hand had been set at 4 and the minute-hand at 30, the disk M would have broken the circuit four times in the first part of its revolution before the hour-hand reached zero, and would have broken the circuit three times more after passing the 0 and before fetching up against the minute-hand, with an interval between the two sets of signals to distinguish the hours from the minutes. It is evident, therefore, that nothing is required to be done but to set each hand opposite the desired hour and minute, and that when the clock-work is released by the electro-magnet O, the disk M will first transmit a set of impulses indicating the hour, and then a set in-

dicating the ten minutes, the two being separated by any desired interval.

For ordinary purposes it will be sufficiently accurate to have the time indicated within ten minutes, and, in the apparatus I have shown, the minute-dial is divided into five parts, corresponding to 10, 20, 30, 40, and 50 minutes, each impulse sent over the main line corresponding to each ten minutes; but it is obvious that the disk M and dial B may be formed to transmit any desired signal or sets of impulses, or to indicate the minutes with any required degree of accuracy.

As already stated, the releasing-pawl K, which is normally drawn into the teeth of the escapement I by the retractile spring *s*, is withdrawn from the said teeth by means of a current through the electro-magnet O sent over the main line from the calling-station; but as this electro-magnet is connected in the main line circuit, which is broken every time a notch in the disk M comes under the spring *n*, it is obviously necessary to prevent the armature L from dropping back and stopping the escapement each time the disk M breaks the circuit. This result I secure by forming an elbow, P, (see also Fig. 4,) on the upper end of the armature L, which elbow projects through the front metal frame, *q*, of the instrument, and rests against the periphery of the transmitting-disk M, as shown in Fig. 2.

The point at which the elbow P bears upon the disk is so arranged with respect to the position of the circuit-breaking spring *n* that, whenever the circuit is broken through the spring *n* and the attraction of the electro-magnet O ceases, the elbow P and pawl K are held forward out of the way of the escapement I by one of the teeth of the disk M, which does not permit the elbow P to drop into one of its notches until it has again closed the circuit through the spring *n*. The edges of the elbow P are beveled, as shown, so that when the disk M is set back by hand the teeth will automatically force the elbow P out of the way, so as not to interfere with its revolution.

It is to be observed that when the hand C stands at zero—the position represented in the drawings—the elbow P, and, consequently, the pawl K, are held forward out of the way of the escapement I by one of the teeth of the disk M, and therefore the hand C would not stay at the zero-point if set there by hand, but would be carried around by the spring J until arrested by the stop *l*; but there is no need of setting the hour-hand at zero, because the machine would always be set to indicate some hour other than zero.

If it were desired to have the machine indicate the hour only without giving the minutes, the minute-hand D would be set at zero, so as to limit the revolution of the hour-hand at that point. The other divisions on the dial should of course be so arranged that when the hour-hand C points to either of them, one of the notches in the disk M, and not one of its



teeth, shall be under the elbow P, so as to allow the pawl K to engage with the escapement I and hold the clock-work in that position until released by the electro-magnet.

5 In order that the subscriber may know when he returns to his office whether he has been called or not, I provide a device arranged to be also operated by the armature L whenever a current is sent through the electro-magnet  
10 O. For this purpose I make the elbow P terminate in a second hooked elbow, L' L', which projects part way through the front of the box A, and I hinge upon the box A a small metal plate or window, R, the outer end, r, of  
15 which is shaped so as to project into the front of the box and catch behind the hooked end of the elbow L, as shown in Figs. 1 and 4.

Whenever a subscriber leaves his office he turns up the window R, and the end r is caught  
20 behind the hook L and held there, as shown by the dotted lines, Fig. 1, until the armature L is drawn forward by a current sent over the line from the calling-office, when the window is released and falls by its own weight, indi-  
25 cating thereby that that office has been called.

In Fig. 5 is shown a telephone-exchange system with the central office arranged for calling the subscribers, and for the reception of the time-indicating signal according to my  
30 invention.

A' A' A' A', respectively, represent subscribers' offices, each of which is provided with the usual calling and telephone apparatus for communicating with the central station  
35 in the customary manner, and also with an automatic signaling-instrument such as I have already described. The line-wire circuits, after passing through annunciators B' B' B' B' at the central office, (or any other well-known  
40 apparatus whereby the operator there is informed which subscriber is calling,) respectively pass through the "cut-out" switches 1, 2, 3, and 4, (or any other well-known means whereby the signaling apparatus may be cut  
45 out in any desired one of the main-line circuits,) and then are connected to ground, as shown. By the insertion of the plug D', consisting of a metal strip on the upper side of a strip of insulating material, as shown, the ground may  
50 be cut off and the switch F' connected to any desired circuit. The switch F' has two positions, one of which connects it with the telephone apparatus and the other of which connects it with an ordinary clock-work or similar register H', arranged to record the im-  
55 pulses sent over the circuit in the usual manner, as clearly shown; thence the circuit leads through the spring-key I normally closed; thence through the battery K, to the ground,  
60 as shown. The key I' is shunted by a rheotome or other device, M', for causing pulsations in the current traversing the line in the well-known manner, and therefore, when the key I' is depressed, the current from the bat-  
65 tery K passes through the rheotome M and out on the main line, thereby ringing the bell

at the subscriber's office in the well-known way.

The practical working of the system is then as follows: When a subscriber calls up the  
70 central office, (which he does by any well-known contrivance for sending a current over the line, such as a magneto-call,) the corresponding annunciator-window at the central office is dropped, disclosing the name of the  
75 subscriber. Thereupon the operator at the central office inserts the plug D' in the proper cut-out, and, by communicating with the subscriber through the telephone G', ascertains the number of a second subscriber with whom  
80 the one calling wishes to converse. He then inserts the plug in the circuit of the second subscriber and turns the switch F to the right, whereby the current from the battery K' is sent to line. If the second subscriber is ab-  
85 sent from his office and has set his indicator, the effect of the current is to operate the electro-magnet O, Figs. 1 and 3, and release the clock-work, which immediately transmits the proper signal, indicating the hour of his re-  
90 turn, &c. This signal is received and recorded at the central office by means of the register H'. If the subscriber is not absent or has not set his time-indicator, the central operator will at once be apprised of the fact by the  
95 non-operation of the recorder H', and he will then press the key I' in order to bring the rheotome or vibrator M into circuit, and thus call up the second subscriber in the usual way, who is then put in direct telephonic commu-  
100 nication with the first subscriber in the well-manner.

In the plan I have herein shown each main circuit is normally closed, with no battery on the line; but when the plug D' is inserted in  
105 one of the "cut-outs," the battery K' is in circuit and remains in circuit while the signal is being transmitted and the armature of the register is held down, and therefore the signal transmitted by the time-indicator consists,  
110 simply, of two series of breaks in the circuit, which are shown by the registering apparatus as intervals between the marks formed by the stylus on the moving paper, as represented in Fig. 5. The register may, however, be ar-  
115 ranged in the well-known manner to mark the paper on the upstroke of its armature, so that the marks on the paper, instead of the intervals between the marks, will correspond to the breaks in the circuit. It is evident, however,  
120 that any kind of registering or indicating mechanism may be employed to register or indicate the time-signal received at the calling-station; but even this recorder may be dis-  
125 pensed with, if desired, and an ordinary telegraph-sounder used instead of the register, or else the impulses may be counted by ear through the telephone.

If a register is employed to record the time-signals, the operator can tear off the strip of  
130 paper marked with any signal and hang it up near the corresponding subscriber's circuit, so



that in case any third subscriber should wish to talk with the office whose time-signal had already been transmitted, the central operator would have a record by which to inform the third subscriber the time of the other's return.

The time-transmitter may be set either when the subscriber leaves his office or when his telephone was last used, and if, in the meantime, the central should happen to call him, or if he should happen to return before the hour at which the transmitter was set, he would be made aware of the calling by the noise of the clock-work in unwinding; but the apparatus may be so arranged by adjusting the tension of the retractile spring *s*, Fig. 3, that the ordinary pulsatory current sent over the line to operate the call-bells *b b* will not be sufficiently strong to withdraw the armature *L* and release the clock-work, and then the pulsatory current may first be sent over the line to ring the subscriber's bell momentarily, and then a stronger continuous current may be employed to release the clock-work, so that the subscriber cannot fail to have heard the call, if in his office.

Whenever a subscriber returns to his office, or at any other time, he may set back his time-transmitter to the 0-point, so as not to transmit any signal over the line, by pressing to the right the hook *L*, Figs. 1, 2, and 3, projecting nearly through the front of the box *A*, which withdraws the pawl *K* from the escapement, and so releases the clock-work and allows the hour-hand to return past 0 until it meets the minute-hand, wherever that may be set. The hour and minute hands may then be re-set, if desired.

It is evident that my automatic signaling mechanism, whereby the calling-office is automatically informed of the time of the subscriber's return, may be placed in a separate box from that containing the usual calling apparatus, and may be constructed to transmit any desired conventional signal or signals. It is also evident that these signals may be pre-arranged to signify other information besides the time of the subscriber's return—such as the place to which he has gone, the time he left his office, &c. It is likewise evident that my invention is not confined to an automatic signaling mechanism of any particular form of construction, nor to any particular mode of transmitting the signal over the circuit.

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

1. The combination, with an electric circuit, of an automatic signaling mechanism constructed to transmit one or more signals over the circuit, means for setting the signal mechanism so as to transmit its signal, and a device arranged to be operated by a current through the circuit, whereby the signal mechanism may be released or caused to operate and transmit its signal automatically over the circuit.

2. The combination, with a telephonic or

telegraphic circuit, of an automatic signaling mechanism located at one office, and arranged to transmit two or more different signals over the circuit, as desired, means for setting the signaling mechanism so as to transmit the desired signal, and a device operated from another office on the said circuit, whereby the signaling mechanism may be released or caused to operate and transmit, automatically, the desired signal over the circuit.

3. The combination, with a telephonic or telegraphic circuit, of an automatic signaling mechanism arranged to transmit different signals over the circuit, according to the position at which it is set, means for setting the signal mechanism so as to transmit the desired signal, a device operated by an electric current on the said circuit, whereby the signal mechanism may be released or caused to operate and transmit its signal over the circuit, and a recording or indicating apparatus in the said circuit, arranged to record or indicate the signal transmitted, substantially as described.

4. The combination, with a telephonic or telegraphic circuit and signaling apparatus operated from one office for calling a second office thereon, of an automatic signaling mechanism located at the said second office, and arranged automatically to transmit different signals over the circuit, according to the position at which it is set, means for setting the said signal mechanism, and a device operated from the first office on the said circuit, whereby the signal mechanism may be released or caused to operate and transmit its signal, the whole being so arranged that the operation of the calling apparatus automatically releases the signal mechanism or causes it to transmit its signal over the circuit, substantially as described.

5. The combination, with a telephonic or telegraphic circuit and signaling apparatus operated from one office for calling a second office thereon, of an automatic signaling mechanism located at the said second office, and arranged automatically to transmit different signals over the circuit, according to the position at which it is set, means for setting the said signal mechanism, and a device operated from the first office on the said circuit, whereby the signal mechanism may be released or caused to operate and transmit its signal, the whole being so arranged that the calling apparatus may be operated without affecting the automatic signaling mechanism, substantially as described.

6. The combination, with a telephonic or telegraphic circuit, of an automatic signaling mechanism constructed to transmit different signals prearranged to indicate specified times of day or other desired fact or facts, according to the position at which it is set, means for setting the said signal mechanism, and a device operated from another office for releasing the signal mechanism or causing it to operate and transmit its signal, whereby the op-



erator at the calling-office is automatically informed of the desired fact or facts when the individual called is absent from his office, substantially as described.

- 5 7. The combination, with a spring-actuated spindle or clock-work and suitable escapement mechanism, of a signal-transmitting contrivance constructed to transmit one set of signals or impulses before it reaches a fixed point  
10 in its revolution, and another set of signals or impulses after passing the said point, means for setting the transmitting contrivance at different positions, so as to alter the first set of signals, and means for limiting the revolution

of the spindle at any desired point, so as to 15 alter the second set of signals, substantially as described.

8. The combination of the spindle F, spring J, and clock-work escapement I with the transmitting-disk M, the hand C for setting the 20 disk at any desired point, and the adjustable stop or hand D, limiting the revolution of the said disk, substantially as described.

Signed this 4th day of September, 1883.

F. BENEDICT HERZOG.

Witnesses:

JAMES T. LAW,

CHARLES G. CURTIS.