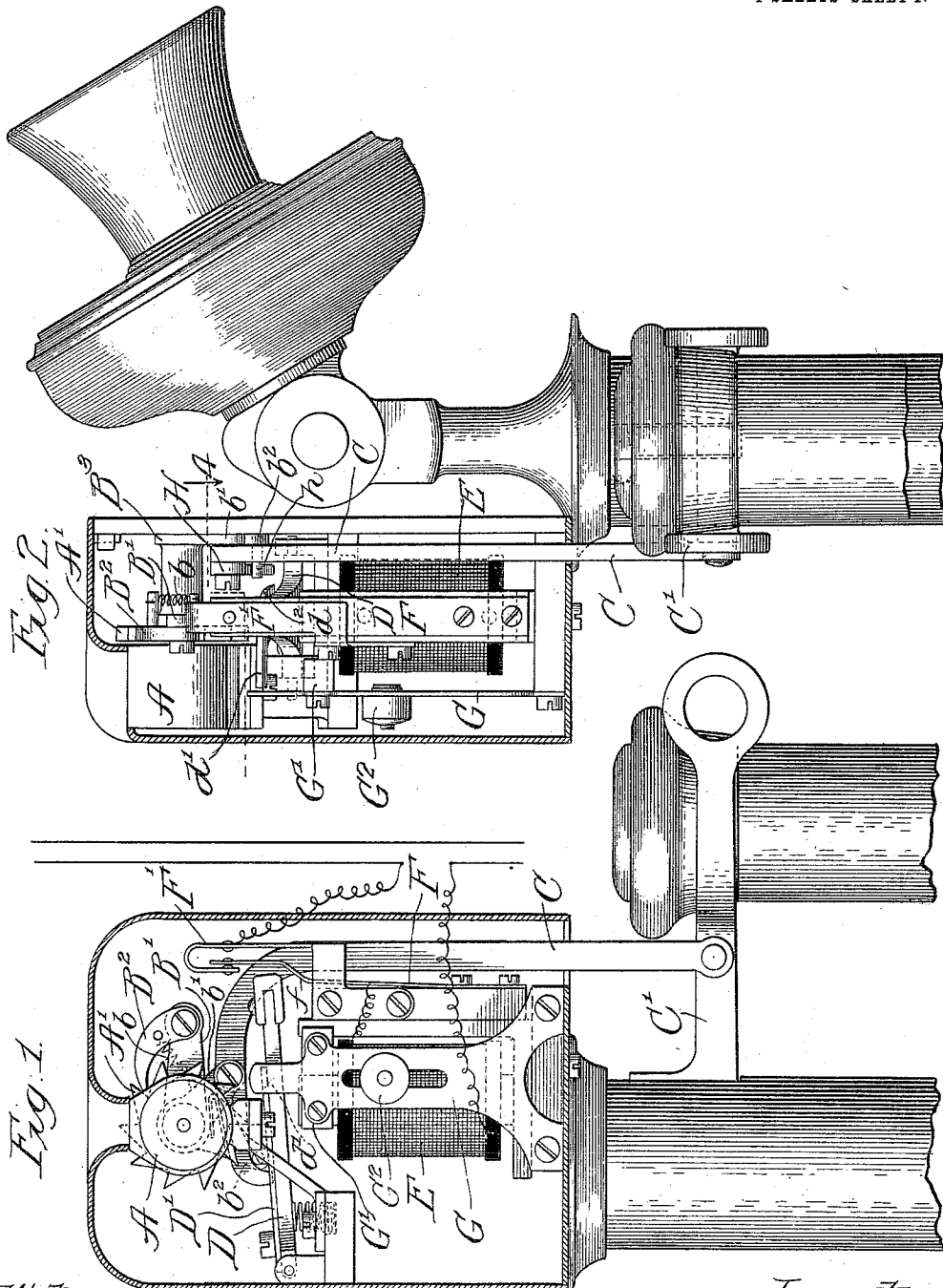


H. K. SANDELL.
 TELEPHONE CALL RECORDER.
 APPLICATION FILED SEPT. 24, 1909.

979,569.

Patented Dec. 27, 1910.

4 SHEETS—SHEET 1.



Witnesses:
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 Chas. H. Buell.

Inventor:
 Henry K. Sandell.
 By D. J. G. Smith, Esq.,
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4 SHEETS—SHEET 2.

Fig. 3.

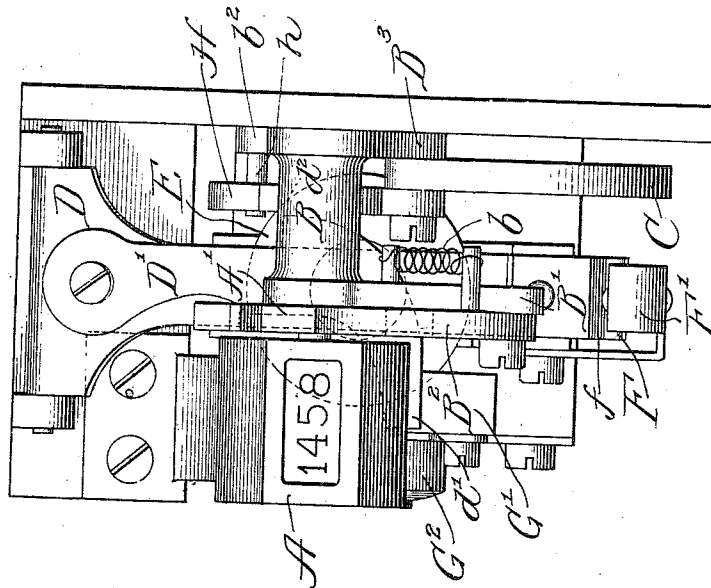
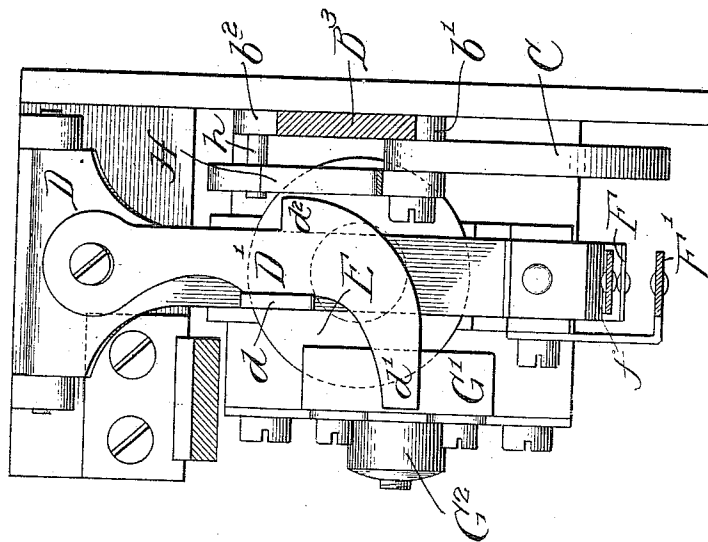


Fig. 4.



Witnesses:
 E. B. Dayford,
 Chas. A. Buell.

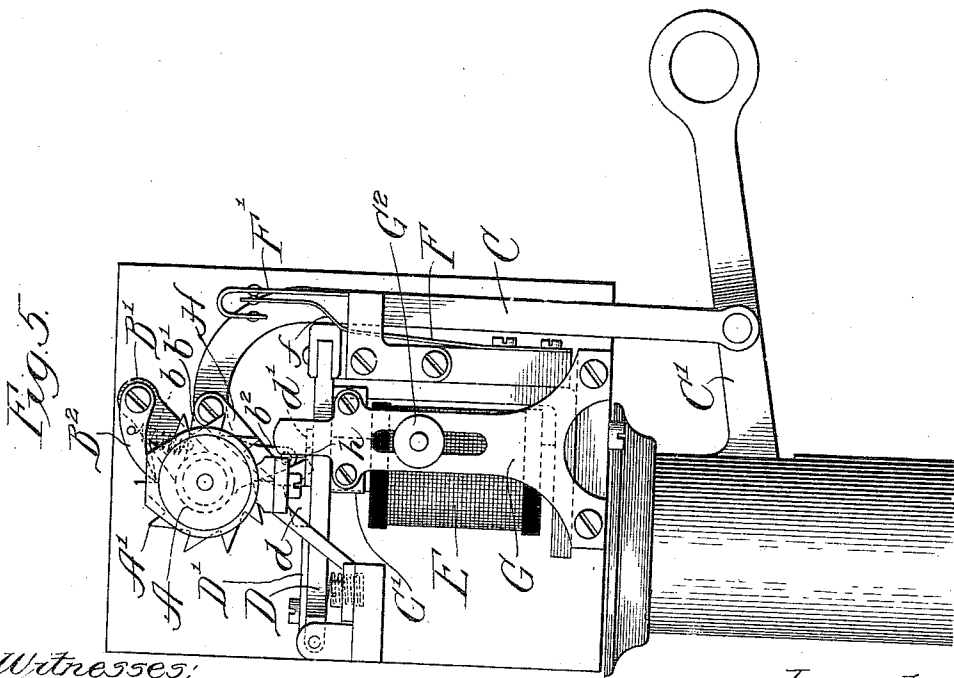
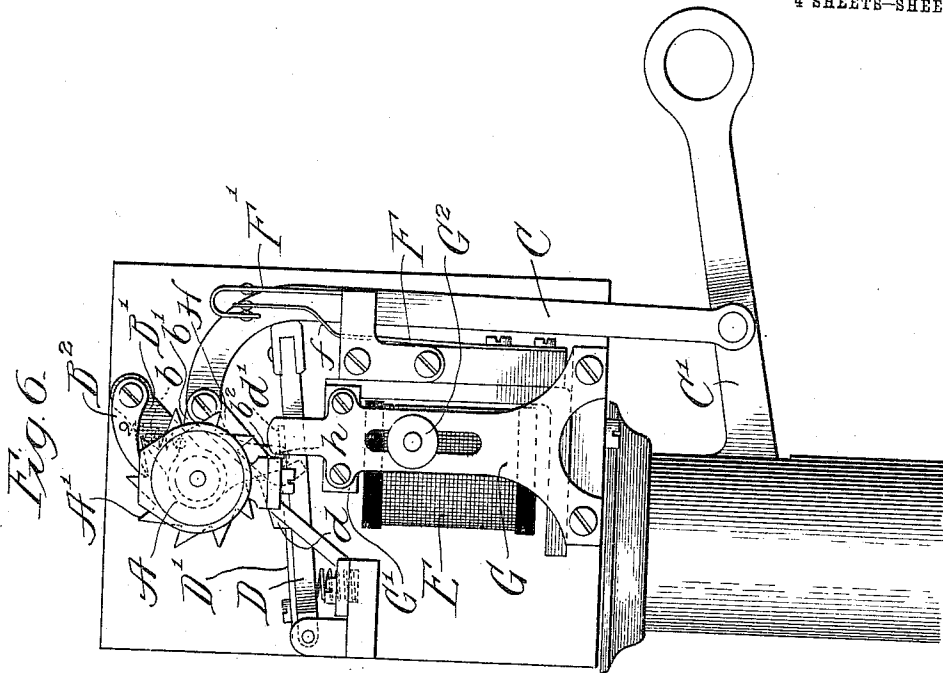
Inventor:
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4 SHEETS—SHEET 3.



Witnesses:

Edw. Gaylord,
 Chas. H. Bull.

Inventor:

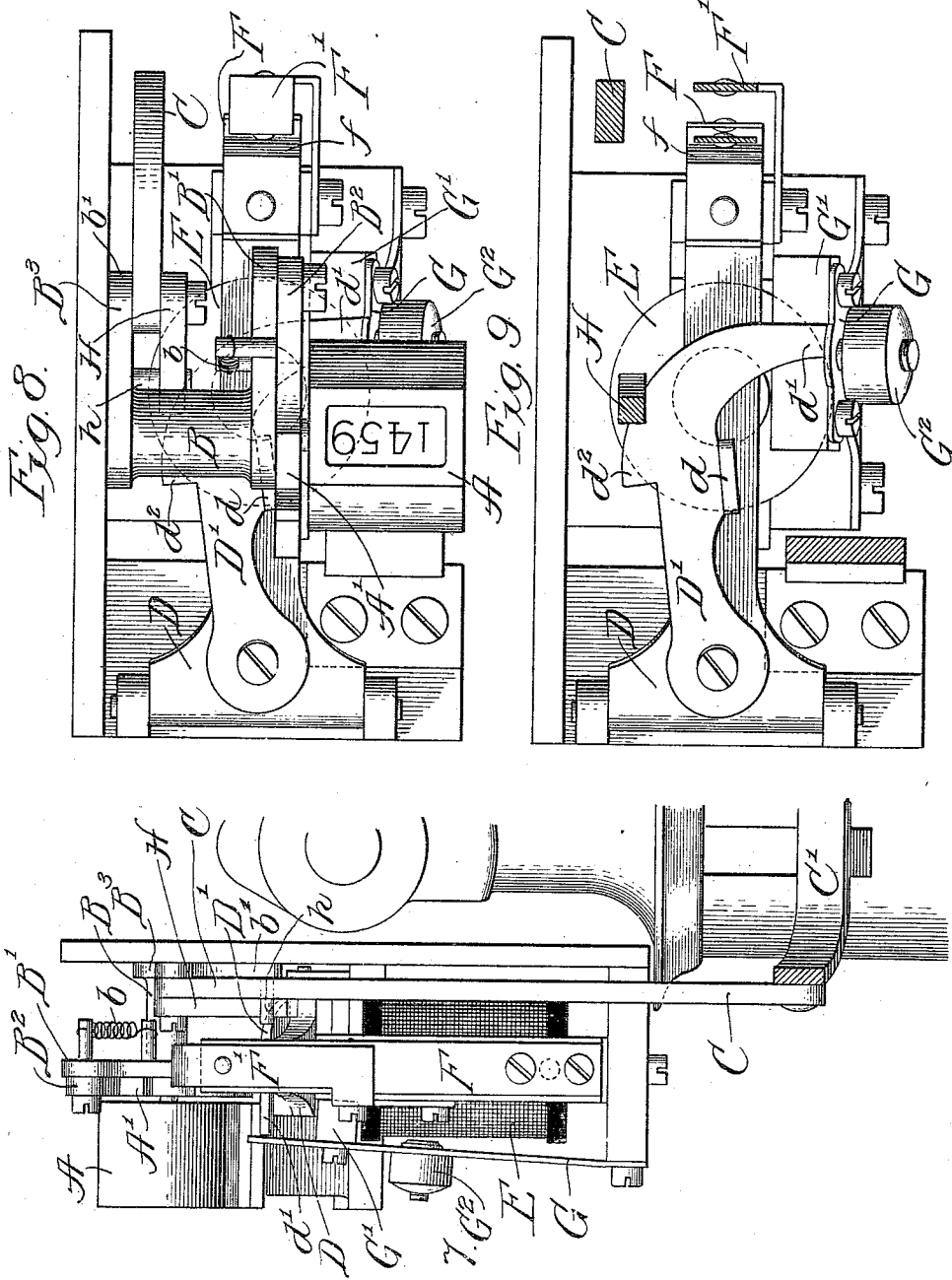
Henry K. Sandell
 By, Dapenforth, Lee, Christensen & Miller,
 Attys.

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4 SHEETS—SHEET 4.



Witnesses:
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Fig. 7. G².

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UNITED STATES PATENT OFFICE.

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

TELEPHONE-CALL RECORDER.

979,569.

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

Application filed September 24, 1909. Serial No. 519,448.

To all whom it may concern:

Be it known that I, HENRY K. SANDELL, a citizen of the United States, residing at 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 a certain new and useful improvement in telephone call recorders, and is fully described and explained in the specification and shown in the accompanying drawings, in which:

Figure 1 is a front view of my improved device, the front portion of the case being broken away and the parts being shown in their normal position; Fig. 2, a similar side elevation; Fig. 3, a top plan of the device with the case removed, the parts being shown in the same position; Fig. 4, a horizontal section in the line 4 of Fig. 2; Fig. 5, a view similar in general to Fig. 1, showing the parts in the position they occupy when making a call; Fig. 6, a similar view showing the parts in the position they occupy immediately after receiving the answer of central to a call; Fig. 7, a side elevation in general similar to Fig. 2, showing the parts in the position they occupy when the busy signal is received; Fig. 8, a view similar to Fig. 3, showing the corresponding parts in the position which they occupy when the busy-signal is received, and Fig. 9, a view similar to Fig. 4, showing the parts in the position they occupy when the busy-signal is received.

Referring to the drawings:—A is a counting-device of ordinary form provided with numeral wheels having the usual means of connection between them whereby the arithmetical carrying can be accomplished. The interior construction of this counting-device is not illustrated in the drawings, for the reason that such construction is well known, and devices of the character can be purchased complete on the market in a form thoroughly suited for their intended purpose in connection with my present invention. The units-wheel of the counting-device A has rigidly attached to it a ten-tooth ratchet-wheel, so that a movement of the ratchet-wheel of one tooth will cause the counting-device to move one number.

A sleeve B is journaled in line with the axis of a ratchet-wheel A¹ and is capable of oscillation in the manner set forth. This sleeve B has an integral radially-projecting

arm B¹ which carries a pawl B² in engagement with the ratchet-wheel A¹, a spring b, which connects pins on the pawl B² and radial arm B¹, serving to hold the pawl normally in engagement with the ratchet-wheel. The sleeve B carries at its rear an integral plate B³, which is roughly triangular in form, as seen in dotted lines in Figs. 1, 5 and 6, and in top-plan and section in Figs. 3 and 4, the right-hand lower corner of this triangular plate being indicated in the drawings, for convenience, by the reference-letter b¹, and the left-hand corner by the reference-letter b². Pivottally secured to the right-hand lower corner b¹, referred to, is a curved link C which runs downward in the manner illustrated in Figs. 1, 5 and 6, its lower end being pivottally connected to the receiver-hook or switch-hook of an ordinary telephone.

It will be obvious that from the construction so far described, when the telephone-receiver is lifted from the switch-hook, the link C will be raised by means of the spring which forces up the switch-hook, this spring being a usual and necessary part of the telephone apparatus to which the meter is applied. This upward movement of the link C will oscillate the plate B³, sleeve B, and consequently the radial arm B¹ from the position shown in Fig. 5, thus rotating the ratchet-wheel A¹ and the units-wheel of the counting-device to the extent of one tooth of the ratchet-wheel or one number of the units-wheel. When the receiver-hook is again depressed, if no means were provided to hold the ratchet-wheel in its advanced position, it would be turned back again to its original position, the spring engagement between the pawl and the ratchet-wheel being sufficient to cause that retrograde movement in the absence of some holding device for the ratchet-wheel.

D is a vertically-movable armature, normally spring-pressed upward, and mounted upon a horizontal pivot. This armature carries on its upper surface a dog D¹ having a tooth d in the plane of the ratchet-wheel A¹. The dog is pivoted to the armature, and is movable in a horizontal plane, as will be clearly illustrated in Figs. 4 and 9, where the dog is shown in two positions, and it is provided also with a forwardly-projecting finger d¹, and a rearwardly projecting-cam surface d².

E is an electro-magnet which is placed in position beneath the armature D. One terminal of the electro-magnet is connected to one of the line-wires as shown in Fig. 1, and the other is connected to a movable spring F, having a cam-shaped portion *f* adapted to be engaged by the end of the armature D. The upper end of the spring F lies within the bend of a U-shaped terminal F^1 , which is connected to the opposite side of a break in the same line-wire to which the terminal of the electro-magnet is connected, thus placing the electro-magnet and the breaking-device, composed of the spring F and U-shaped metal piece F^1 in series with each other and in series with one of the line-wires. The electro-magnet E is so arranged that with the normal line current, it will act only as a holding-magnet for its armature D, but will be unable to draw the same down by magnetic force alone. In other words, when the armature is pushed down mechanically in the manner to be described, it will be held down by this magnet as long as current is going over the line, but the moment there is a break in the line-current, the armature will move upward under the influence of its spring, and will remain up in spite of any current which may flow through the magnet thereafter until again mechanically pressed down adjacent to the pole of the magnet.

A second armature G is provided which is pivoted upon a horizontal pivot and extends upward therefrom in a vertical direction, being capable of a limited back-and-forth oscillation. This armature carries a block G^1 which projects over adjacent to the pole of the electro-magnet, and it also carries an adjustable weight G^2 for a purpose to be described. The armature G is so arranged that when a heavy current, such as the ringing-current or the busy-signal current is sent over the line, it will be attracted, but will be wholly unaffected by the ordinary line-current. When the armature G is to be operated by the busy-signal current, which is of a pulsatory nature, the adjustable weight G^2 is used to tune the armature to the speed of pulsation of the current normally used upon the line selected. It will be noted by reference to Figs. 4 and 9, that when the armature G is attracted, it swings the dog D^1 upon its pivot. It is also to be noted the dog D^1 is not spring-pressed in either direction but will remain wherever placed, and for the purpose of returning it to its normal position, which is shown in Fig. 4, after it has been pushed to the position shown in Fig. 9 by the armature G, a tooth H is carried by the same pivot, which carries the link C, this tooth extending to the left from its pivot and resting upon a pin *h*, which is carried by the corner b^2 of the plate B^3 . The tip of this tooth is in such position that when the plate B^3 rocks from the position shown

in Figs. 5 and 6 to the position shown in Fig. 1, the tooth will wipe along the cam-surface d^2 of the dog D^1 , wedging said dog back to its normal position.

The construction of the parts and their manner of coöperation with each other having been generally set forth, a complete description of the operation of the device can now be given.

The parts occupy the position shown in Fig. 1 when the device is at rest. When it is desired to make a call, the receiver is lifted from the receiver or switch hook and the parts move under the influence of the switch-hook to the position shown in Fig. 5. That is to say, the sleeve B is rocked, and the ratchet-wheel is turned one tooth. Simultaneously, one of the teeth of the ratchet-wheel at the lower portion of its periphery runs over the tooth *d* on the dog D^1 , thus depressing the armature D, which in its downward movement, contacts with the cam *f* on the spring F and swings the said spring from the position shown in Fig. 1 to the position shown in Fig. 5. At the time when the position shown in Fig. 5 is reached and the circuit is again completed through the electro-magnet, the armature D will have reached the sphere of influence of the magnet E and will be held in the lower position magnetically, the tooth at the bottom of the periphery of the ratchet-wheel running past the corresponding tooth *d* on the dog D^1 so as to permit the armature to rise when released from such magnetic attraction. When the operator at central plugs into the subscriber's jack, there is a momentary break in the line-current caused by the operation of the plug upon the jack. When this break occurs, the armature immediately rises to the position shown in Fig. 6, throwing the tooth *d* into the path of one of the lower teeth on the ratchet-wheel and preventing its retraction. The breaking-device consisting of the spring F and the U-shaped loop F^1 is provided merely to accentuate the break thus produced by the central-operator. In some cases, the break produced at central might be so short that the inertia of the armature D would not permit it to get beyond the range of magnetic activity of the magnet E by the time the magnet was again energized at the completion of the insertion of central's plug, and the breaking-device serves in an obvious manner to accentuate the break thus produced. Upon the very slightest upward movement of the armature G, the spring F begins to move from the position shown in Fig. 5 toward the position shown in Fig. 6, and it can not reach its complete left-hand position until the armature has moved under the influence of its spring entirely beyond the effective magnetic field of the magnet. The operation so far described is that which

takes place in over ninety per cent. of the calls made, and it also includes all that is done when a call is answered.

It will be obvious that when the parts reach the position shown in Fig. 6; that is the position occupied after central has plugged in, a return of the switch-hook to its normal position will cause the pawl B² to move one tooth on the ratchet-wheel A¹ thereby leaving the counter advanced one number. It will also be obvious that if the switch-hook were returned to its normal or lowered position from the position shown in Fig. 5, the counting device would simply be turned back one tooth, the ratchet-wheel being free to move without engagement with the tooth *d* on the dog D¹ which in that position is held down by the magnet. This is the operation when a call is answered. If the bell rings, the switch-hook is raised, the parts moving in the manner already described to the position shown in Fig. 5. There is, however, no opportunity for a break in the line, and when the receiver is placed back upon its hook, the parts will move back to their original position, the armature being held downward by the attraction of the magnet until the line-current is momentarily broken by the movement of the switch-hook at the extreme end of its operation. Thus, when answering a call, the counter, or indicator, will simply move forward one number and then move backward one number.

After the parts reach the position shown in Fig. 6, when the subscriber's call has been answered by central, the parts are in a position where a call will inevitably be registered upon the return of the switch-hook unless some further manipulation be performed. A certain percentage of the calls are ineffective, either because the called subscriber does not answer, or because the called subscriber is busy. In the latter case, the operator sends out the busy-signal and in the former case, it would be necessary in the use of my apparatus to send out either a busy-signal or other current more powerful than the ordinary line-current such as the ringing current. In other words, it is essential in the use of this apparatus, that when there is an ineffective call which has been answered by central, that a more powerful current or a pulsatory current shall be thrown upon the line.

All switchboard installations are provided with means by which this current can be sent out, and in the great bulk of cases, such currents are sent out in ordinary practice today, so that the sending of such a current requires no additional equipment at central and only in a very small fraction of cases will it require any manipulation additional to that which is now commonly performed. It is to be understood that when this heavy

current is sent out, the parts will occupy the position shown in Fig. 6. That is, the subscriber's call will have been answered by central. The heavy current or pulsatory current will move the parts to the positions shown in Figs. 7, 8 and 9; that is to say the armature G will be attracted, its upper end contacting in the manner illustrated with the forwardly extending finger *d*¹ upon the dog D¹ swinging the same from the position shown in Fig. 4 to the position shown in Fig. 9, thus moving the tooth *d* out of the plane of the ratchet-wheel and permitting the retrograde rotation of the ratchet-wheel with the sleeve B by reason of the engagement therewith of the pawl B² upon the downward movement of the switch-hook. Simultaneously with the downward movement of the switch-hook, the finger H will wipe along the cam-face *d*² of the dog D¹ returning the same to its normal position.

From the foregoing statement of operation it will be seen that this device will automatically register the calls in a position visible to the subscriber by a combined mechanical and electrical action without employing any movement whatever in the great bulk of cases either on the part of the central-operator or of the subscriber, which operation is not now performed by these individuals. Furthermore, it will be seen that the registering-device itself is exceedingly simple and compact; that it is economical, and that its use entails the installation of no apparatus at the central station and no substantial change in the wiring system. Its use, also, does not in any way burden the service, nor interfere with the usual and normal operation of the various parts of the system.

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, register-advancing means, and means whereby the breaking of the line-current shall render said register-advancing means effective.

2. The combination with a telephone line of a telephone call register, register-advancing means operated by the movement of a part of the telephone which is necessarily moved in making a call, and means whereby the breaking of the line-current shall render the register-advancing means effective.

3. The combination with a telephone line of a telephone call register, switch-hook operated register-advancing means, and means operated by the continuous passage of the normal line-current for rendering said reg-

ister-advancing means ineffective, and arranged, when influenced by the changes in line-current, produced by the plugging in of the central operator to render said register-advancing means effective.

4. The combination with a telephone line of a telephone call register, switch-hook operated register-advancing means, means operated by the continuous passage of the normal line current for rendering said register-advancing means ineffective, and arranged, when influenced by the changes in line-current produced by the plugging in of the central operator, to render said register-advancing means effective.

5. The combination with a telephone line of a telephone call register, switch-hook operated means for advancing the register and normally operating to move the same back, and means operated by the changes in the line-current produced by the plugging in of the operator for detaining the register.

6. The combination with a telephone line of a telephone call register, switch-hook operated means for advancing the register and normally operating to move the same back, means operated by the changes in the line current caused by the plugging in of the operator for detaining the register, and means operated by a heavier than normal current for rendering said detaining-device ineffective.

7. The combination with telephone line and a telephone call register, of an advancing pawl operated by the subscriber, and arranged normally to move forward and retract the register and a detaining pawl controlled by the operator and arranged to hold the register in advanced position.

8. The combination with telephone line and a telephone call register, of a register-advancing pawl connected to the switch-hook to be oscillated thereby, said pawl being arranged to move forward and retract the register, a detaining pawl and means under the control of the operator for actuating the detaining pawl.

9. The combination with telephone line and a telephone call register, of a switch-hook operated register-advancing pawl, a register-detaining pawl, and a holding magnet normally operating to hold the detaining pawl in ineffective position, and to release the same under the control of the operator.

10. The combination with telephone line and a telephone call register, of a switch-hook operated register-advancing pawl, a register-detaining pawl, and a holding magnet normally operating to hold the detaining pawl in ineffective position and to release the same under the control of the operator and electro-magnetic means for elevating said detaining pawl when released into an operative position.

11. The combination with telephone line and a telephone call register provided with a ratchet, of an advancing pawl connected with the switch-hook, a holding magnet, an armature of the said holding-magnet carrying a detaining pawl positioned to be held out of the path of the ratchet when held by said magnet and to reënter the path thereof when released by said magnet.

12. The combination with telephone line and a telephone call register provided with a ratchet, a switch-hook operated advancing-pawl, a holding-magnet, an armature for said magnet, a detaining pawl movable upon said armature, and arranged when said armature is attracted by said holding magnet to be out of the path of said ratchet and when said armature is released to be in the path of said ratchet, and a second armature adapted to move said pawl on said first-named armature to throw the same when released out of the path of said ratchet.

13. The combination with telephone line and a telephone call register provided with a ratchet, of an advancing pawl connected with the switch-hook, a holding magnet, an armature of the said holding-magnet carrying a detaining pawl positioned to be held out of the path of the ratchet when held by said magnet and to reënter the path thereof when released by said magnet, and a break-intensifying device in series of said magnets and actuated by its armature.

14. The combination with telephone line and a telephone call register provided with a ratchet, a switch-hook operated advancing-pawl, a holding-magnet, an armature for said magnet, a detaining pawl movable upon said armature, and arranged when said armature is attracted by said holding magnet to be out of the path of said ratchet and when said armature is released to be in the path of said ratchet, a second armature adapted to move said pawl on said first-named armature to throw the same when released out of the path of said ratchet, and a break-intensifying device in series of said magnets and actuated by its armature.

15. In combination, telephone line and a telephone call register adapted normally to be advanced at the beginning of the use of a telephone, and to be retracted at the close of such use, a register detaining-pawl and means for imparting to said pawl movements in two planes, one of said movements alone rendering the pawl operative upon the register, and the two together rendering it inoperative.

16. The combination with telephone line and a telephone call register provided with a ratchet and arranged normally to be advanced at the beginning of a period of use of a telephone and to be retracted at the end of a period of use, a detaining pawl arranged to be moved successively in two

planes under the control of the operator, the first movement advancing it into the path of the register ratchet, and the second moving it out of said plane.

5 17. In a device of the class described, the combination with a telephone line of an electro-magnet controlled by line-conditions, an armature and a telephone call register whose operation is effected by the position of said
10 armature, and an adjustable weight upon

said armature to tune the same to pulsatory current.

In testimony whereof, I have hereunto set my hand at Chicago, this 20th day of September, 1909, in the presence of two witnesses.

HENRY K. SANDELL.

In presence of—

RALPH SCHAEFER,
JOHN WILSON.