

H. P. CLAUSEN.
ELECTRICALLY CONTROLLED METER SYSTEM.
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2 SHEETS—SHEET 1.

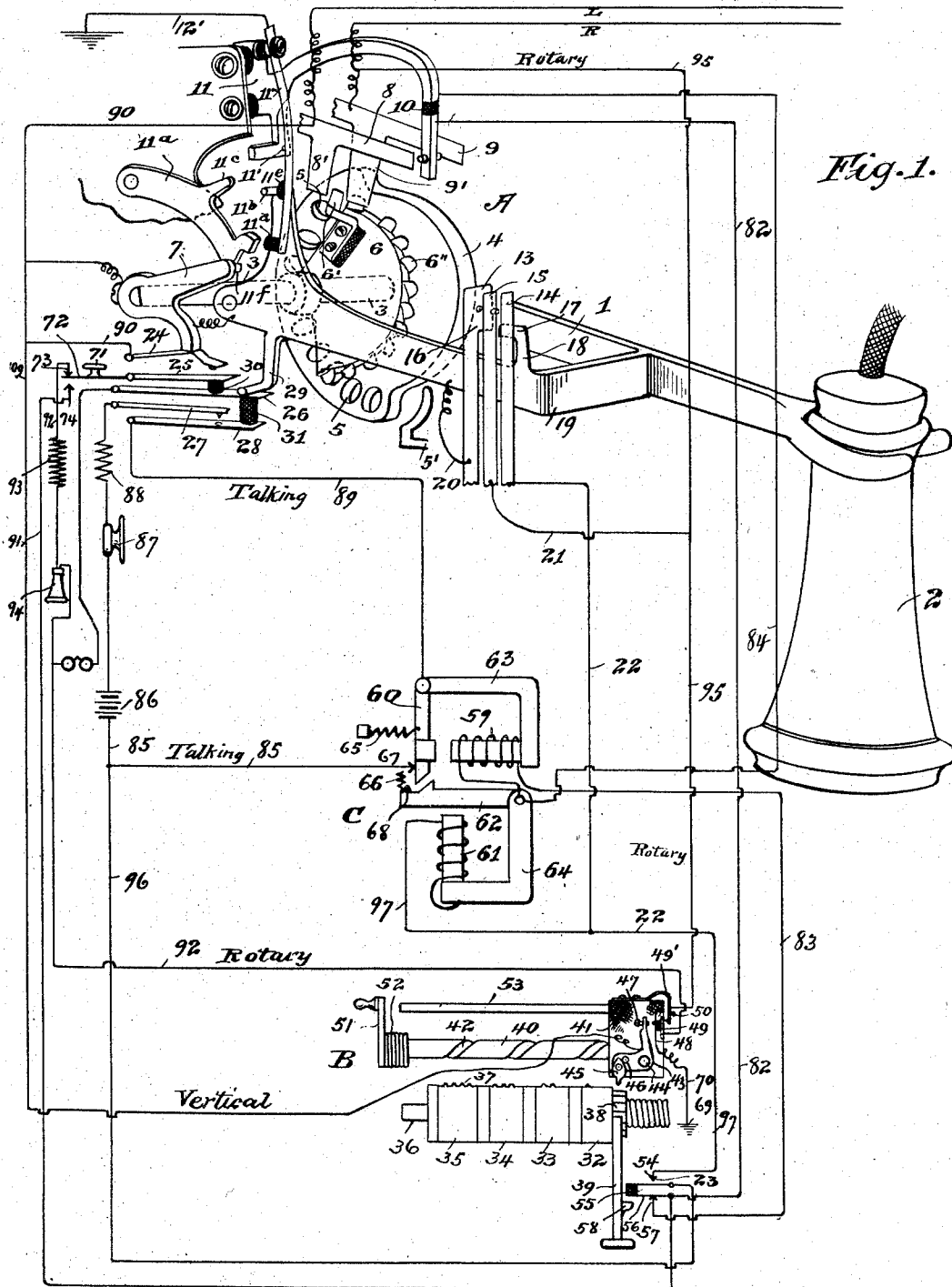


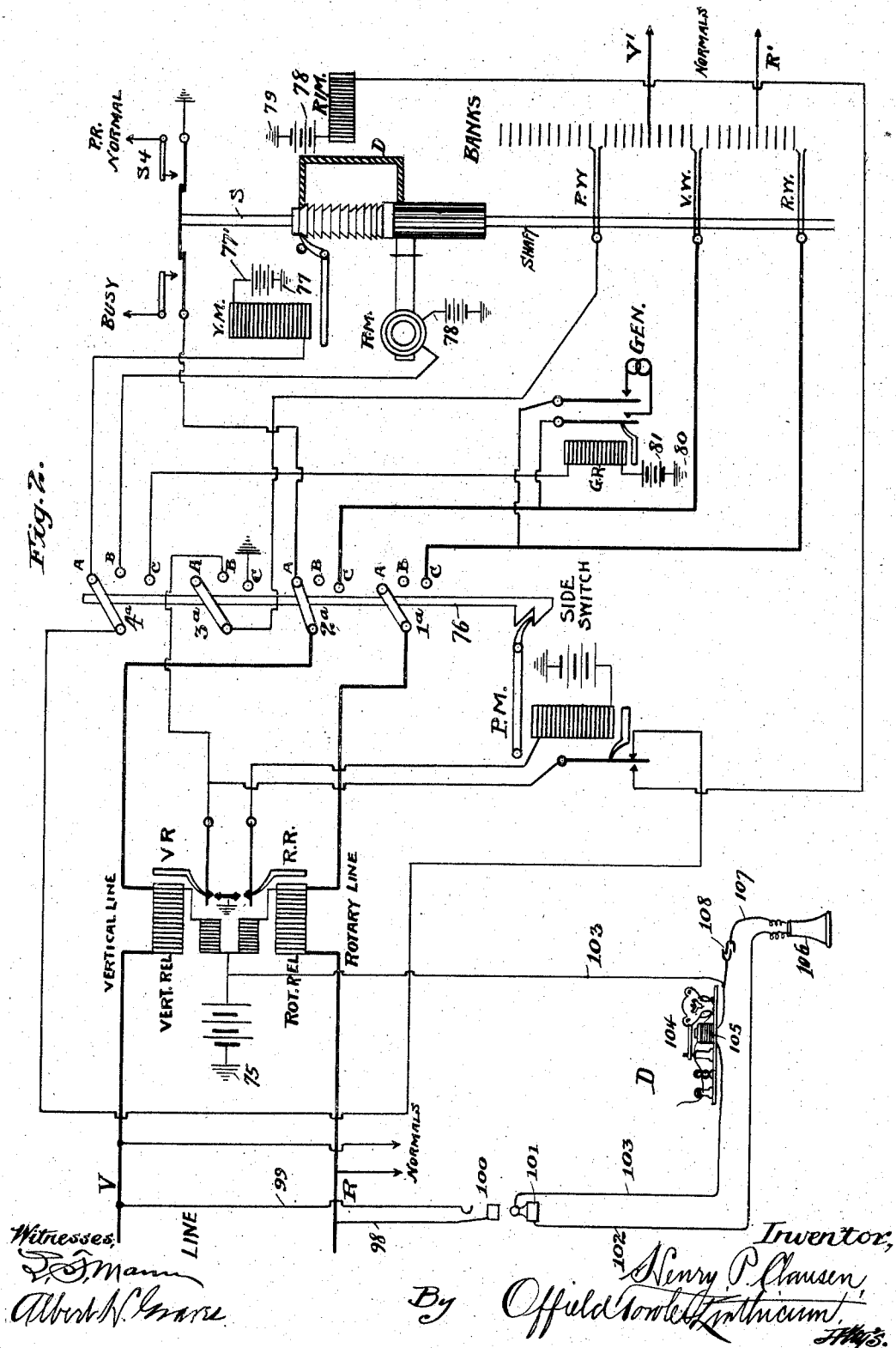
Fig. 1.

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928,245.

2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

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ELECTRICALLY-CONTROLLED METER SYSTEM.

No. 928,245.

Specification of Letters Patent.

Patented July 20, 1909.

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To all whom it may concern:

Be it known that I, HENRY P. CLAUSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electrically-Controlled Meter Systems, of which the following is a specification.

This invention relates to improvements in electrically controlled meter systems, and refers more specifically to a system of the character referred to, adapted for controlling a call meter at the subscriber's station in either an automatic or manual switchboard telephone system.

The salient object of the invention is to provide in conjunction with an automatic telephone system, *i. e.*, a telephone system in which one subscriber secures connection with any other belonging to the same exchange through the medium of an automatic electric switch, an electrically controlled meter system whereby the calling subscriber is compelled to record upon his own meter the call before he is enabled to converse with the party called.

Other objects of the invention are to provide in such a system means whereby the calling subscriber is permitted to first ascertain whether or not the party called responds to the call, before he is compelled to record his call upon the register; to provide in such a system means whereby the effective operation of the meter controlling mechanism is not dependent upon a single closing or opening of a single circuit, but on the contrary is actuated by any one of several distinct closings or openings of one or more circuits; to provide in such a system means operating to automatically restore the subscriber's set to its normal condition, in which it is receptive to an incoming call, upon the restoring of the receiver to the switch-hook or other act of the subscriber which replaces the accessories of his set in their normal position; to so construct and arrange the meter controlling system as to avoid interference with the normal operation of the telephone system, or, in other words, so as to avoid the necessity of additional manual operation, other than the mere pressing of a button or equivalent act to operate the tally device; to provide a system of the character referred to which, in its broader sense, is not confined in its application to any particular telephone system, but on the contrary is capable of

embodiment or use in connection with most if not all telephone systems in use; to provide in a system, of the character referred to, means which differentiates from or distinguishes between those acts of the subscriber in calling for a connection and in answering a call, so that the meter controlling mechanism in no wise interferes with the subscriber when he responds to a call from another station but does prohibit his effectual use of his telephone when he wishes to call another subscriber, unless he records the call; to provide means whereby the talking connections of the calling subscriber's set are disabled in the act of projecting a call for connection, associated with means whereby the subscriber's set is restored to effective condition, without necessitating the recording of a call on the register, when the attempt to get a connection has been ineffectual; and in general to provide a simple, practical and efficient system of the character referred to.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and will be readily understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view showing the complete electrical connection at a subscriber's station, and so much of the mechanism of the subscriber's set as is necessary to a full understanding of the invention; Fig. 2 is a diagrammatic view showing a conventional arrangement of the exchange circuit connections and apparatus of one automatic system in common use, and an operator's "reading set" associated therewith.

The invention is herein shown as applied to a telephone system now in common use, and commonly known as the "Strowger automatic," but as hereinbefore intimated it is to be understood that the invention is in no wise limited to this particular application.

Describing first those features of the subscriber's instrument involved in the application of my improved system thereto, "A" designates as a whole the subscriber's instrument, 1 designates the switch-hook, which, as usual, is pivotally mounted to rise and fall when the receiver 2 is lifted from or placed upon the switch-hook, 3 designates a main shaft rotatively journaled in the

main frame and carrying upon its outer end a finger lever 4 provided with a series of finger holes 5 corresponding to the digits, 6 designates a switch cam wheel mounted upon and moving with the main shaft, and 7 a contact-actuating arm likewise mounted upon the main shaft and controlling certain contacts as will hereinafter appear.

8, 9 and 10 respectively designate three contact strips which comprise what may be termed the switching impulse contacts; the contact 8 being connected with what is commonly designated the "vertical" side of the main line corresponding to the left main line, the contact 9 being connected with the "rotary" or right-main line, and the contact 10 being located between the other two and connected with an insulated part 11 of the frame and with a local conductor which connects with various parts of the set, as will hereinafter appear.

The contact device 10 constitutes a member through which various circuits are grounded at the subscriber's station, and to this end the insulated member 11 is provided with an anvil or back contact 11' over which is arranged to lie a spring strip 11"; the latter being insulated from the frame and connected to ground by means of a conductor 12'. Normally, and while the switch-hook is down the spring 11" is held in open position. The switch-hook as it rises lifts the detent, and for this purpose the switch-hook frame is provided with an arm 11^b which engages a projection 11^c on the detent. The spring 11" is provided with two insulated studs, 11^a and 11^e; the former adapted to engage the end of the detent 11^a and the latter being normally engaged by the arm 11^b when the switch-hook is down. As the switch-hook rises and the arm 11^b passes out of engagement with the spring the latter passes into bearing with the detent, and as the switch-hook approaches the limit of its upper movement and lifts the detent the insulating stud 11^a slides upon the detent to a position where a slight further raising of the detent will permit it to slip off and thus effect the closing of the spring contact. This slight further lifting of the detent is accomplished upon the first movement of the finger lever; the contact arm 7 being to this end provided with a stud 11' which engages the under edge of the detent and imparts the slight lifting movement thereto.

It will be understood from the foregoing that the subscriber's instrument is not grounded until he actually begins to operate his finger lever. In other words, the act of answering a call by lifting his receiver from the switch-hook does not ground his instrument and this is a feature of importance as will appear later.

13, 14 and 15 respectively designate a set and system of three contacts controlled by a

switch cam mechanism of which the cam member 16 is formed integrally with the spring contact strip 13, and the wiper member 17 is formed as a part of an arm 18 upon a frame member 19 connected to and moving with the switch-hook. The contact 13 connects to frame, as by a conductor 20, and in this way is adapted to be placed in circuit with the "vertical" side. The contact 15 is connected through a conductor 21 with a conductor 95 and is thus placed in circuit with the "rotary" side of the system, while the contact 14 connects with a normally open back contact device 23, concerned in the control of the register, as will hereinafter appear.

24, 25, 26, 27 and 28 respectively designate a system of contacts under the joint control of the arm 7 mounted on the main shaft, and a somewhat similar arm 29 formed as an extension of the frame member 19 of the switch-hook; the arrangement being such that the lifting of the switch-hook closes the local primary or talking circuit controlled by contacts 27 and 28, and simultaneously closes the normally open circuit controlled by the contacts 24 and 25, which contacts 24 and 25 are however again separated whenever the finger lever 4 is operated to move the arm 7 out of its normal position. The contacts 25 and 26 are connected to move together by means of an insulating block 30, and opening movement is imparted to the contact 28 through an insulating stud 31 carried by the contact 26 which is depressed by the arm 29.

"B" designates as a whole the meter or subscriber's register, and "C" the relay which controls the meter. Only so much of the register is shown as is necessary to understand the application of the invention; it being understood that any suitable form of register may be employed so long as it embodies as one of its features a manually operated member whereby the tallies are recorded and the actuation of which serves to close and open certain contacts, as will be hereinafter described.

Describing the parts shown, 32, 33, 34 and 35 designate a series of counter members journaled upon a common shaft 36 and interconnected in any usual way so as to transfer the count from the units counter on through the series, by denominations. Concerning the register it may be noted, that each counter-wheel is provided upon its periphery with a circumferential series of contact projections 37; these projections being arranged in longitudinally extending groups, each of which groups may correspond to one of the digits of the decimal system of notation. Connected with the units counter is a ratchet 38 which is acted upon by a manually operable push-bar 39 in such manner as to step the units counter forward step by step.

Adjacent to and parallel with the series of counter-wheels is arranged a traveling transmitting mechanism, by means of which an electrical reading of the register may be effected. This mechanism comprises a spirally grooved shaft 40 upon which is operatively mounted a traveler 41, consisting of a block of insulating material operatively connected with the spiral groove 42 of the shaft 40 and carrying a vibratory contact lever 43 pivoted at its angle 44, and carrying at its engaging end a contact device 45. This is in turn pivoted upon the lever so as to vibrate idly during movement in one direction of the traveler but held by a stud 46 so as to impart positive movement to the vibratory lever upon the return movement of the traveler as the contact device 45 engages the series of contact projections 37 which may at that time happen to be in register therewith. The end of the vibratory lever remote from the contact device 45 carries a contact screw 47 which engages a spring contact strip 48 connected to ground by a conductor 70. The strip 48 also forces another spring 49 into bearing with a co-operative spring 49'; the springs 49 and 49' being constructed to tend to open normally and insulated from spring 48. A fixed stud 50 of insulating material engages the spring 49' when the traveler is in its normal retracted position and holds said spring in closed contact with spring 49; it being understood that as soon as the traveler starts forwardly along the shaft 40 these contacts open. The shaft 40 is actuated, by means of a crank-handle 51, to move the traveler forwardly or away from its normal position, and a coiled spring 52, acting upon the shaft 40, returns the traveler to its normal position when the crank-handle is released. In order to hold the traveler in non-rotative relation to the shaft 40 a guide 53 is arranged to extend parallel with said shaft and the traveler has sliding engagement with this guide.

The manually operable push bar 39 controls a set of contacts designated respectively 54, 55, 56 and 57. These contacts are shifted by a lug 58 upon the member 39.

The relay "C" comprises a cutting-out magnet 59 and its armature 60 and a restoring magnet 61 and armature 62; these two magnets being arranged in such relation to each other that the armature 60 constitutes a latch member and the armature 62 a retaining member which is adapted to hold the clutch or armature 60 in closed position. The relay "C" is shown diagrammatically, no attempt being made to show the correct mechanical construction of the same but only the electrical relation of parts. As shown, the frame member 63 of the cutting-out relay supports the core of the magnet 59 and forms a suitable support upon which the

armature 60 is pivoted; while the frame 64 of the restoring relay similarly supports the core of its magnet and forms a pivotal support for the armature 62. Each armature is normally held in open position by means of a retracting spring as indicated at 65 and 66, respectively; the armature 60 being normally held in engagement with a back contact device 67 while the armature 62 engages a back stop 68. The frame 64 is connected to ground as will hereinafter appear, and the vibratory contact lever 43 of the register is also connected to ground at 69 through a flexible conductor 70 which permits the necessary movement of the traveler.

Describing now the various local circuits brought into use in the operation of the system in so far as they are concerned in the present invention, it may be first explained that the user of an automatic telephone of the type herein shown, when he desires to make a call, must first remove the receiver from the hook-switch and thus unlock the mechanism so that the finger lever may be operated. The raising of the hook-switch closes the circuit between contacts 24 and 25 and between contacts 27 and 28, and also places spring contact 11" in condition to be grounded upon the first movement of the finger lever; all as hereinbefore described. The operator now proceeds to spell out the number called for by oscillating the finger switch 4. As the finger switch is oscillated forwardly by placing the finger in a given one of the apertures 5 thereof and bringing it forwardly until the finger is arrested by the stop 5' two wing-like cam-extensions 8' and 9' formed integrally with the contact strips 8 and 9, respectively, are engaged by corresponding switch cam projections 6' and 6'' carried by the switch cam 6. These cam projections 6' and 6'' are so disposed that they oscillate the respective wipers 8' and 9' idly during the forward stroke of the finger lever—that is to say, they move the contacts 8 and 9 in a direction away from the intermediate contact 10. Upon the return stroke of the finger lever, however, each one of the cam projections 6'' which has been carried past the wiper 9' engages the latter, forces it inwardly and closes circuit with the contact 10 so that the "rotary" side of the main line is closed at this point and thus grounded through spring 11" a number of times corresponding to the number of cam projections 6'' which are thus moved past the wiper 9'. As the finger lever approaches the limit of its return movement the cam projection 6' engages the wiper 8' and forces the contact 8 into engagement with the contact 10, thus closing the left or "vertical" side of the main line to ground once. At "central" the automatic switch which effects the selecting of the subscriber's line being called, comprises switch mechanism which is properly

responsive to the two grounded circuits closed through the "rotary" and "vertical" sides of the main line, respectively, these impulses operating to actuate the selector switch in such manner as to secure line connections with the called party. The final act of securing a connection, as automatic telephones are ordinarily used, is to ring the called subscriber's bell thus calling him to his instrument. Ringing current is sent through the called subscriber's instrument by pushing a push-button 71, which forces a contact spring 72, normally resting in bearing with a back contact 73, into engagement with a front contact 74. This grounds the "vertical" side of the calling subscriber's set, which in turn operates a relay at "central" that throws ringing current on the metallic circuit extending from "central" to and through the called subscriber's bell.

In Fig. 2 is shown diagrammatically an accepted form of arranging the circuits and mechanism of an automatic Strowger exchange switch adapted to cooperate with the subscriber's set hereinbefore described in enabling the subscriber to automatically secure connections with other subscribers belonging to the same exchange. This diagram may be considered as conventional, it being understood that the particular switch mechanism at "central", in common with the particular form of subscriber's set are alike immaterial so long as they are adapted for the incorporation therewith of those special features pertaining to and adapted to carry out the present invention.

In Fig. 2 V and R, respectively, designate the "vertical" and "rotary" main lines leading into the exchange from the calling subscriber's station, VR and RR, respectively designate the "vertical" relay and "rotary" relay each connected to ground at 75 through impedance coils, PM designates a private magnet, 1^a, 2^a, 3^a and 4^a side switches connected to move together by means of an actuating rod 76 acted upon by the private magnet, and each adapted to be shifted into either of three positions, as clearly indicated in the diagram.

VM designates a "vertical" magnet grounded at 77 through a battery 77' and operating through a ratchet mechanism to lift the main switch member S step by step.

RM designates a "rotary" magnet acting on the switch member S to rotate the latter step by step, likewise grounded at 78, and R¹.

M designates a release magnet which operates to release the switch member S and allows the latter to return to normal, this magnet being also grounded at 79 through a battery 78.

GR designates a generator relay grounded at 80 through a battery 81, and Gen designates a generator operating to throw ringing

current on the line when the generator relay is energized.

PW, VW and RW, respectively, designate a private wiper, a "vertical" wiper and a "rotary" wiper, all of which are controlled and operated by the main switch member S, to cooperate with banks of contacts. The line terminals of one subscriber connected with the "rotary" and "vertical" banks are indicated at V' and R'. It will be understood that the called subscriber's set is identical with that of the calling subscriber, and that when a subscriber is called by the ringing of his bell his hook-switch will, of course, be down.

The operation of the system and the circuits involved may be described and traced as follows: The calling subscriber lifts his receiver from the hook-switch, thus unlocking the finger lever mechanism and placing the spring 11" in condition to be grounded by the first movement of the finger lever as hereinbefore described. He next spells out the numeral by operating the finger lever as described and in so doing the first movement of the lever places spring 11" to ground. During the return movement of the finger lever, following the forward movement of the latter, the "vertical" side of the main line is grounded through contacts 8 and 10, and current flowing from "central" over the "vertical" side passes to ground over a circuit which may be traced as follows: from contact 8 to the insulated portion of contact 10, thence over a conductor 82 to spring contact 56 controlled by the push button of the register, thence to back contact 57, thence over a conductor 83 to and through the windings of the magnet 59, thence back over conductor 84 to that part of the contact device 10 which is in electrical connection with the spring 11", and thence to ground over the conductor 12'. Current through this circuit obviously energizes magnet 59, draws down its armature 60 thus opening a circuit at back contact 67 and latching the armature into engagement with the detent armature 62. The back contact 67 controls the talking circuit, which may be traced from said contact by conductor 85 to battery 86, thence to transmitter 87, primary coil 88, contact devices 27 and 28, and thence by conductor 89 back to the armature 60. Opening the talking coil obviously prevents the calling subscriber from talking with the party called until talking connections are restored, which is accomplished by energizing the releasing magnet of the controlling relay as will hereinafter appear. The subscriber having spelled out the number wanted by means of his finger lever and secured connection with the called for subscriber, next calls the latter to his instrument by pushing his ringing button 71. This ringing circuit is so arranged that it

likewise energizes the cutting out magnet of the controlling relay in order to render more certain the operation of the latter, and this ringing circuit may be traced as follows:

5 from the "vertical" side of the main line to a conductor 90 and by the latter to contacts 24 and 25, thence through the push button spring 72 to front contact 74, thence over conductor 91 to contact spring 56 and back

10 contact 57, thence over conductor 83 to and through the cutting out magnet of the controlling relay and to ground as before. The fact that the controlling relay has opened the talking circuit does not prevent the calling subscriber from hearing the called subscriber when he answers, since the circuit

15 through the calling subscriber's receiver has remained undisturbed; the circuit through the receiver and secondary coil may be traced from the "vertical" side over conductor 90, contacts 24 and 25, push button spring 72, back contact 73 to a conductor 92, which extends through the secondary coil 93 and receiver 94, and thence to spring 49 on

20 the traveler of the register. Spring 49 normally engages spring 49' and from the latter a conductor 95 leads back to the "rotary" side of the main line, thus completing the circuit. The calling subscriber, having been

30 answered by the called subscriber, is now sure of his connection, but before conversation can take place he must restore the talking circuit through his transmitter, and this he does by pushing the push button 39 of the toll register. As the push button 39 is depressed its lug 58 engages the pair of contacts 55 and 56 opening at back contact 57 and closing at front contact 54. This closes

40 the circuit through the restoring magnet 61 as follows: from local battery 86 and conductor 85 to a conductor 96, which leads to spring 55 controlled by the register push button, thence to front contact 54, thence

45 over a conductor 97 to and through the windings of the restoring magnet, thence to frame of the relay, and from this frame back to the battery over conductor 89 and the rest of the talking circuit. Energizing magnet 61 trips the latch-armature 60 and allows the latter to close the talking circuit at back contact 67.

It will, of course, sometimes happen that the called subscriber is already connected

55 with another line when a given subscriber endeavors to get connection with him, and in such event the switch mechanism at "central" is so arranged as to automatically throw into the calling subscriber's circuit a buzzer or other signal ordinarily termed the "busy" signal. When a calling subscriber finds the line of the party wanted "busy", he, of course, should not be compelled to register such ineffectual call, but it will be remembered that he has already placed the

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controlling relay in closed position and thereby opened his talking circuit. The controlling relay should, of course, be restored so that he may himself answer calls and so that his instrument may be left in normal condition. 70

The restoring of a relay without registering a call is automatically effected by the return movement of the hook switch to its normal position when the receiver is replaced thereon; the circuit for accomplishing this being traced as follows: As the hook switch descends the cam member 17 upon the frame thereof engages the cam 16 on spring contact 13 and forces the three springs 13, 15 and 14 into engagement with each other. This momentarily closes the circuit between line 95 of the "rotary" side and contact 15 through a conductor 21, and from contact 15 to contact 14 and thence to line 97 over conductor 22. Line 97 includes the windings of the restoring magnet 61; a continuation of this circuit being to ground from the frame of said magnet over the conductor 84, contact member 10, spring 11' and conductor 12'. The energizing of magnet 61, of course, withdraws its armature and permits the armature 60 to return to its normal position. 85 90

A further feature of the present construction, and one which may be dispensed with if deemed desirable, consists in the provision of means whereby the subscriber's toll register may be read automatically from a distant station, as for example the central exchange. 95 100

The register herein shown is of a type designed for automatically transmitting a reading of the accumulated calls over the line wires and so doing without destroying the record set up, *i. e.*, without re-setting the register. The manner in which the traveler 41 reciprocates across the counter wheels, and the vibratory movement imparted to the lever 45 thereby, has been explained. The vibration of lever 45 transmits impulses 110

Referring to Fig. 2 there is shown bridged into the calling-in subscribers' main lines V and R conductors 98 and 99 which terminate in a spring jack 100. "D" designates as a whole the exchange operator's reading set, which comprises a plug 101 adapted to the spring jack, conductors 102 and 103 connected with the plug and recording device 104, shown as a conventional Morse tape recorder, and the actuating magnet 105 of which is in circuit with the conductor 103, a receiver connected at one side with the conductor 102 and at its other side connected with the conductor 103 by means of a conductor 107, and a condenser 108 interposed in conductor 107 between the receiver and recording device. The conductor 103 extends to ground at 75 through the main battery thus forming a grounded circuit through the recording de- 130

vice 104 at the central station and the transmitter mechanism of the subscriber's register at the subscriber's station, which may be traced as follows: from ground at 75 through battery and over conductor 103 to the magnet 105, thence to the tip or "vertical" side of the main line and over the latter to contact device 8 of the subscriber's set, thence over conductor 90 to a conductor 109 connected therewith and which in turn leads to and connects with the vibratory contact lever 43. The latter coöperates with back contact 48 which is connected to ground at 69 through the flexible conductor 70.

When a reading is to be taken, the operator at "central" calls upon the subscriber to rotate the crank handle 51 of his register and release the same so as to let it return. As the traveler starts forwardly it opens the circuit between contacts 49 and 49' thus preventing the operation of the transmitting mechanism from interfering or being interfered with by the other circuits. As hereinbefore described, the engaging device 45 of the vibratory lever oscillates idly during the forward movement of the traveler but imparts vibration to the lever during the return movement. The groups of contact projections 37 on the counter wheels engaging the contact 45 of the lever produce corresponding makes and breaks of the ground to ground circuit last described, thus actuating the tape recorder and making a permanent record at "central." It will be noted that the taking of a reading in no wise disturbs the position of the counters, and it will be obvious therefore that the reading may be repeated as many times as is deemed desirable.

It will be seen from the foregoing description that I accomplish the several stated objects of the invention and provide a comparatively simple and effective system for measured service control. It will be obvious that the particular application of the invention herein illustrated and described is only one of many applications, and accordingly I do not limit myself to the details either of arrangement or construction except in so far as they are made the subject of specific claims.

I claim as my invention:

1. In combination with a subscriber's telephone set, a call register provided with a manually operable tally device, a controlling relay comprising a cutting-out magnet, a restoring magnet, an interlatching mechanism controlled by said magnets, a circuit leading through said cutting-out magnet and controlled by contacts operable by a manually operated member of the telephone set, and a circuit leading through said restoring magnet and controlled by contacts operable by the manually moved tally device of the register.

2. In combination with a subscriber's telephone set, a call register provided with a manually operable tally device, a controlling relay comprising a cutting-out magnet, a restoring magnet, an interlatching mechanism controlled by said magnets, a circuit leading through said cutting-out magnet and controlled by contacts operable by a manually operated member of the telephone set, a circuit leading through said restoring magnet and controlled by contacts operable by the manually moved tally device of the register, and another circuit leading through the restoring magnet and controlled by contacts operated by a manually operable part of the subscriber's set.

3. In a measured service system for telephones, the combination with a subscriber's telephone set, of a call register, a controlling device comprising a cutting-out magnet and a restoring magnet, the cutting-out magnet arranged to control through its armature the subscriber's transmitter circuit and the restoring magnet arranged to control through its armature the armature of the cutting-out magnet, a circuit including the windings of the cutting-out magnet and controlled by contacts operated by a manually movable part of the subscriber's set, a circuit including the restoring magnet controlled by contacts operable by a manually movable part of the register, and a second circuit including the restoring magnet controlled by contacts operated by a manually movable part of the telephone set, as and for the purpose set forth.

4. In a measured service system for telephones, the combination of an automatic switch mechanism located at a central exchange, and a plurality of line wires and subscribers' sets connected with said switch mechanism, of a call register located at one of the subscriber's stations, a controlling device operable to control a part of the telephone circuit essential to communication with other subscribers, operative connections between said controlling device and the manually movable central-switch operating member of the subscriber's telephone whereby the talking circuit is disabled through operation of the controlling device, and operative connections between the controlling device and the manually operable tallying member of the subscriber's register whereby the recording of a call upon the register operates the controlling device to restore the talking connections.

5. In combination with an automatic telephone system, comprising a central exchange switch, a plurality of sub-stations each connected with said central exchange switch, a manually operable device at each sub-station for operating the central exchange switch and thereby securing selected connections and a hook-switch, of a measured serv.

ice system comprising a subscriber's register provided with a manually operable tallying member, a controlling relay comprising a cutting-out magnet and a restoring magnet, a circuit including the windings of said cutting-out magnet controlled by contacts operable by the manually operable central-switch operating member of the sub-station equipment, a talking circuit controlled by said cutting-out magnet, a circuit including said restoring magnet and controlled by contacts operable by the manually movable tally device of the register, and another circuit including the windings of said restoring magnet and controlled by contacts operable by the switch hook, as and for the purpose set forth.

6. In combination with an automatic telephone system, comprising a central exchange switch mechanism, a plurality of sub-stations connected with said switch mechanism and a telephone sub-station equipment at each sub-station comprising a manually operable member for operating the central exchange

switch, a hook switch, an annunciator and the usual talking set, a controlling relay comprising cutting-out and restoring magnets, a call register provided with a manually operable tallying member, circuit connections including the cutting-out magnet and controlled by the manually operable central switch operating member, a talking circuit controlled by the armature of said cutting-out magnet, a detent controlling the closing of said talking circuit and itself controlled by said restoring magnet, a circuit including said restoring magnet and controlled by contacts operable by the manually movable tallying member of the register, and another circuit including the windings of the restoring magnet and controlled by contacts operable by the hook-switch, as and for the purpose set forth.

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