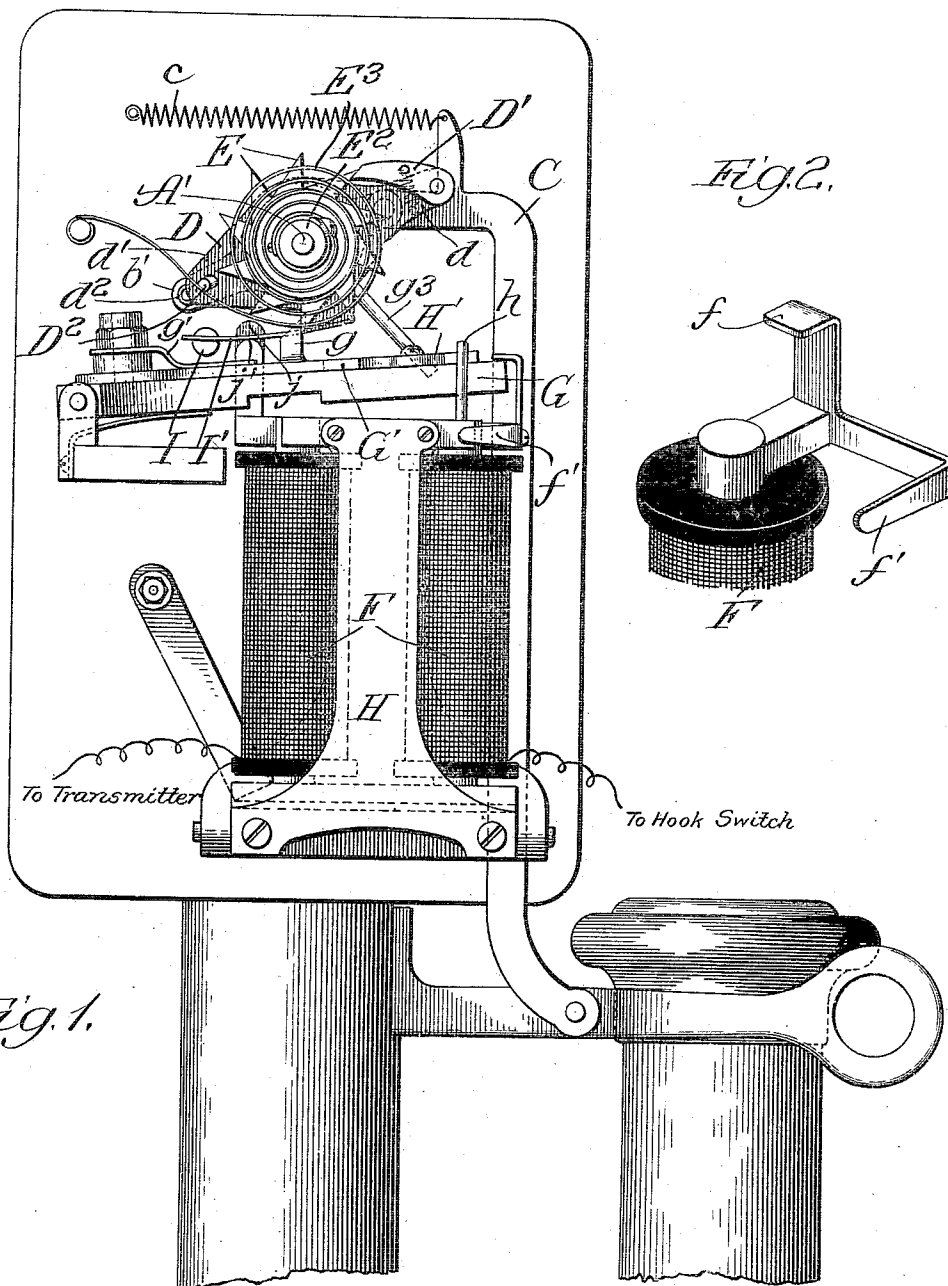


H. K. SANDELL.
 TELEPHONE CALL RECORDER.
 APPLICATION FILED MAY 23, 1910.

979,570.

Patented Dec. 27, 1910.

5 SHEETS—SHEET 1.



Witnesses:
 E. C. Chyld,
 Chas. H. Buell

Inventor:
 Henry K. Sandell,
 By Dymally, Lee, Christensen & Miles,
 Attys

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 5 SHEETS—SHEET 2.

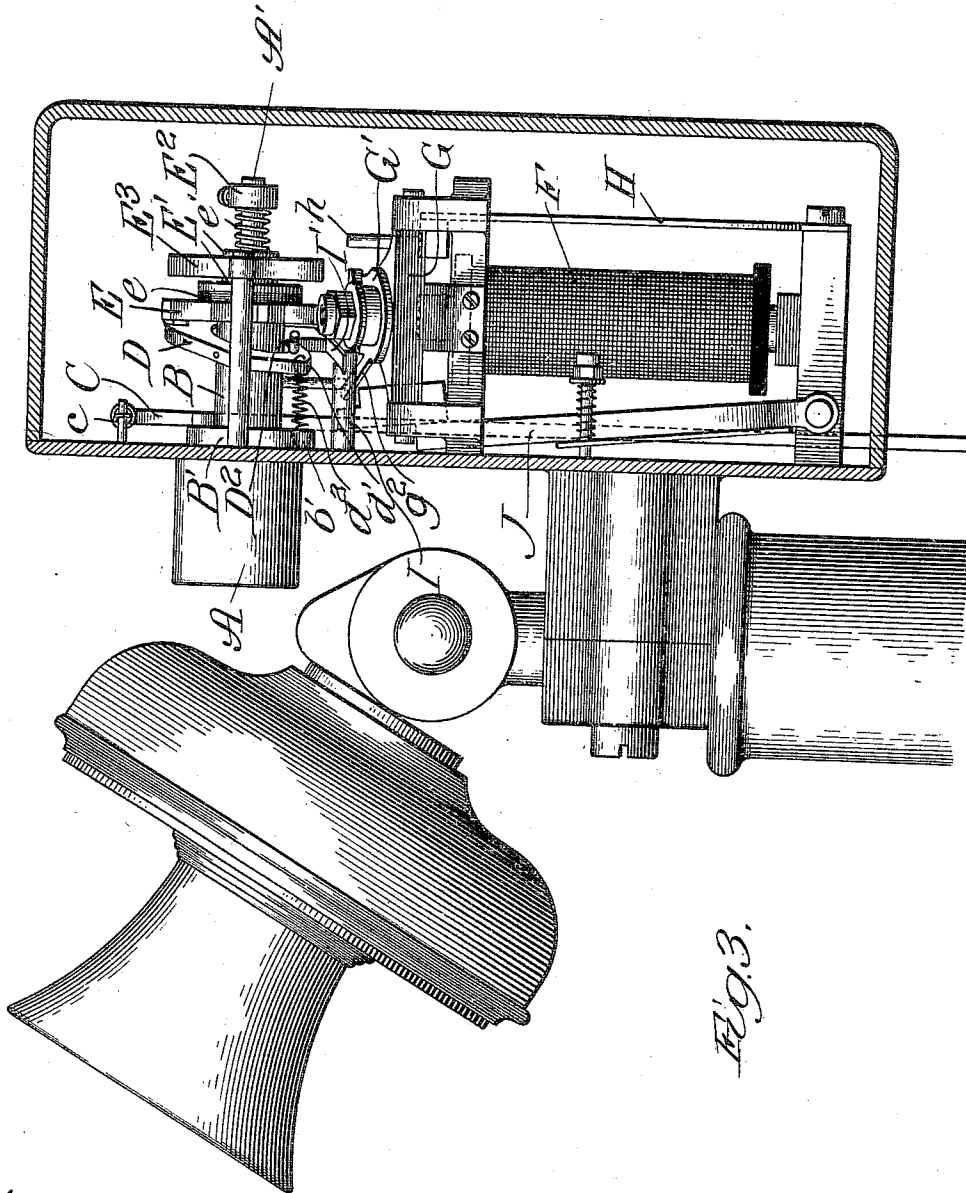


Fig. 3.

Witnesses:
 Chas. E. Gaylord,
 Chas. H. Buell.

Inventor:
 Henry K. Sandell,
 By *Dunfords, L. C. Chittenden & Co.*
 Attys.

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5 SHEETS-SHEET 3.

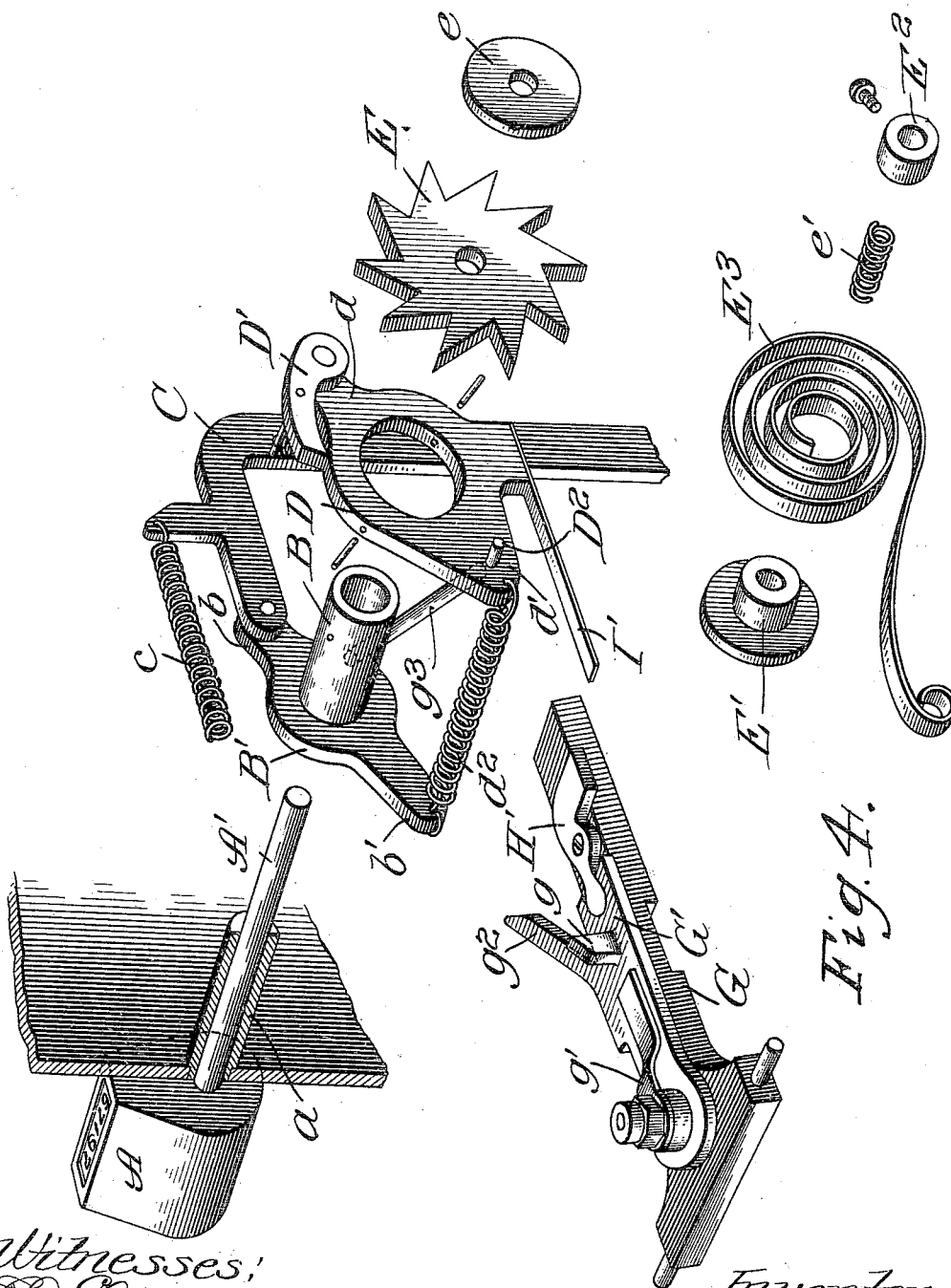


Fig. 4.

Witnesses:
Ed. C. Paylor,
Chas. H. Bull.

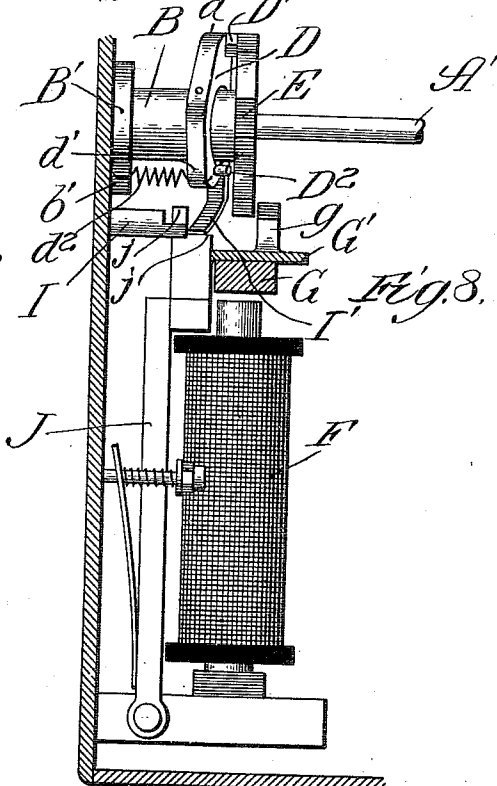
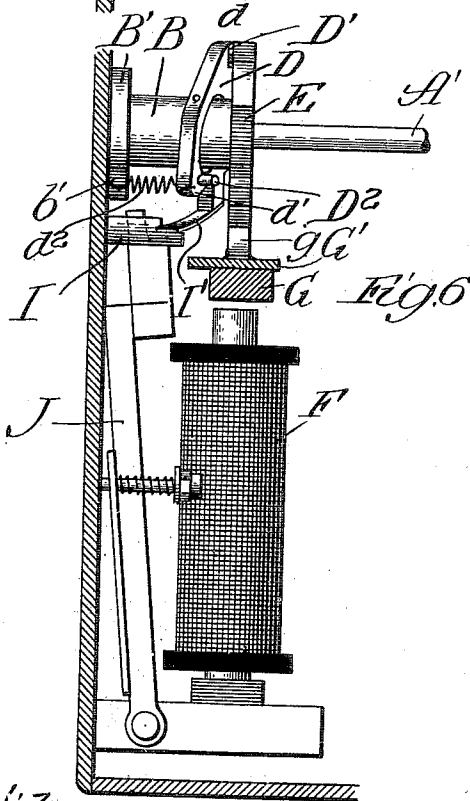
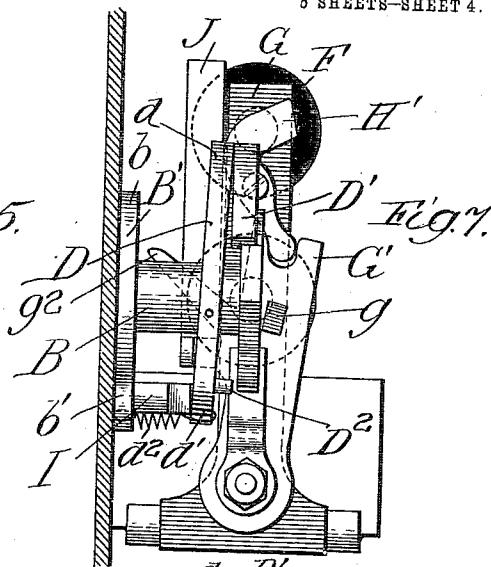
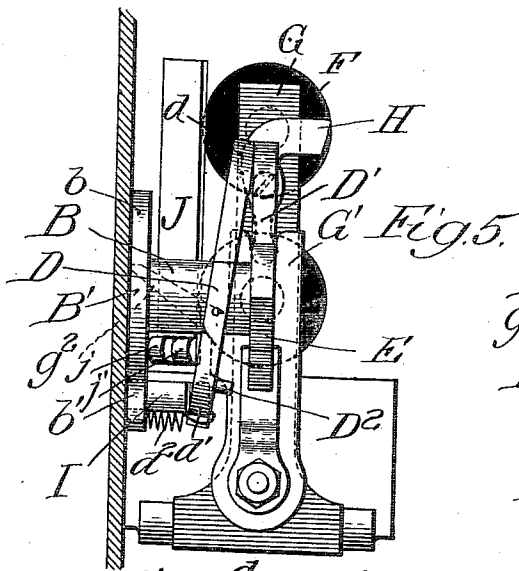
Inventor:
Henry K. Sandell,
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5 SHEETS—SHEET 4.



Witnesses:
 E. C. Payson,
 Chas. H. Bull.

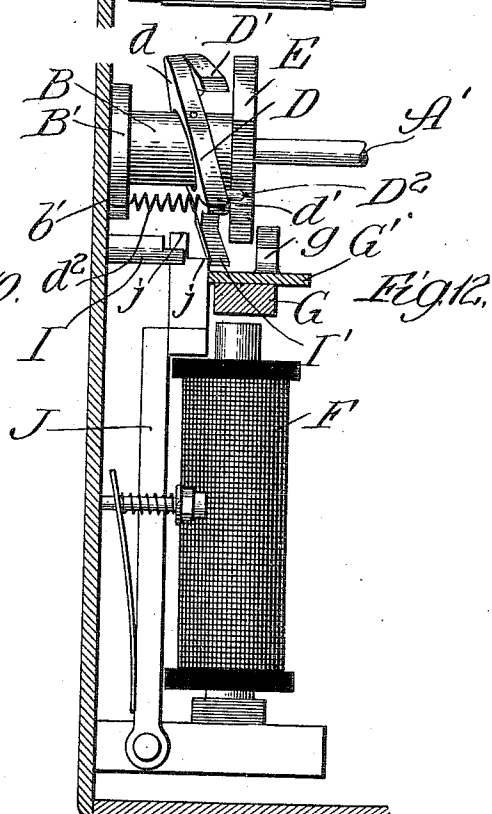
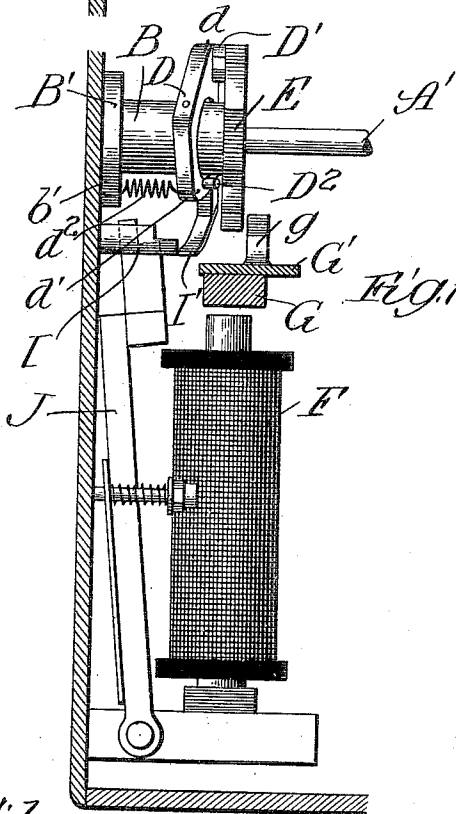
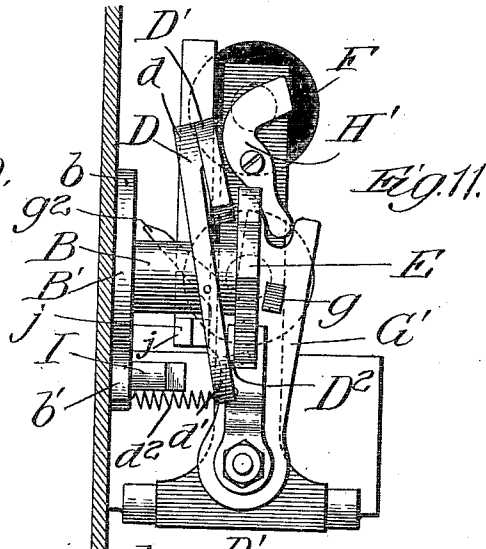
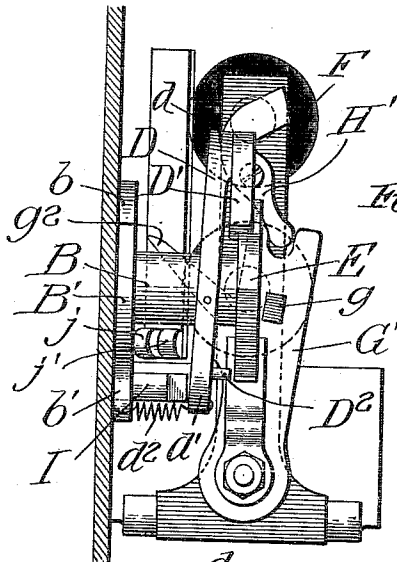
Inventor:
 Henry K. Sandell,
 By Dyrenforth, Lee, Critton & Wiles,
 Attys.

H. K. SANDELL.
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APPLICATION FILED MAY 23, 1910.

979,570.

Patented Dec. 27, 1910.

5 SHEETS—SHEET 5.



Witnesses:
Ed. Chaylord,
Chas. H. Buell.

Inventor:
Henry K. Sandell,
By Dyrenforth, Lee, Christian & Miles,
Attys.

UNITED STATES PATENT OFFICE.

HENRY K. SANDELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO HERBERT S. MILLS, OF CHICAGO, ILLINOIS.

TELEPHONE-CALL RECORDER.

979,570.

Specification of Letters Patent. Patented Dec. 27, 1910.

Application filed May 23, 1910. Serial No. 562,838.

To all whom it may concern:

Be it known that I, HENRY K. SANDELL, a citizen of the United States, residing at Mills Building, Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Telephone-Call Recorders, of which the following is a specification.

My invention relates to certain new and useful improvements in telephone call recorders, and is fully described and explained in the specification and shown in the accompanying drawings, in which,

Figure 1 is an elevation of my improved device, the front portion of the case being removed to show the interior construction; Fig. 2 is a detailed perspective of the upper end of one of the magnets; Fig. 3 is a side elevation showing the case in section; Fig. 4 is a perspective view showing the register and its connections and adjacent parts in detail together with the manner in which the same are assembled; Figs. 5, 7, 9 and 11 are top plans of certain of the operating parts in different positions showing successive stages of the operation of the device and Figs. 6, 8, 10 and 12 are side elevations of the same parts in the same different positions, Figs. 6, 8, 10 and 12 corresponding to Figs. 5, 7, 9 and 11 respectively.

The device of the present application is intended as an improvement upon the device of my application for patent on telephone call recorders filed September 24th, 1909. Serial Number 519,448. The operation of the present device is in general similar to the device of that application, but it has been found desirable to introduce two new features of operation into the present device. In the device of that application, the register is advanced one number by raising the switch hook and if the switch hook be immediately depressed before anything else occurs, the register will be returned to its original position. If however, the line circuit is broken as by the operator inserting the plug to answer the call, the register will be held in position when the switch hook is again depressed so that it will remain forward one number. It has been found in the practical use of that device that if the switch hook be raised to answer a call, at a time when the ringing current is flowing over the line, the alternations of said ringing current will have substantially the same

effect as a break in the circuit, and the register will remain advanced, instead of being retracted as ought always to be the case when the switch hook is lifted to answer a call. It has also been found in the use of that device, that it is occasionally very desirable to have the central operator able to set back the register bodily. For instance, if the wrong party be obtained and the calling subscriber then says that the call should be canceled as he does not care to wait for the proper party, or if the proper party cannot be raised it is desirable and almost necessary to have some means under the control of the central operator, whereby the register can be set back, to the end that the ineffective call will not be permanently registered. The present device is adapted to perform, in addition, to the functions of my prior device referred to, these two functions.

Referring to the drawings A is a register of ordinary form embodying suitable carrying mechanism and having a shaft A^1 attached to its units wheel, the said shaft passing through and being journaled in a boss a upon the rear of the case of the recorder. Upon the boss a , and therefore concentric with the shaft A^1 is journaled a sleeve B at one end of which is secured a plate B^1 having two oppositely extending radial arms b and b^1 respectively. A link C is secured to the arm b of the plate B^1 , the said link being bent into right angular form as illustrated and extending down to the switch hook, a spring c being provided which tends to throw said link upward in an obvious manner, thereby reinforcing the switch hook spring, which alone may not be quite sufficient to operate the extra mechanism of the call register. Outside the sleeve B is pivotally mounted a plate D, the plate being adapted to be oscillated about a center at right angles to the axis of the sleeve in the manner fully illustrated in the drawings. The plate D has oppositely projecting arms d and d^1 , the arm d carrying a dog D^1 and the arm d^1 carrying a pin D^2 . The arm d^1 is connected to the arm b^1 of the plate B^1 by means of a spring d^2 which tends normally to hold the arm d in a forward and the arm d^1 in a rear position. Outside the end of the sleeve B is mounted a ratchet wheel E which is rigid on the shaft A^1 . Outside this ratchet wheel is a leather

washer e , then a loose collar E^1 having a flat plate of the size to fit against the leather washer, then a short spring e^1 and outside of that an adjustable collar E^2 by means of which the loose collar E^1 can be pressed with greater or less force through the medium of the spring e^1 against the leather collar and the ratchet E . A spring E^3 is fastened to the loose collar E^1 at its inner end and its outer end is secured to a stationary point on the frame of the device. The result of this arrangement is that as the ratchet and register shaft are rotated in a forward direction, they will turn the loose collar and the inner end of the spring with them, thus winding up the spring until the backward tension of the spring is sufficient to overcome the friction between the collar and leather washer, or the leather washer and ratchet wheel as the case may be, after which the register shaft and its ratchet will move forward without the loose collar. The friction between the loose collar and the ratchet is so adjusted that the spring will at all times be wound up enough to turn the register back three or four numbers if the same were entirely released.

The pawl D^1 on the plate D normally engages one of the teeth of the ratchet E and the pin D^2 is normally entirely out of engagement with said teeth, but by oscillating the plate D about its pivot on the sleeve B the pawl will be thrown out of engagement with its tooth and the pin D^2 into engagement with a tooth, the two coöperating with the ratchet to form an escapement, so that each time a complete oscillation of the plate D is made the ratchet and register will make one complete backward movement under the influence of the spring E^3 up to a time when the power of the spring E^3 is exhausted, which will be after the register has moved backward three or four numbers. The provision of means whereby the register can be set back three or four numbers is quite sufficient for all ordinary practical purposes. The mechanism, through the medium of which the plate D is oscillated, will presently be set forth.

F is an electro-magnet which is arranged in series with the line. This magnet is provided with three armatures which for purposes of distinguishing them will be termed a main armature, a front armature and a rear armature.

G is the main armature, the same being pivoted upon a horizontal pivot and having the upward movement of its free-end limited by a metal extension f on the upper end of the adjacent pole of the magnet F . The main armature G has pivoted upon its upper surface an armature-dog G^1 provided with a tooth g , a friction device g^1 preventing the too ready turning of the armature-dog upon its pivot. When in its normal

position the tooth g is in the plane of the ratchet E , but the tooth of the armature-dog can be moved forward in either of two ways presently to be described, so as to be out of the plane of the ratchet. The armature-dog is provided with a finger g^2 in position to be engaged by a pin g^3 which extends radially from the sleeve B . When the switch hook is depressed the pin g^3 swings to the left as shown in Figs. 1 and 4, and, if the tooth of the armature-dog has been swung forward it engages the finger g^2 to move the armature-dog backward thereby returning the tooth to its normal position.

H is the front armature, and the same is pivoted near the lower end of the magnet upon a horizontal pivot so as to swing back and forth, its forward movement being limited by engagement with an extension f^1 of magnetic material, magnetically connected with the upper end of the core of the magnet. The main armature has pivoted to it, near its right hand end as viewed in the drawing, a lever H^1 of the first order, which has a tip extending into the path of a pin h on the end of the front armature, so that when said armature is swung backward it will strike said tip and, in an obvious manner, swing the free-end of the armature-dog forward thereby removing the tooth thereon from the path of the ratchet.

The magnet is of such strength that when affected only by the normal line current it will not actuate any of its armatures, but it is of such strength as to operate as a holding magnet for the main armature when the same is depressed in the manner presently to be set forth, and as set forth in connection with my prior application. The front armature responds only to alternating currents. When an alternating current passes through the magnet coils the magnetic tip f^1 will tend to repel the front armature starting it forward and it will then be drawn up to the poles of the magnet and, owing to the greater power of said poles it will remain there with the result that the tooth on the armature dog will be swung forward out of the path of the ratchet, said dog being returned to its normal position as already set forth at the close of the downward movement of the switch hook after the call is completed. This front armature is the mechanism through the medium of which a ringing current is prevented from causing a call to be registered. When the switch hook is raised the sleeve B , plate D , pawl D^1 and ratchet E are moved forward with the result that the register is advanced one number and the action of the ratchet upon the tooth of the armature dog depresses the main armature and it is held in a depressed position by the magnet, which, as already stated, operates as a holding magnet, until there is a break in the current, at which time

the main armature moves up, holding the ratchet in its advanced position and rendering the registering device effective. This is the normal operation in making a call.

5 When the switch hook is raised to answer a call there is normally no break in the line current so that the main armature remains permanently depressed, the tooth on the armature dog remains below the ratchet, and
10 when the switch hook is depressed at the close of the conversation the dog G^1 will, by friction, retract the ratchet to its original position. If, however, the switch hook be
15 raised to answer a call while the bell is ringing the main armature will, naturally, move up, and this would tend to make the movement of the register an effective one, excepting for the fact that simultaneously
20 with this upward movement of the main armature, the front armature moves forward and shifts the tooth on the armature dog forward out of the path of the ratchet, so that when the switch hook is again depressed the ratchet will be retracted.

25 I is a shouldered peg which projects forward from the rear face of the casing of the device, the shoulder at the end of said peg affording a rest for a flat spring I^1 secured to and projecting from the plate D. The
30 normal position of the plate D is that illustrated in Figs. 3, 5 and 6, in which the tip of the spring rests on the shoulder of the peg I.

J is the rear armature. This armature is
35 pivoted on a horizontal pivot, is normally pressed backward by means of a suitable spring, and can have its upper or free end swung forward under the influence of the magnet from the position shown in Fig. 8.
40 The upper end of the armature is cut away on its forward side, so that a shoulder is provided, whereby there are two contact surfaces j and j^1 in different planes, the surface j^1 being the normal front surface of the
45 rear armature and the surface j being to the rear thereof and above the same. The armature J is so arranged that it will respond only to a very much more powerful current than is used to affect the other armatures,
50 the current which is preferably used for this purpose being a 110-volt current such as is commonly used in connection with telephone apparatus for operating the coin-discharging mechanism of those instruments
55 where the calls are paid for by depositing money in a box. Inasmuch as these types of telephones are in common use on almost all exchanges each operator necessarily has at her disposal means for throwing a 110-volt
60 current over every line under her control. Now this current can be used to operate the armature J. When the plate D is in its normal position, the application of this powerful current will draw the armature J forward for the first time, the parts being, be-

fore the application of this current, in the positions shown in Figs. 5 and 6, and moving, under the influence of this current, to the positions shown in Figs. 7 and 8. In this motion of the armature, the contact surface j on the tip thereof engages with the
70 spring I^1 , knocking the same off the peg or pin I to the position best shown in Fig. 8, and at the same time a lower portion of the armature strikes the armature dog directly,
75 swinging the same forward about its pivot and pushing its tooth out of the path of the ratchet, thereby permitting the return of the switch hook to retract the register, so that the call is not effectively registered.
80 The flowing in of this powerful current will take place either independently of or in conjunction with a busy signal so that when the proper party is not obtained the central operator can readily prevent the registration
85 of the call. Furthermore, by a second or other subsequent operation of the rear armature the register can be set back bodily when necessary in the following manner. It will be noted that in Figs. 7 and 8 the pawl
90 on the plate D is still in engagement with the ratchet and the pin D^2 on said plate is still out of engagement with the ratchet, although both have moved somewhat from their normal position. When the rear armature
95 moves back as the flow of the powerful current ceases, all the parts remain in the same positions excepting that the armature draws its shoulder from beneath the free-end of the spring I^1 so that said spring
100 moves farther down as best shown in Fig. 10. On a subsequent advance of the rear armature the contact surface j^1 engages the spring I^1 and moves said spring forward to a still greater distance, whereupon the parts
105 assume the position shown in Figs. 11 and 12, where the pawl on the plate D has pulled out of the ratchet, and the pin has advanced to catch a tooth. When the flow of current is again stopped the armature will drop
110 back and the spring d^2 will draw the plate D back to the positions shown in Figs. 9 and 10, the pawl and pin operating after the manner of the corresponding parts of an escapement, so that the ratchet is turned back-
115 ward in the manner already set forth. This operation can be repeated three or four times, the register being thus set back three or four numbers. Of course on the depression of the switch hook at the close of the
120 use of the instrument, the plate D oscillates about the axis of the sleeve B so as to raise the spring I^1 well above the pin or peg I. The parts can thus again assume their normal or original position, and at the same
125 time in the manner already described the armature dog is moved back to its original position.

It will be seen that the present device as stated at the opening of its description ac- 130

compleishes the purposes outlined in said opening in a simple and efficient manner and particularly that the device, although accomplishing its additional functions can be effectively and regularly operated upon an ordinary telephone circuit such as is in common use without any alteration whatever of the switchboard or the switchboard connections at the central office and without any unusual manipulation on the part of the operator other than the use of a high-voltage switch which is now used by all operators working upon circuits having coin-boxes.

I realize that considerable variation is possible in the details of construction of my improved device, without departing from the spirit of my invention and I do not intend, therefore, to limit myself to the specific form herein shown and described.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with a telephone line, of a telephone call register, means for advancing the register, a spring resisting its advance, means for preventing the overwinding of the spring, an escapement device and electro-magnetic means for operating the escapement device to permit the spring to turn back the register.

2. The combination with a telephone line, of a telephone call register, a spring which resists the advancing of the register, friction means interposed between the spring and the register to prevent the overwinding of the spring, an escapement device engaging the register and electro-magnetic means controlled by line conditions for operating the escapement means to permit the spring to turn the register backward.

3. The combination with a line, and a telephone call register, of register-advancing means, means tending normally to retract the register, means cooperating with the register-advancing means to form therewith an escapement mechanism and electro-magnetic means controlled by line conditions, and operating said means as an escapement to permit the step by step retraction of the register.

4. The combination with a telephone line, a telephone call register and a driving ratchet attached thereto, of two pawls cooperating to advance the ratchet, means for moving one pawl through the medium of a part of the telephone instrument necessarily moved in making a call, an electro-magnetic means for rendering one pawl effective or ineffective in accordance with line conditions, means cooperating with one pawl to form therewith an escapement mechanism, and electro-magnetic means controlled by line conditions for operating said pawl and its cooperating means as an escapement.

5. The combination with a telephone line, a telephone call register and a register driving ratchet and an advancing pawl connected to a part of the telephone necessarily manipulated in making a call and adapted to be moved thereby, a holding-pawl to engage the ratchet, electro-magnetic means for rendering said holding-pawl effective or ineffective in accordance with line conditions, means cooperating with the advancing pawl to form therewith an escapement, means tending normally to retract the register and electro-magnetic means controlled by line conditions for operating the advancing pawl and its cooperating means as an escapement.

6. The combination with a telephone line, a telephone call register and a register driving ratchet and an advancing pawl connected to a part of the telephone necessarily manipulated in making a call and adapted to be moved thereby, a holding-pawl to engage the ratchet, electro-magnetic means for rendering said holding-pawl effective or ineffective in accordance with line conditions, means cooperating with the advancing-pawl to form therewith an escapement, means tending normally to retract the register and electro-magnetic means controlled by line conditions for operating the advancing-pawl and its cooperating means as an escapement, after said holding-pawl has been rendered ineffective.

7. The combination with a line, a telephone call register and a register driving ratchet of means for advancing the ratchet as calls are made, means tending normally to retract the ratchet, means operated by the occurrence of certain line conditions for rendering the advancing means ineffective to operate the ratchet, means cooperating with the ratchet-advancing means to form therewith an escapement and means whereby subsequent occurrence of the same line conditions will operate the register-advancing means and its cooperating device as an escapement.

8. The combination with a telephone line, a telephone call register and a register-driving ratchet, of register-advancing means arranged to advance the ratchet in the making of a call and normally retract the same, means for holding the ratchet in advance position upon the occurrence of certain line conditions, means cooperating with the register advancing means to form therewith an escapement and an electro-magnetic device controlled by certain line conditions which on the first occurrence of certain line conditions renders the holding-means by the ratchet ineffective and on the subsequent occurrence of the same line conditions operates the aforesaid escapement device to permit the reverse movement of the ratchet step by step.

9. The combination with a telephone line, a telephone call register and register-advancing means operated by a part of the telephone necessarily operated in making a call, means whereby the passage of the normal line current will maintain said register-advancing means ineffective, means whereby a break in the line current will render said advancing means effective, and means whereby after said register advancing means has been placed in effective position the passage of the ringing current will render said advancing means again ineffective.

10. The combination with a line, a telephone call register, and a register-driving ratchet of an advancing pawl, and a holding-pawl, connection between the advancing pawl and the part of the instrument moved in making a call, and electro-magnetic means for keeping said holding pawl in ineffective position during the passage of the normal line current and arranged to move the holding-pawl into effective position upon a break in the circuit, and electro-magnetic means operated by the passage of the alternating ringing current for moving said holding-pawl into ineffective position.

11. The combination with a line, a telephone call register, and a register-driving ratchet, of an advancing pawl, and a holding-pawl, connection between the advancing pawl and the part of the instrument moved in making a call, and electro-magnetic means for keeping said holding pawl in ineffective position during the passage of the normal line current and arranged to move the holding pawl into effective position upon a break in the circuit, and electro-magnetic means operated by the passage of the alternating ringing current for moving said holding-pawl into ineffective position, by moving it in a different plane from that in which it moves from its normal position.

12. The combination with a line, a telephone call register and a register-driving ratchet of an advancing pawl operated by a part of the telephone instrument moved in making a call, an electro-magnet, an armature, a holding pawl pivotally mounted on the armature to swing in the plane thereof, said magnet being arranged to hold its armature and holding-pawl out of engagement with the ratchet while the normal line current is passing and to permit the holding pawl to move into engagement with the ratchet when the normal current is interrupted, and a second armature actuated by the ringing current to move said pawl with reference to the armature out of engagement with the ratchet.

13. The combination with a line, a telephone call register and a register-driving ratchet of an oscillatable member rocked by the movement of a part of the instrument necessarily moved in making the call, a

plate carried by said oscillatable member and pivoted thereto to rock with reference thereto in a plane transverse to that of the oscillation of the member, a pawl and pin on said plate adapted by the oscillation thereof to act upon the ratchet as an escapement, the pawl normally engaging the ratchet to advance the same, an electro-magnet, an armature therefor, a holding-pawl movable on the armature transversely to its normal movement, the pawl being adapted to move into the path of the ratchet upon the occurrence of certain line conditions, and a second armature actuated only by other line conditions arranged to move the pawl transversely out of the path of the register on first movement of the second armature and being arranged when again moved to oscillate the plate for escapement purposes.

14. The combination with a line, a telephone call register and a register-driving ratchet, of an oscillatable member rocked by the movement of a part of the instrument necessarily moved in making the call, a plate carried by said oscillatable member, and pivoted thereto to rock with reference thereto in a plane transverse to that of the oscillation of the member, a pawl and pin on said plate adapted by the oscillation thereof to act upon the ratchet as an escapement, the pawl normally engaging the ratchet to advance the same, an electro-magnet, an armature therefor, a holding-pawl movable on the armature transversely to its normal movement, the pawl being adapted to move into the path of the ratchet upon the occurrence of certain line conditions, and a second armature actuated only by other line conditions, a member on said plate which is engaged by the first movement of said second armature and moved from its normal position to a second position, the armature being provided with means for engaging said member when in second position upon subsequent movements of said armature thereby to actuate said plate and the parts carried thereby as an escapement.

15. The combination with a line, telephone call register and a register-driving ratchet of an oscillatable sleeve concentric with the ratchet, a plate pivoted to the sleeve on transverse pivot, a pawl on the plate normally engaging the ratchet, a pin on the plate normally out of engagement with the ratchet, said pawl and pin being adapted to operate as the two members of an escapement as the plate is rocked on the sleeve, the sleeve being connected to a part of the telephone instrument necessarily manipulated in making the call, whereby the pawl will normally advance the ratchet and retract the same at the completion of the call, an electro-magnet, an armature, a holding-pawl mov-

able on the armature and arranged to be held out of engagement with the ratchet by the passage of the normal line current, and upon the break therein to engage the ratchet and a second armature moved by a more powerful current than the normal, and arranged on its first oscillation to shift said holding-pawl transversely to its normal movement out of engagement with the ratchet and on subsequent movements to oscillate the plate to move the parts carried thereby as the members of an escapement.

16. The combination with a line, a telephone call register and a register-driving ratchet, of an oscillatable sleeve concentric with the ratchet, a plate pivoted to the sleeve on transverse pivot, a pawl on the plate normally engaging the ratchet, a pin on the plate normally out of engagement with the ratchet, said pawl and pin being adapted to operate as the two members of an escapement, as the plate is rocked on the sleeve, the sleeve being connected to a part of the telephone instrument necessarily manipulated in making a call, whereby the pawl will normally advance the ratchet and

retract the same at the completion of the call, an electro-magnet, an armature, a holding-pawl movable on the armature and arranged to be held out of engagement with the ratchet by the passage of the normal line current, and upon the break therein to engage the ratchet and a second armature moved by a more powerful current than the normal, a spring on said plate in position normally to be engaged by the tip of the second armature, whereby the first oscillation of the second armature will move said spring into position to be engaged by the shoulder on the armature and subsequent movements of the second armature will oscillate the plate to actuate the parts carried thereby as an escapement.

In testimony whereof, I have hereunto set my hand, this 20th day of May nineteen hundred and ten, in the presence of two subscribing witnesses.

HENRY K. SANDELL.

In presence of—

RALPH A. SCHAEFER,
JOHN WILSON.