No. 620,042. Patented Feb. 21, 1899.

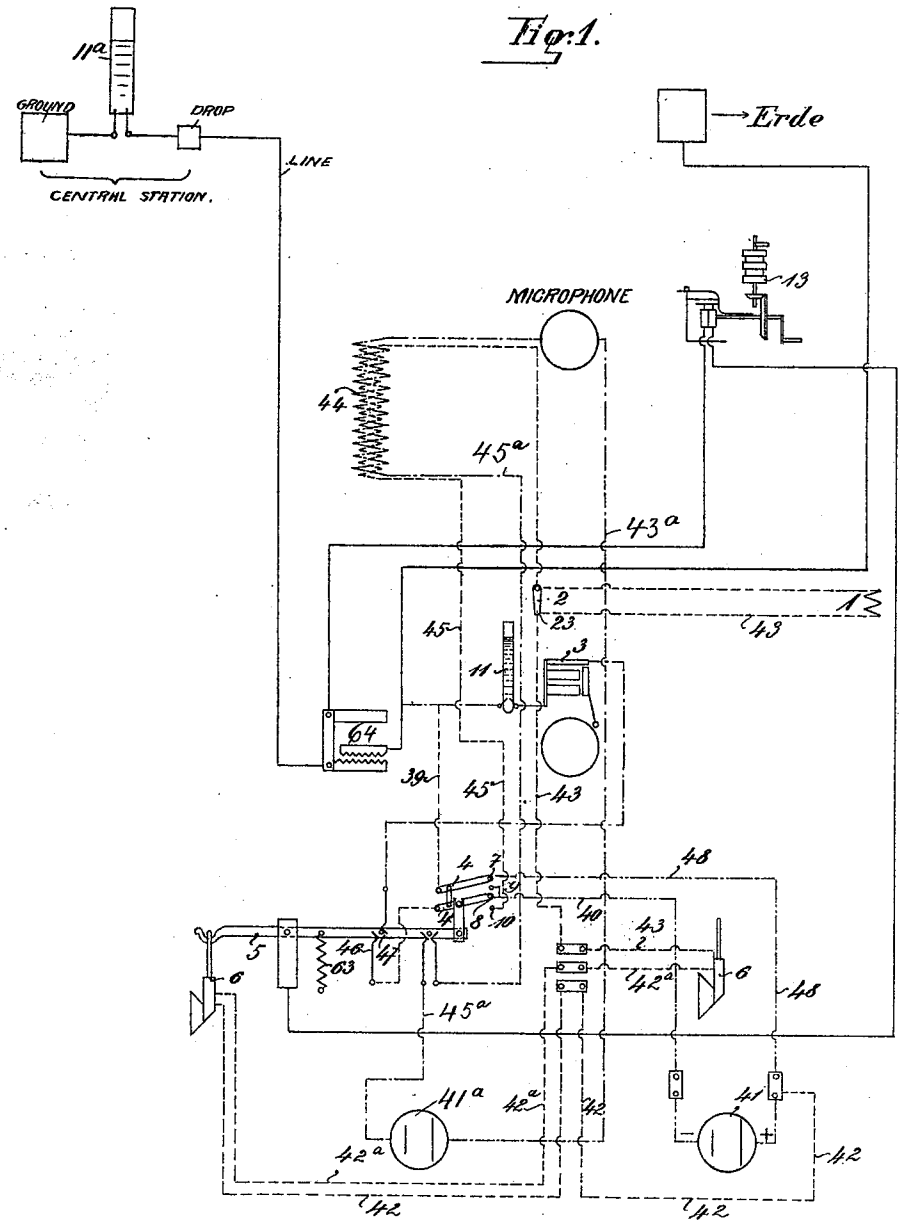
B. KRAUSSE.

TELEPHONE CALL REGISTER.

(Application filed Aug. 1, 1898.)

(No Model.) 6 Sheets—Sheet 1.

Fig. 1.



Witnesses
John Lotka
Julius Lutz.

Inventor
B. Krausse.
per
Munn & Co
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 620,042. Patented Feb. 21, 1899.

B. KRAUSSE.

TELEPHONE CALL REGISTER.

(Application filed Aug. 1, 1898.)

(No Model.) 6 Sheets—Sheet 2.

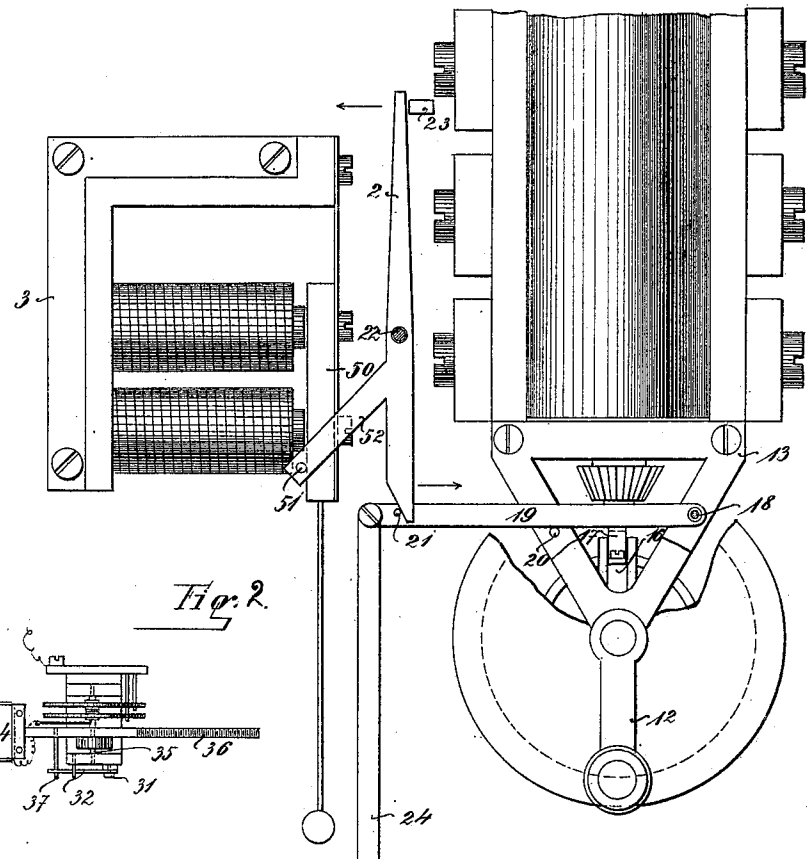
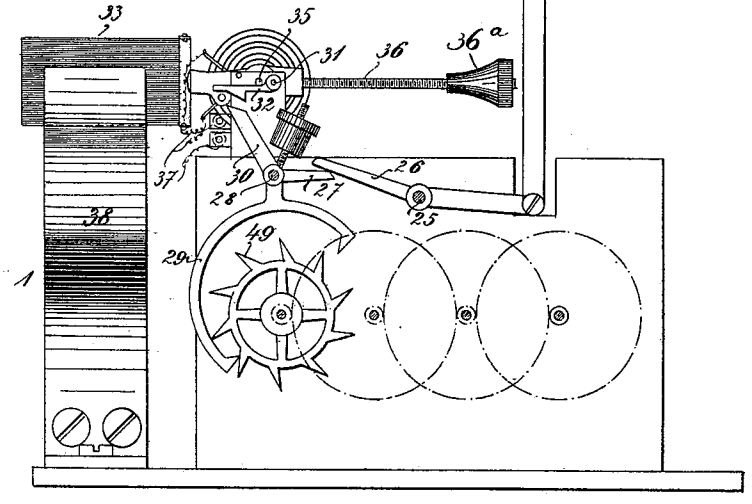


Fig. 4.

Fig. 2.



Witnesses
John Lotz
Julius Lotz

Inventor
B. Krausse
per Munn & Co
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 620,042. Patented Feb. 21, 1899.

B. KRAUSSE.

TELEPHONE CALL REGISTER.

(Application filed Aug. 1, 1898.)

(No Model.) 6 Sheets—Sheet 3.

Fig. 3.

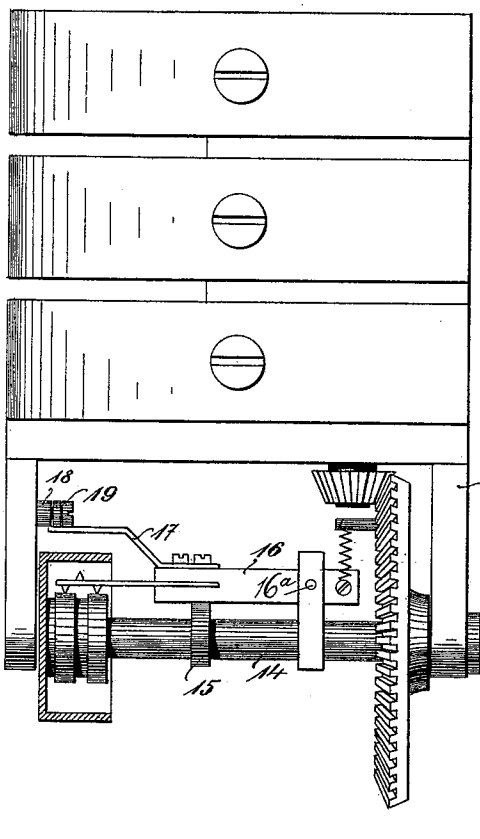


Fig. 6.

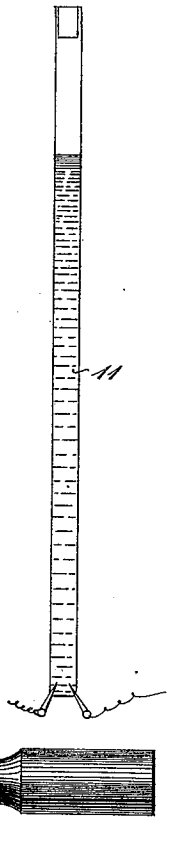
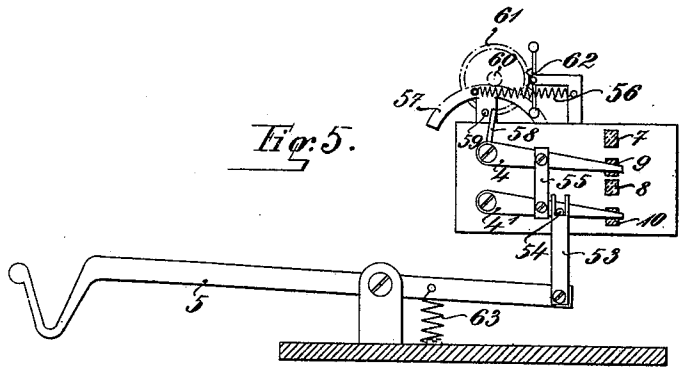


Fig. 5.



Witnesses
John Lotka
Julius Lutz

Inventor
B. Krausse
per Munn & Co
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 620,042. Patented Feb. 21, 1899.

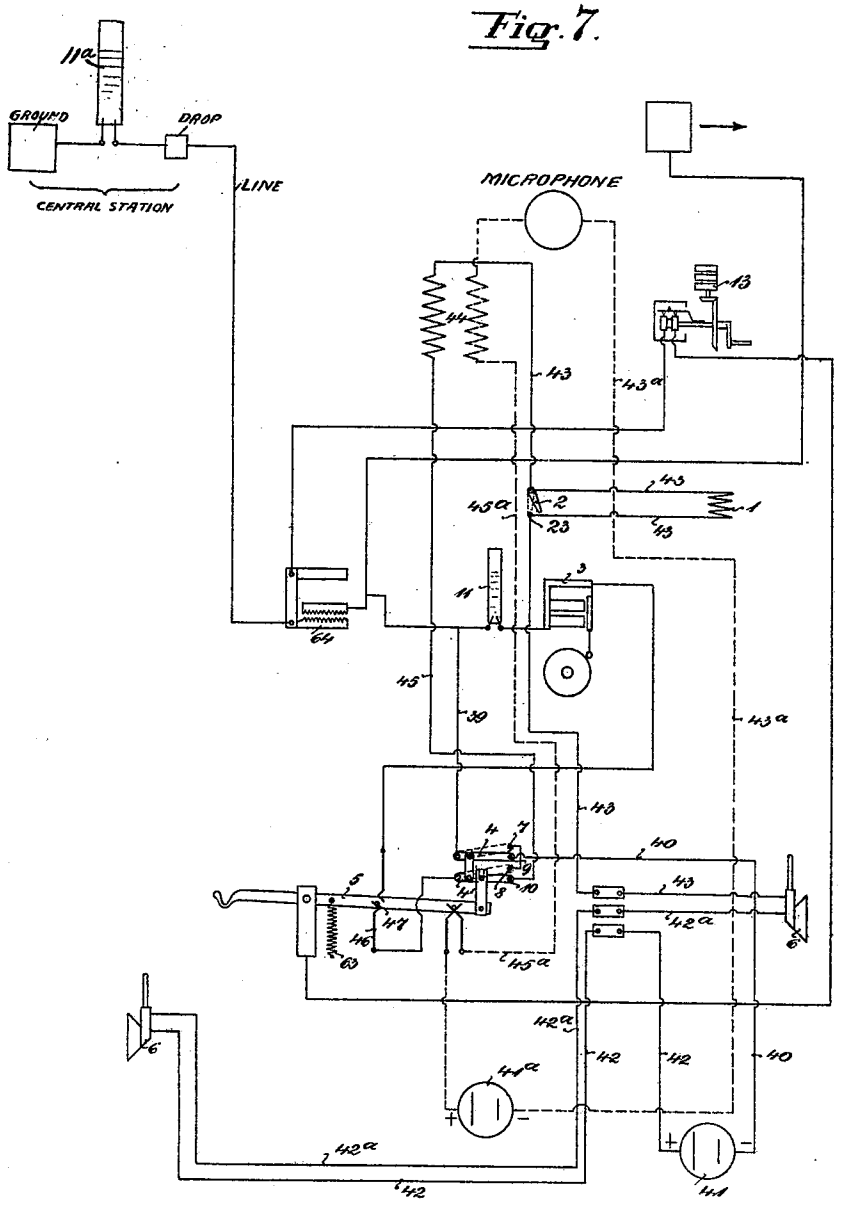
B. KRAUSSE.

TELEPHONE CALL REGISTER.

(Application filed Aug. 1, 1898.)

(No Model.) 6 Sheets—Sheet 4.

Fig. 7.



Witnesses.
John Cooke
Julius Lutz

Inventor.
B. Krausse
per Munn & Co
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 620,042. Patented Feb. 21, 1899.

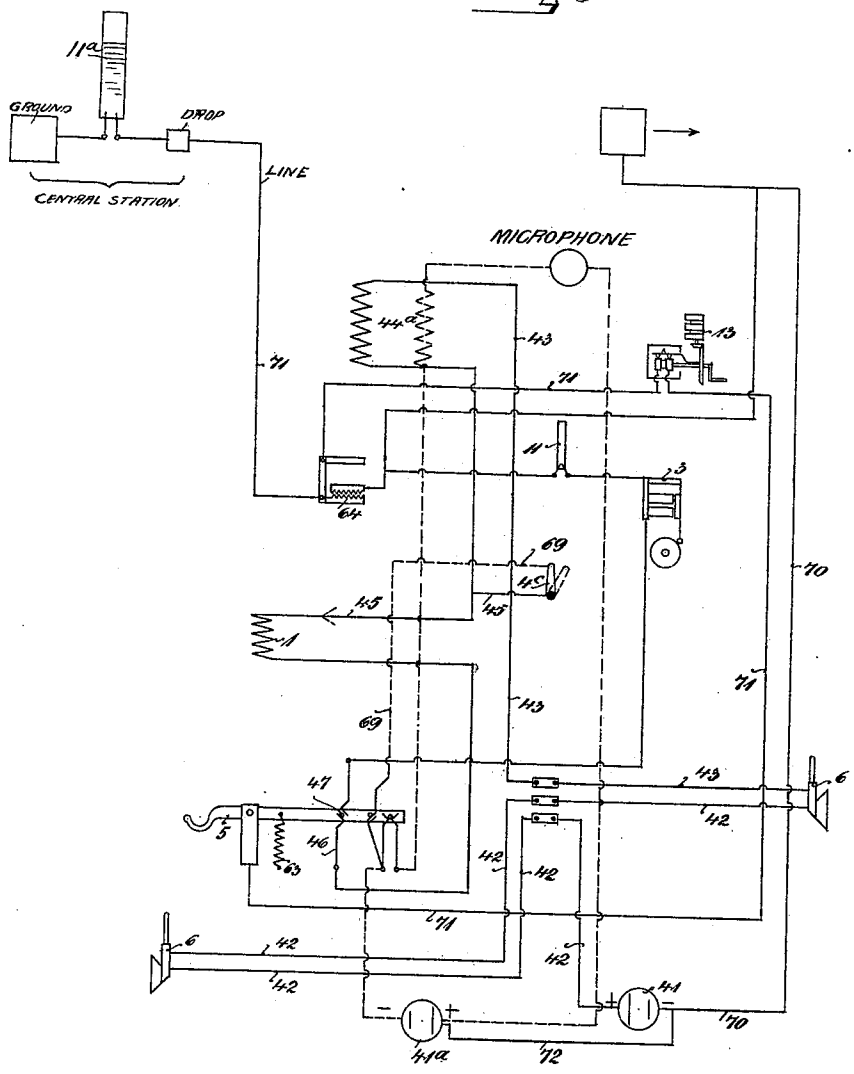
B. KRAUSSE.

TELEPHONE CALL REGISTER.

(Application filed Aug. 1, 1898.)

(No Model.) 6 Sheets—Sheet 5.

Fig. 8.



Witnesses.
John Lotka
Julius Lutz.

Inventor.
B. Krausse.
per
Munn & Co
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 620,042. Patented Feb. 21, 1899.

B. KRAUSSE.

TELEPHONE CALL REGISTER.

(Application filed Aug. 1, 1898.)

(No Model.) 6 Sheets—Sheet 6.

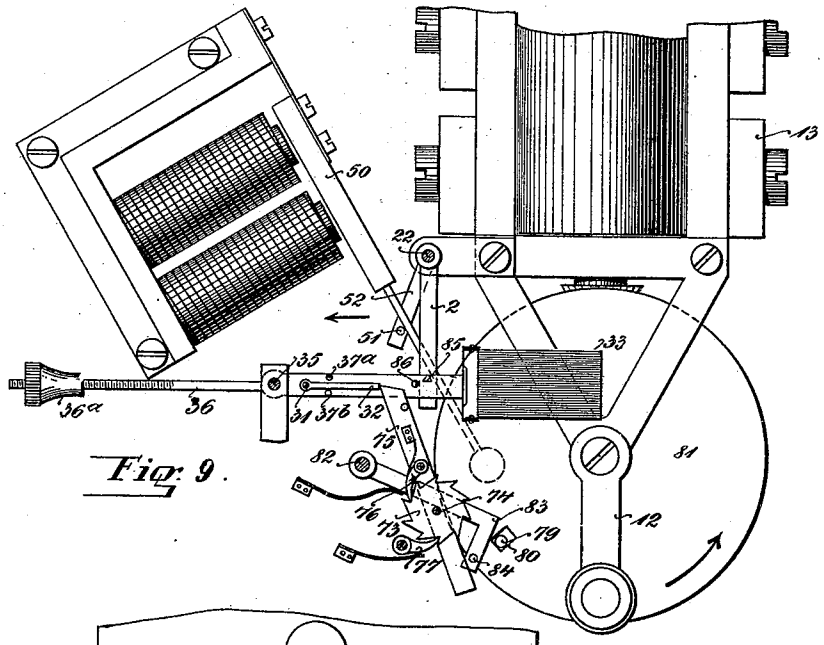


Fig. 9.

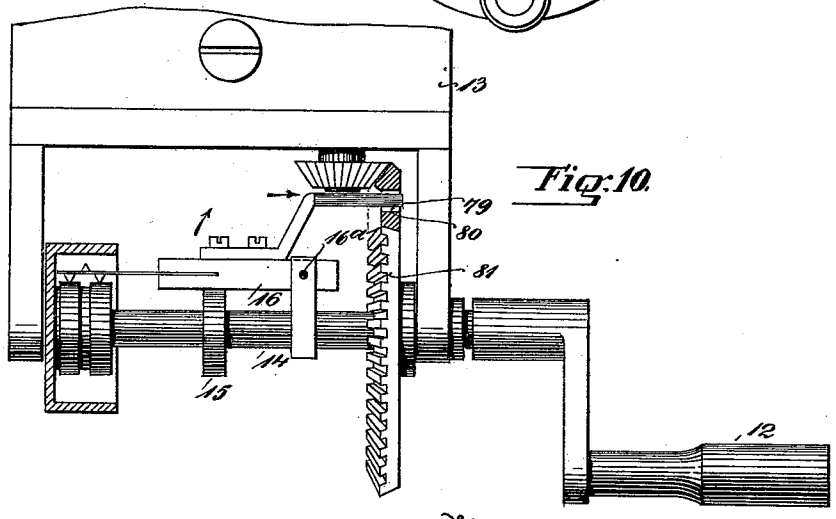


Fig. 10.

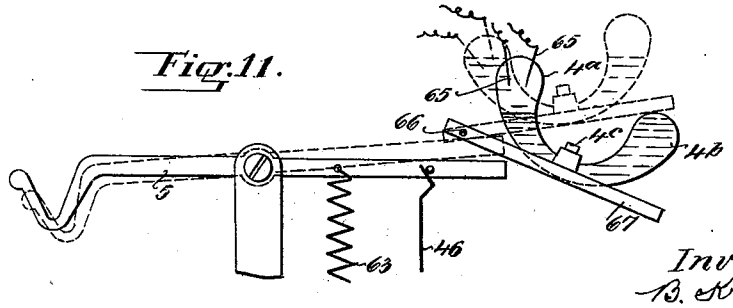


Fig. 11.

Witnesses.
John Lotka
Julius Lutz.

Inventor.
B. Krausse
per
Munn & Co.
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BRUNO KRAUSSE, OF WILMERSDORF, GERMANY, ASSIGNOR TO HEINRICH EICHWEDE, OF BERLIN, GERMANY.

TELEPHONE-CALL REGISTER.

SPECIFICATION forming part of Letters Patent No. 620,042, dated February 21, 1899.

Application filed August 1, 1898. Serial No. 687,434. (No model.)

To all whom it may concern:

Be it known that I, BRUNO KRAUSSE, a subject of the King of Prussia, German Emperor, and a resident of Wilmersdorf, near Berlin, Germany, have invented certain new and useful Improvements in Telephonic-Call Registers, of which the following is a specification.

My invention relates to a device for registering the length of time a telephone subscriber uses his instrument in actual conversation with other subscribers, (or, if desired, the number of conversations,) so that the time consumed in conversation with the central offices will not be registered, neither will any registration take place if the subscriber rung up fails to answer the call. The arrangement shown in the annexed drawings and described hereinafter effects this purpose in a simple and satisfactory manner. By means of a circuit-closing or contact device operated from the place called up when the receiver is taken off its hook both stations are connected in such a manner for a short time that the current then passing is strong enough to operate at the call end a clock or registering apparatus, or both together, such a current being produced in different ways. For instance, the said circuit-closing or contact device puts into circuit in series at the given moment the batteries of both stations put generally into circuit against one another, or one of these element groups is put out of circuit and only the current of the group remaining is used for operating the clock and registering work, or a branch wire passing from the speaking-wire to the ground is inserted by a time-contact and the current of the elements in this wire is used for operating the clock and registering work.

In the annexed drawings, Figure 1 shows the arrangement of the improved apparatus, in which the controlling elements of both stations are temporarily connected in series when the receiver is hung on the hook. Fig. 2 is a front elevation, with parts broken away, of the call-indicator and of the alarm in connection with the mechanism for operating the registering device. Fig. 3 is a side view of the call-indicator and the parts connected therewith. Fig. 4 is a plan view of the releasing mechanism for the registering-work. Fig. 5 is a side view of the switch connected with the telephone-hook. Fig. 6 shows an electrolytic cell serving as resistance. Fig. 7 shows the plan of another form of arrangement of mechanism in which the controlling element or elements of the one station are temporarily put out of circuit. Fig. 8 shows the plan of a third form of arrangement of apparatus for operating the clock and registering work there in which are inserted temporarily the elements with a branch wire passing from the speaking-wire to earth. Fig. 9 shows the front view, with parts broken away, of the inductor and of the alarm in connection with the releasing device of this apparatus. Fig. 10 shows the side view of a part of the inductor. Fig. 11 shows the side view of a time-contact.

In the following will be first described the arrangement of the plan shown in Fig. 1 and the construction of the parts of the apparatus shown in Figs. 2 to 5.

In the mechanism shown there are arranged two receivers 6, connected in series; but the circuit arrangement of the present apparatus for telephones with only one receiver is essentially the same. Of the receivers 6, which are connected with one another by the wire 42^a, the one is in connection by means of the wire 42 48 with the one controlling element or battery 41 and the contact-plate 7 and the other one by the wire 43 with the contact 23. When using only one receiver, the wire 42 is omitted, and the wires 43 and 42 are then connected with the receiver. The wire 43 is further joined to a device 1, serving for releasing the clock and registering work, and to the induction-coil 44 and contains a switch-lever 2, which when lying on the contact-plate 23 short-circuits the releasing device 1. The coil 44 is connected by the wire 45 with the contact-plate 10, adjacent to the contact 7. A double switch 4 4′, which is operated from the telephone-hook 5, lies either on the contacts 7 and 8 or on the contact-plates 9 and 10, whereby the contacts 8 and 9 are always in connection with the battery 41 by means of the wire 40. The inductor 13 is connected with the line and with the telephone-hook 5, a lightning-arrester 64 being inserted. In the call-bell circuit is inserted between the call-

bell 3 and the earth-wire an electrolytic cell 11, serving as a resistance. The microphone element *m* and the battery 41ª are joined on the one side to the wire 45ª, which, passing to the primary binding of the coil 44, is opened or closed by the telephone-hook 5, and on the other side to the wire 43ª. The exterior line leads to the annunciator-drop arranged in the known manner at the central office; but between this drop and the ground there is also inserted another resistance-cell 11ª.

The inductor 13, Figs. 2 and 3, is provided in the well-known manner with a crank 12, which is seated on the axle 14. The latter carries an eccentric 15, by which the spring-controlled lever 16, which is fulcrumed upon the pin 16ª, can be raised. The lever 16 is provided with an arm 17, which lies with its free end under the lever 19, fulcrumed upon the pin 18, and raises the same once at each revolution of the axle 14. On the inductor-frame there is seated a pin 20, which limits the movement of the lever downward. On the lever 19 there is seated a pin 21, which lies against the under end of the switch-lever 2, which is fulcrumed upon the pin 22 and can be brought into or out of contact with the contact-plate 23. The arm 52 of the switch-lever 2 is provided with a pin 51, which lies in the way of the armature 50 of the call-bell 3, as shown in Fig. 2.

The lever 19 is connected by a rod 24 with a lever 26, which is fulcrumed on the pin 25 and lies with its free end on the nose 27 of the escapement-pawl 29, fulcrumed upon the axle 28. This escapement-pawl 29 has an upwardly-directed arm 30, which can be engaged with a retaining-pawl 32, fixed on the casing of the apparatus and fulcrumed upon the pin 31. By means of the escapement-pawl 29 the escapement-wheel 49 is operated in the known manner, which is connected either with a train of wheels for registering the number of conversations or with a clockwork for indicating the duration of the conversations, or with both.

The releasing device 1, which serves for operating the clock and registering work, consists of a coil 33, which surrounds a magnet 34 in a freely movable manner and is fixed on a lever 36, fulcrumed upon the axle 35 and balanced by means of a weight 36ª. For increasing the magnetic effect on the coil 33 iron plates 38 are arranged on both sides of the magnet 34. On the lever 36 there is seated a pin 37, on which there lies the pawl 32, fulcrumed upon the pin 31. The coil 33 is joined to the wire 43, as shown in Figs. 1 and 2.

The electrolytic cell 11, Fig. 7, serving as resistance, consists of a glass tube filled with acidulated water—for instance, diluted sulfuric acid with two platinum wires embedded therein, the exterior ends of which are connected with the wires. Such an electrolytic cell, while offering no appreciable resistance to the passage of the alternating current produced by the inductor 13, will not let pass unhindered a continuous current, but forms at the passage of the same an electromotive counter force of about 2.7 volts.

The telephone-hook 5, Fig. 5, is under the influence of the spring 63 and is provided at its inner end with a fork 53, which surrounds a pin 54, seated on the switch-lever 4′ of the double switch. The levers 4 and 4′ of the double switch are connected with one another by an intermediary member 55, made of insulating material. The upper switch-lever 4 has an arm 58, which lies against the pin 59 of a wheel 57, which stands under the effect of a spiral spring 56. The wheel 57 meshes into a pinion 60 of the wheel 61, which is prevented by a retarding device 62 from a quick revolution, but in such a manner that it can move to both sides—that is, forward and backward. When the receiver 6 is suspended on the telephone-hook 5, the levers 4 and 4′ lie on the upper contacts 7 and 8. When taking the receiver 6 off, however, the levers 4 and 4′ are lowered slowly by the effect of the spring 56, connected with the wheel 57, until its free ends are lying on the under contacts 9 and 10.

The operation of the described device is as follows: When one wants to call the central station and a subscriber, one turns, as usual, the crank 12 of the inductor 13. Hereby the levers 16 and 19 are raised by means of the eccentric 15, seated on the axle 14, whereby the switch-lever 2, turnable with some friction, is moved in the direction of the arrow, Fig. 2, and is removed from the contact 23. Simultaneously the rod 24, joined to the lever 19, is raised in such a manner that the free end of the lever 26 presses on the nose 27 of the escapement-pawl 29 and moves the latter upward until its arm 30 springs behind the click 32, which keeps the pawl in the position ready for registering. The call-bell circuit is as follows: from the ground through the cell 11, to the call-bell 3, pin 47, telephone-hook 5, and inductor 13 to the line, Fig. 1. Through the interruption which takes place by the revolution of the inductor-crank of the circuit between the switch-lever 2 and the contact 23 the releasing device 1 will no more be in a shunt, but will be directly in the line-circuit. When the subscriber then takes the receiver 6 from the telephone-hook 5, the switch 4 4′ moves from the upper contacts 7 8 downward and engages the lower contacts 9 10, whereby the following connection is produced: From the earth the wire 39 passes to the switch-lever 4, contact 9, wire 40 to the negative pole of the battery 41, wire 42, through the receiver 6, connected by means of the wire 42ª 43, releasing device 1, induction-coil 44, wire 45, contact 10, switch-lever 4′, spring 46, contact-pin 47, telephone-hook 5, and from the latter in the well-known manner through the line to the annunciator-drop of the central station, this drop being connected with the ground. This putting into circuit the battery 41 of the calling-station would send

its current through the coil of the drop-magnet to the earth and operate the releasing device 1 of the calling subscriber. In order to prevent this, there is inserted in the circuit in series with the drop-magnet of the central station the above-described resistance-cell 11^a, which stops the continuous current of the battery 41 in consequence of the electromotive counter force formed at once without, however, preventing the passage of the inductor-current used for calling. Similarly after having rung up the desired subscriber's station, as in Fig. 1, the current of the battery 41 would pass through the line, inductor 13, telephone-hook 5, pin 47, and call-bell 3 to the earth and operate the releasing device 1 of the caller. In order to prevent this, there is also inserted a resistance 11 in the same manner as above described between the call-bell 3 and the earth.

When the person called takes his receiver 6 off, he throws the induction-coil of the microphone in series with the line in the usual manner by the engagement of the spring 46 with the pin 47 on the telephone-hook 5. As the switch 4 4′ in consequence of brake device connected with it moves slowly downward it keeps during this movement the circuit closed at the contacts 7 8 for a short time in the position shown in Fig. 1, while the telephone-hook 5 occupies already the position before described. During this lapse of time there is produced the following connection with the calling-station: line, telephone-hook 5, contact 47, contact-spring 46, switch-lever 4′, contact 8, wire 40, controlling element 41, wire 48, contact 7, switch-lever 4, and earth-wire 39. From this mode of connection it results that in the station called up the positive pole and in the calling-station the negative pole of the controlling element 41 are connected with the ground. Therefore now the controlling elements 41 of the calling-station and of the subscriber called are connected in series, so that now a sufficiently strong current passes through the wire in order to operate the clock and registering work at the calling-station. The connections are so made that the coil 33 will swing upward on the axle 35 when the current is passing and will thus lift the click 32 by means of the pin 37, whereby the escapement-pawl 29 becomes free and registers the beginning of the conversation by engaging with the balance-wheel 49, connected with the clock or registering work. As soon as the double switch 4 4′ has moved so far downward that it closes the contacts 9 10 the electrical connections are the same at the called station as at the calling-station, with the difference only that by the movement of the armature 50, produced during the operation of the call-bell 3, which armature lies against the pin 51 of the armature 52, secured to the switch 2, the switch 2 in the station called is slid on the contact 23 in a direction opposed to the arrow shown in Fig. 2, where it remains. The releasing mechanism at the called station is therefore short-circuited, so that it can never be released by any current that may come from the calling-station. Besides the batteries 41 of both stations are connected with the ground at their negative poles and are therefore put into circuit against one another, so that now the conversation can begin. It is not necessary to reverse the connections of the battery of the subscriber called; but a weaker and in many cases sufficient current can be obtained by connecting the wire coming from the calling subscriber directly with the earth or return wire and using only the current of the battery of the calling subscriber for operating the clock and registering work. Such an arrangement is shown in Fig. 7. Here the wire 40, coming from the negative pole of the battery 41, is connected with the contact 9 of the switch 44′, while the contacts 7 and 8 are connected with one another. With this connection the current coming from the calling subscriber would take its way in the following manner at the moment when the subscriber called lifts the receiver 6, when the switch 4 4′ still occupies the position shown in dotted lines: from the telephone-hook 5 to the pin 47, contact-spring 46, switch-lever 4′, contacts 8 7, switch-lever 4, and wire 39 to the ground and return wire. In this form of arrangement the current necessary for influencing the clock or registering work is produced in such a manner that the battery 41 of the subscriber called when taking off the receiver 6 is put out of circuit for a moment and the current of the battery of the calling subscriber consequently is alone effective.

The form of arrangement of the conversation-counting device (shown in Figs. 8 to 11) has for its purpose to keep the existing arrangement and the fixed connection of the batteries and to allow of the batteries of both stations being put into circuit in series, so that a current sufficiently strong for all cases is produced for releasing the registering device. For obtaining this purpose there is inserted at the station called on when taking the receiver off, by means of a hereinafter-described time-contact, a branch wire passing from the line-wire to the earth in such a manner that the battery-cells in the line-circuit, the number of which can be chosen at pleasure, are connected in series for a short time with one or more elements of the calling-station in order to operate the clock and registering work. In the form of arrangement represented the arrangement is made in such a manner on account of simplicity that when taking the receiver 6 off there is inserted at the station called by means of the branch wire 72, connected with the earth, the microphone-battery 41^a, indispensable at any station.

The time-contact 4^c, operated by the movement of the telephone-hook 5, consists, as shown in Fig. 11, of a vessel filled partly with mercury, but the rest being a vacuum, the

pear-shaped parts 4^a and 4^b of this vessel being connected with one another by a narrow channel, the one of these pear-shaped parts receiving the contact-pins 65, seated on the ends of the wires. This contact 4^c is fixed on an arm 67, turnable around the pin 66, against the under side of which arm there lies the inner end of the telephone-hook 5. When the receiver 6 is suspended on the latter, the contact 4^c is in the position shown in dotted lines, in which the two contact-pins 65 are surrounded by the mercury. As, however, hereby the contact 46 47 is not closed, no current passes through the wire. When the receiver 6 is taken off, the contact 4^c is lowered. The mercury, however, can pass only gradually from the upper vessel 4^a into the under one 4^b, and thus keeps the contacts 65 still in conducting connection some seconds after the speaking-circuit is already closed by the contact 46 47. This circumstance is utilized by means of the branch wire 69, Fig. 1, for the temporary putting into circuit of the microphonic battery 41^a in series with the element or elements of the calling-station. The passage of the current is as follows: In the calling-station contact 4^c, (represented in Fig. 8 only as a simple switch-arm,) as the receiver 6 is taken off, is in the dotted position shown and is therefore open. The current coming from the subscriber called passes consequently from the earth and return wire 70 to the battery 41, through the wire 42, receiver 6, wire 43, secondary winding 44^a of the induction-coil, wire 45, releasing device 1, operating the latter, contacts 46 47, telephone-hook 5, into the line 71, passes through the latter to the station called, goes here through the telephone-hook 5, contacts 46 47, releasing device 1, wire 45, time-contact 4^c, branch wire 69 to the negative pole of the battery 41^a, and from the positive pole of the latter through the wires 72 and 70 to earth. Hereby the releasing device 1 of the subscriber called is not operated, as its lever 36 is stopped in the manner hereinafter described.

The batteries 41, as before said, have their positive poles connected with the line and their negative poles connected with the ground. It can therefore be seen that when taking off the receiver 6 of the subscriber called his microphone-battery 41^a is put into circuit in series with the battery 41 of the calling-station without any interruption of the speaking-circuit, and the registering device of the calling-subscriber is hereby operated.

The construction and manner of influencing the registering-work is somewhat changed in the device represented in Figs. 8 to 11 from the device before described. The releasing device 1, Fig. 9, consists here again of a coil 33, which surrounds freely a fixed magnet (not represented in the drawings) and is seated on the balanced lever 36, fulcrumed upon the axle 35. On the latter lever there is provided a click 32, easily movable between two limiting-pins 37^a and 37^b and fulcrumed upon the pin 31. The first registering-disk is formed as a ratchet-wheel 73, on the axle 74 of which there is mounted to turn an arm 75, lying with its upper end in the path of the click. The spring-operated pawl 76, seated on this arm, meshes in such a manner with the wheel 73 that at a revolution of the arm 75 downward the wheel 73 is moved forward one tooth, while a pawl 77, fixed on the plate, prevents any backward revolution of the ratchet-wheel 73. The arm 75 is brought by the revolution of the inductor-crank 12 into the position ready for counting and registering. This is effected by the revolution of the crank 12, causing the eccentric 15, Fig. 10, seated on the axle 14, to move the arm 16, fulcrumed upon the pin 16^a, in the direction of the arrow, whereby a pin 79, seated on the latter arm, passes through an opening 80 of the inductor-wheel 81. At the further revolution of the wheel 81 this pin 79 meets the bent lever 83, fulcrumed upon the pin 82, and presses the same down. As the lever 83 lies with a pin 84 against the under end of the arm 75 it turns by its downward movement this arm 75 in such a manner that the upper end of the same lies behind the click 32. Hereby the arm 75 strikes against the arm 2, rotatable with some friction upon the pin 22, and moves the same in such a manner that its projection 85 comes out of line with the pin 86 of the lever 36, so that the latter can thus move freely. When the current passes through the coil 33, the latter moves upward with the lever 36, whereby the click 32 is carried along and lets the arm 75 fall downward, the pawl 76 of which pushes hereby the wheel 73 forward for one tooth, and thus registers a conversation. When, however, the station is called, a counting shall not take place. This is obtained by the movement of the call-bell armature 50. When ringing up, the arm 52, connected with the arm 2 and lying with a pin 51 against the call-bell hammer, is displaced in the direction of the arrow, Fig. 9. Hereby the projection 85 of the arm 2 is laid over the pin 86 of the lever 36, and thus prevents an upward movement of the latter.

As there are telephone arrangements in which instead of the earth-wire a special return-wire is used, it will be understood that my invention applies as well to constructions in which a return-wire is used as to those in which a ground connection is employed and that a ground connection and a return-wire are equivalents.

It is evident that the several devices used in the described arrangement can be replaced by equivalent means without the characteristics of the present invention being affected.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a telephone system, a registering device, a device for normally locking the same,

an electrically-operated releasing mechanism for said locking device, electric generators, such as batteries, located at the subscribers' stations, and current-switching devices, in connection with said batteries and with the releasing mechanism, said current-switching devices being controlled by the establishment and interruption of the speaking-circuit and serving to normally connect like poles of said batteries so as to render the batteries inactive, while the establishment of connections for conversation will so affect the current-switching devices as to change the connection of the batteries and send an operating-current into the releasing mechanism, and mechanism for operating the locking device at the end of a conversation.

2. In a telephone system, a registering device, a device for normally locking the same, an electrically-operated releasing mechanism for said locking device, current-switching devices, in connection with said releasing mechanism and with generators such as batteries, said devices being controlled by the establishment and interruption of the speaking-circuit, to operate the releasing mechanism of the calling subscriber when the speaking-circuit is completed, a switch located at each subscriber's station to put the releasing mechanism in a shunt-circuit, mechanism controlled by the calling subscriber ringing up the central, for throwing the shunt-circuiting switch at his station out of action, means controlled by the operation of the call-bell at the called subscriber's station, for throwing the shunt-circuiting switch at his station into action, so that only the releasing mechanism of the calling subscriber can be operated, and mechanism for operating the locking device at the end of a conversation.

3. In a telephone system, a registering device, a device for normally locking the same, an electrically-operated releasing mechanism for said locking device, current-switching devices, in connection with said releasing mechanism and with generators such as batteries, said devices being controlled by the establishment and interruption of the speaking-circuit, to operate the releasing mechanism of the calling subscriber, when the speaking-circuit is completed, a resistance interposed between the call-bell and the ground to oppose the passage of a continuous current while allowing the alternating call-current to pass, and mechanism for operating the locking mechanism at the end of a conversation.

4. In a telephone system, a registering device, a device for normally locking the same, an electrically-operated releasing mechanism for said locking device, current-switching devices, in connection with said releasing mechanism and with generators such as batteries, said devices including a time-contact or circuit-closer controlled by the movement of the telephone-hook and connected with one of the said generators and with the ground, said time-contact consisting of a vessel partly filled with mercury and made in two parts connected by a throat at which is located the connection leading to the ground, so that said time-contact will be operative only as long as the mercury flows through said throat, to so connect the generators as to momentarily increase the intensity of the current flowing through the line, sufficiently to operate the releasing mechanism of the calling subscriber, and mechanism for operating the locking mechanism at the end of a conversation.

BRUNO KRAUSSE.

Witnesses:
HENRY HASPER,
C. H. DAY.