

No. 764,963.

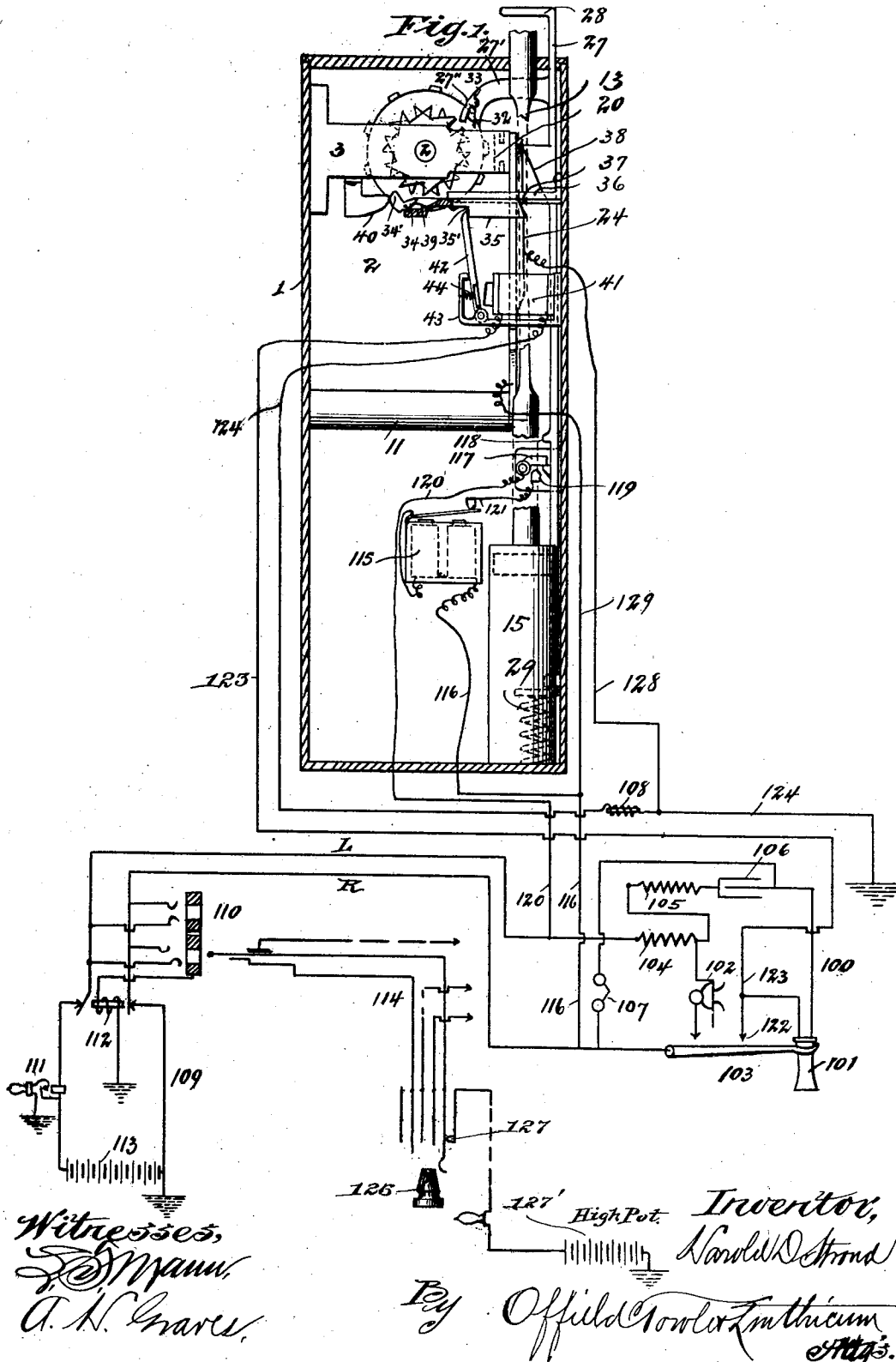
PATENTED JULY 12, 1904.

H. D. STROUD.
TOLL REGISTER FOR TELEPHONES AND AN ELECTRICAL SYSTEM FOR
CONTROLLING SAME.

NO MODEL.

APPLICATION FILED JUNE 4, 1902.

3 SHEETS—SHEET 1.



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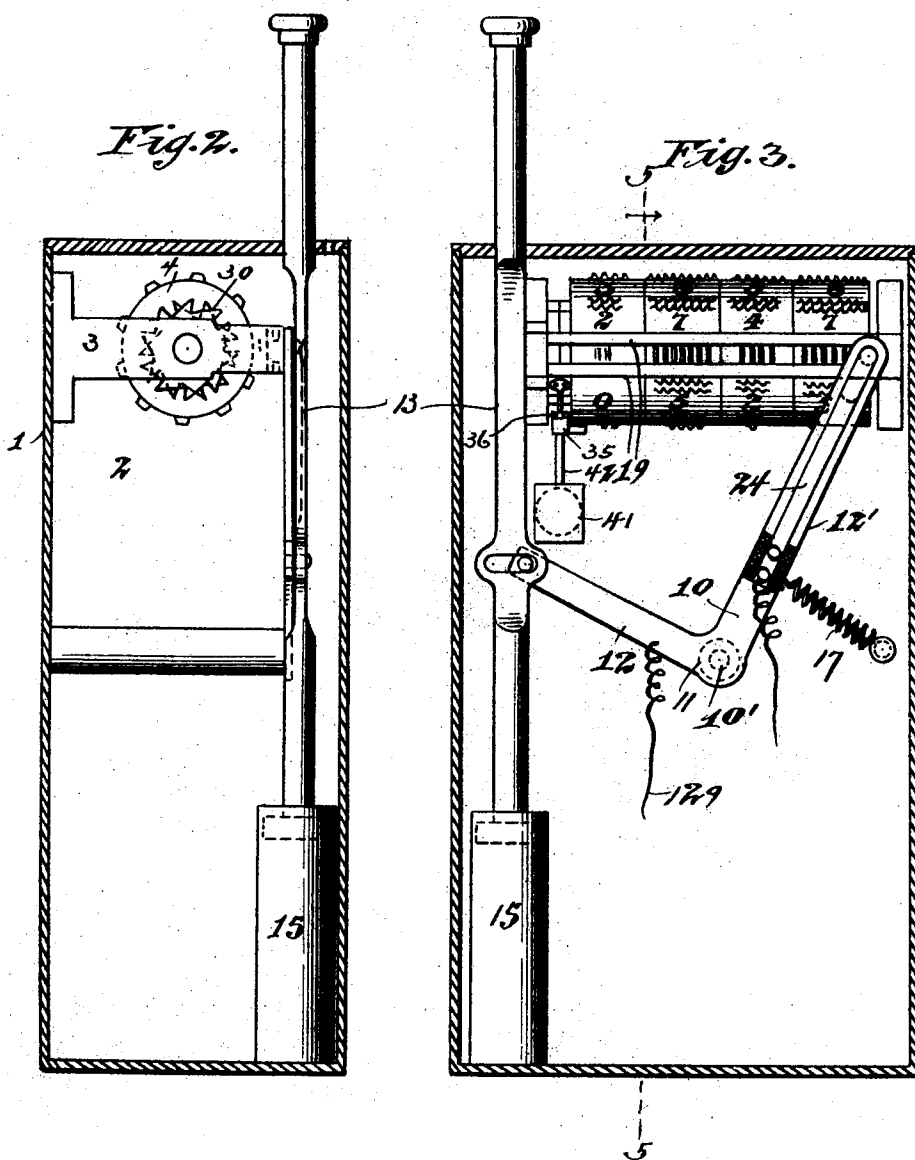
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3 SHEETS—SHEET 2.



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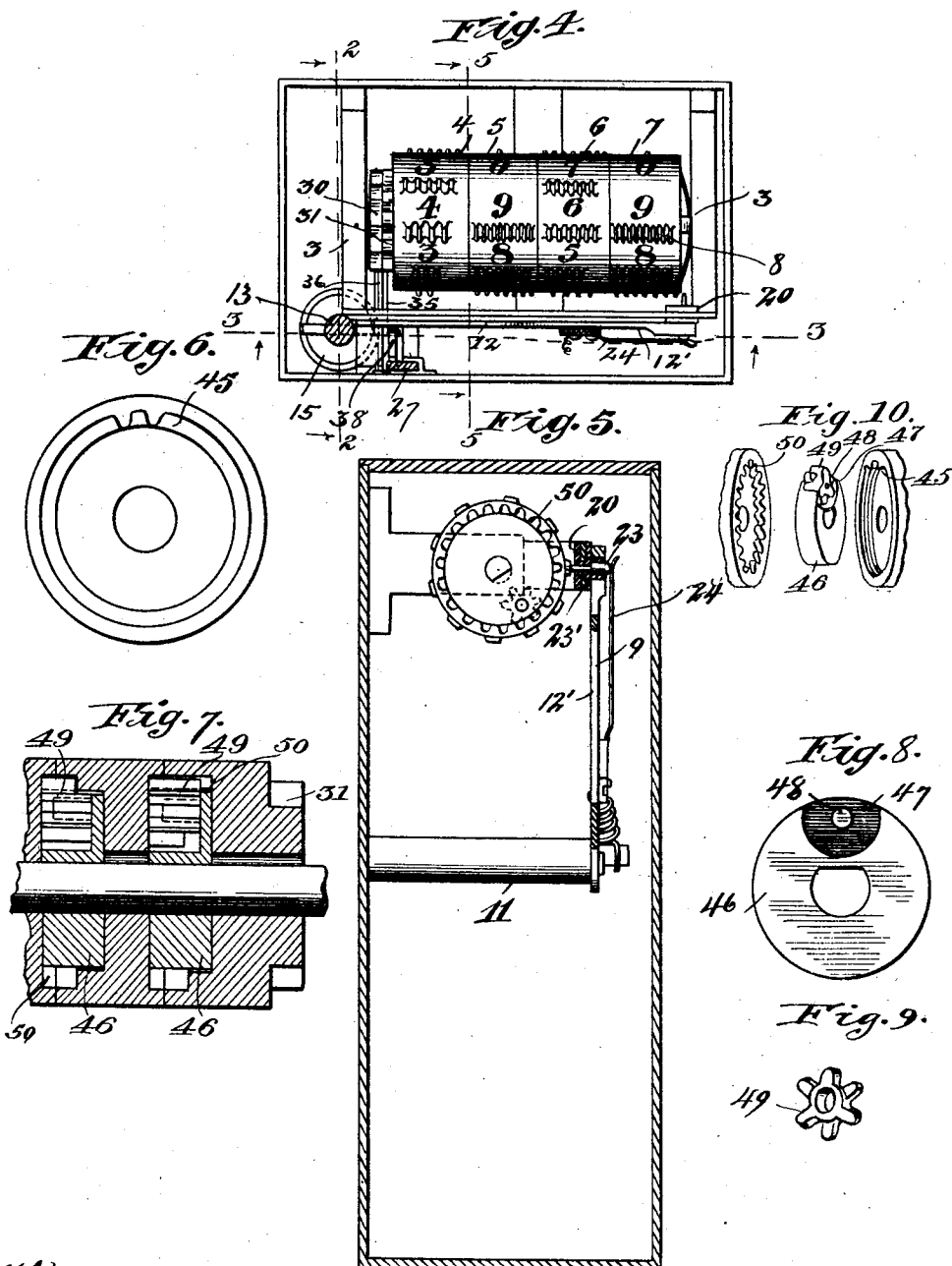
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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TOLL-REGISTER FOR TELEPHONES AND AN ELECTRICAL SYSTEM FOR CONTROLLING SAME.

SPECIFICATION forming part of Letters Patent No. 764,963, dated July 12, 1904.

Application filed June 4, 1902. Serial No. 110,196. (No model.)

To all whom it may concern:

Be it known that I, HAROLD D. STROUD, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Toll-Registers for Telephones and an Electrical System for Controlling the Same, of which the following is a specification.

This invention relates to improvements in toll-registers and an electrical system for controlling the same, the device being particularly adapted for use in connection with telephones, although not necessarily confined to this particular application.

The salient object of the invention is to provide a construction and arrangement by which, while the subscriber performs the operation of recording the call or registers the toll yet, nevertheless, the operator at the central exchange is enabled to count back or throw off the toll or call registered in case, for example, she should be unable to give the proper connection and the subscriber should accordingly not be charged with the call.

Secondary objects of the invention are to provide a simple and practical mechanism for carrying out the invention; to provide improved means tending to prevent the exchange operator from setting back or throwing off register-calls improperly—as, for example, by collusion with the subscriber; to combine the improved setting-back mechanism forming a part of the present invention with a register so constructed and arranged that readings of the accumulated calls may be taken from the central exchange electrically, and in general to provide a simple and improved construction and arrangement of the character referred to.

To these ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and the invention will be more readily understood from the following description by reference to the accompanying drawings, forming a part thereof, and in which—

Figure 1 is a view showing diagrammatically the arrangement of the electrical system

and showing inside elevation a register adapted for carrying out the invention, the proximate side of the casing being removed to expose the internal arrangement of the register and the electrical connections with the system being shown. Figs. 2 and 3 are respectively transverse vertical and longitudinal vertical sectional views of the register, taken approximately on lines 2-2 and 3-3 of Fig. 4 and looking in the direction of the arrows. Fig. 4 is a top plan view of the register with top casing removed, the push-button staff being shown in horizontal section. Fig. 5 is a transverse vertical sectional view taken on line 5-5 of Fig. 4 and looking in the direction of the arrows; and Figs. 6, 7, 8, and 9 are details of the registering-disks. Fig. 10 is a perspective view showing the relative relation of two of the registering-disks with the transmitting mechanism therebetween, but slightly separated.

It is to be understood that so far as the carrying out of the principal feature of the invention is concerned the particular construction of the registering device is not essential; but, on the contrary, any suitable registering device or tallying mechanism may be adapted or modified to that end. The particular register shown herein, so far as its general features of construction are concerned, forms no part of the present invention; but an understanding of its construction and operation is necessary to a comprehension of the invention.

Referring to the drawings, 1 designates as a whole the casing of the register, within which is conveniently mounted a shaft 2, having its ends supported in suitable brackets 3 and held from rotation thereby. Upon the shaft 2 are journaled a plurality of registering-disks, as 4, 5, 6, and 7, each of which is provided upon its outer surface or periphery with a series of longitudinally-extending rows of contact-points or projections 8, these groups of contact-points representing the digits from "0" to "9" and being spaced at uniform angular distances apart around the circumferences of the several disks. Said contact-points are of metal or suitable conducting material

and are adapted to make and break contact with the wiper or traversing contact device for the purpose of transmitting electrical impulses to a distant station. To this end the several tallying disks or wheels are so journaled upon the shaft as to be stepped forward and to be arrested in their several positions with their groups or lines of contact-points in longitudinal alinement with each other, as best indicated in Figs. 3 and 4.

9 designates as a whole the traversing contact device, which consists of an angular lever 10, pivotally supported at its angle, as indicated at 10', to a suitable support 11 within the casing and having one of its arms 12 operatively connected with an actuating-rod 13, arranged to reciprocate vertically within the casing and extending out from the top of the same to form a push-button. A dash-pot 15, operatively connected with the actuating-rod 13, insures a gradual movement of the latter and of the connected traversing device across the faces of the series of disks. A retracting-spring 17 normally holds the actuating-rod 13 uplifted. Extending longitudinally across or opposite the faces of the several disks is a pair of parallel guides 19, supported upon the brackets 3, so as to extend adjacent to the peripheries of the several disks.

20 designates a sliding block or traverser mounted to slide upon the guides 19 and made of insulating material. The slide or traverser 20 is operatively connected with the arm 12' of the angular lever by means of a slot-and-pin connection, and within the sliding block 20 is mounted a sliding plunger 23, the inner end of which extends through the block and beyond the latter in position to engage with the projections 8 of the several disks, while the opposite or outer end protrudes through the lever-arm and is engaged by a spring 24, so as to insure a wiping and yielding engagement with said contact-points. The inward movement of the plunger is limited by an annular shoulder 23', which insures the interruption of the circuit or the breaking of the contact between the several points of the disks.

In order to step the tallying-wheels forward to register the number of calls, a second actuating-rod 27 is provided, which is mounted to reciprocate in suitable bearings in the casing and is likewise arranged to extend upwardly through the top of the casing and terminates in a push-button 28. The actuating-rod 27 is likewise normally held at its upper limit of movement by means of an expansion-spring 29. Said rod is arranged laterally opposite the end of the units tallying-disk 4, which latter is provided with a double ratchet-wheel, as 30 and 31, each having a series of teeth corresponding in number to the series of digits. The rod 27 is provided with a laterally-extending rigid arm 27', upon which is mounted a push-pawl 27'',

which is arranged to engage and step forward the ratchet-wheel one step upon each depression of the actuating-rod. In the normal uppermost position of the actuating-rod 27 the end of the pawl stands out of the path of the ratchet-teeth and in order that the engaging end of said pawl may move yieldably away from that side of the ratchet-wheel which it engages a small limber spring 32 is interposed between the pawl and the arm upon which it is mounted. The heel of the pawl 33 is so shaped as to form a stop, which limits the outward movement of the pawl under the action of the spring 32. The second ratchet-wheel, 31, upon the units-disk is arranged reversely with reference to the ratchet 30 and is adapted to be acted upon by a pawl 34, connected with the setting-back or throwing-off mechanism now to be described. Said mechanism comprises a shiftable block 35, which is mounted to reciprocate horizontally upon suitable ways 36, mounted upon the register-casing, one end of said shiftable block being provided with an inclined end, as indicated at 37, which is operatively engaged by a correspondingly-inclined projection or cam 38, formed or mounted upon the actuating-rod 27. The opposite end of the shiftable member extends adjacent to the ratchet-wheel 31 and carries the pawl 34, hereinbefore referred to, the latter being pivotally mounted and yieldably held toward the ratchet-wheel by means of a spring 39. The pawl 34 is, however, in the normal position of the shiftable block—*i. e.*, when the latter is at the left-hand limit of its throw, as viewed in Fig. 1—held out of the path of the ratchet-teeth, and to this end said pawl is provided with an angular upstanding arm 34', the end of which engages a bracket-like projection 40, mounted upon the bracket member 3, when in the position described, and thus oscillates the engaging end of the pawl downwardly into the position shown in Fig. 1. The object of so constructing the pawls 27'' and 34 that they will be normally held out of the path of the ratchet-teeth is in order that either ratchet mechanism may be employed to rotate the tally-disks without being interfered with by the other ratchet mechanism, it being understood that the two ratchet mechanisms operate to rotate the tally-disks in opposite directions. The shiftable member 35 is shifted in its operative movement by means of a magnet and armature-lever, (designated 41 and 42,) said magnet being arranged in the electric circuit controlled by the operator at central, as will hereinafter appear. In the preferred construction shown the magnet 41 is conveniently mounted upon the side casing of the register to extend horizontally therefrom and is provided with a frame member 43, to which is pivotally attached the armature-lever 42, the end of said frame member being extended so as to overlie the armature-lever and act as a stop to limit the movement

of said armature away from the magnet. The armature is, as usual, normally held retracted by means of a spring 44, and its free or swinging end is arranged to engage a shoulder 35', formed upon the shiftable member 35. It will be noted that the construction of the shoulder 35' is such that the armature may be returned to its open position after it has acted to force the shiftable member toward the right to the limit of its movement without retracting the shiftable member.

Any suitable carrying mechanism may be employed for transferring or imparting a proper movement from the tally-disks of lower order to those of next higher order in the usual manner; but in the present instance I have chosen a mechanism which is capable of carrying—i. e., transferring movement from one disk to the next—in either direction. The details of this construction are best shown in Figs. 6, 7, 8, and 9. As shown in said figures, each of the tally-disks except that of highest order is provided with an internal gear rim or flange 45, having two teeth and arranged to overhang or telescope upon the periphery of a disk-like pinion-support 46, which is immovably mounted upon the main shaft 2. The pinion-support is provided in one face, at its periphery, with a recess 47, carrying a stud 48, upon which is journaled a pinion 49, which, as best seen in Fig. 9, is essentially a double pinion, one member of which has six teeth, while the opposite side has three. The disk of next highest order is provided in its meeting face with an internal gear 50, having double the number of teeth that there are unit spaces or digits upon the periphery of the disk, and the said pinion 49 is so disposed that its side having the six teeth intermesh with the disk of higher order, while its opposite side, provided with three teeth, intermeshes with the disk of lower order and having but two teeth. The triangular disposition of the three teeth of the pinion causes said pinion to cooperate with the untoothed overhanging portion of the flange of the disk of lower order to lock said pinion against movement, except during the time its two teeth are operatively engaged with the pinion. In other words, upon each rotation of the disk of lower order the pinion will be rotated one-third of a revolution and will thereby rotate the disk of next higher order two teeth or one-tenth of a revolution, the pinion then becoming locked against further rotation until the disk of lower order completes its revolution. It will be understood from the foregoing that the disks of lower order will actuate the disks of higher order equally well in whichever direction they are rotated, since their parts are symmetrical and bear the same relation to each other whether rotated forwardly or backwardly.

The construction of the register having now been described a description of the electrical

connections and operation of the mechanism is in order.

Referring to Fig. 1, 100 designates as a whole the subscriber's telephone set comprising as its principal features the usual receiver 101, transmitter 102, switch-lever 103, primary and secondary coils 104 105, condenser 106, bell 107, and resistance 108, these several parts being interconnected in the usual well-understood manner. 109 designates as a whole so much of the central exchange system as is concerned in the present invention, the principal features of which comprise answering-jacks 110, annunciator 111, relay 112, battery 113, and cord, designated as a whole 114, of which latter a part only is shown. The connections at the subscriber's instrument and at the central exchange may be and are shown as the usual ones and require no detailed description.

A description of the several operations involved in the use of the register and the tracing of the circuits concerned in such operations will make clear the special circuit connections and the operation of the mechanism. Assuming that the subscriber wishes a connection, he calls central by removing the receiver in the usual manner, which closes the circuit, including the annunciator 111. Central then instructs him to register his call, which he does by depressing the push-button 28, which operation closes a circuit through the buzzer 115 and sets up a disturbance on the line, which transmits the signal to central that the call has been registered by the subscriber. The circuit through the buzzer may be traced as follows: From the right main line a conductor 116 leads to and through the coils of the buzzer, from thence to a back contact or anvil 121 of the buzzer, and thence to a shiftable contact device 117, which is frictionally held in either position to which it is moved and is upon the depression of the actuating-rod 27 engaged by a shoulder 118 upon said actuating-rod and forced downwardly into electrical contact with a fixed anvil 119. From the latter a conductor 120 leads back to the left main line, thus completing the circuit, which is of course closed and supplied with energy at central. During the depression of the push-button 28 and actuating-rod upon which the latter is mounted the units disk of the register is stepped forward by the engagement of the pawl 27" therewith, thus registering the call upon the instrument. The central operator having received the signal for a connection plugs into the subscriber's answering-jack and inquires what connection is wanted and then proceeds to try and make the connection in the usual manner. In case, however, she finds that it is impossible to make the proper connection with the subscriber wanted she sets back the calling subscriber's register in the following

manner: When the subscriber lifted his ear-
 phone from the switch-lever 103 in the usual
 manner, a circuit was closed leading through
 the right line from central to and through
 5 the magnet 41 of the subscriber's register
 and thence to ground, this circuit being from
 the switch-lever 103 to the back contact 122,
 thence by a conductor 123 to and through the
 magnet 41 and back to ground by a conductor
 10 124. Inductive resistance 108 is interposed
 in this conductor 124 leading to ground. The
 central operator is provided with a key and
 connection to ground through a battery, as
 indicated at 126, 127, and 127', which are
 15 employed when she desires to set back the
 register. The completion of the circuit from
 ground to ground over the right line-wire
 closes the circuit through the magnet 41 and
 draws down the armature of the latter, thus
 20 drawing the shiftable member 35 and the pawl
 connected therewith to the right and return-
 ing the units disk to its former position or
 setting it back one step. The central opera-
 tor having thus restored the register or thrown
 25 off the toll notifies the subscriber that the
 connection wanted cannot be had and that she
 has set back the register. It is to be noted
 in this connection that the shiftable member,
 which was actuated to set back the register,
 30 remains in the position to which it has thus
 been shifted until the subscriber again calls
 for a connection and actuates his push-button,
 whereupon the inclined cam-surface carried
 by the actuating-rod 27 engages the corre-
 35 spondingly-inclined end of the shiftable mem-
 ber and restores it to its normal position.
 The object of this provision is to prevent the
 operator at central from collusively or inad-
 vertently setting back the register more than
 40 a single step at one time, it being obvious
 that the vibration of the armature 42 of the
 magnet 41 will be ineffective until the shift-
 able member has been restored manually by
 the subscriber. Another circuit is provided
 45 for taking a reading of the accumulated calls
 upon the register from central, this feature,
 however, of the mechanism forming no part
 of the present invention. The circuit connec-
 tions and operation may, however, be briefly
 50 explained as follows: From the ground-con-
 ductor 124 a branch conductor 128 leads to
 the spring 24, which is mounted upon the an-
 gle-lever 10, which spring, as hereinbefore
 explained, forms electrical contact with the
 55 teeth or projections 8 of the register-disks
 through the plunger 23. The disks of the reg-
 ister are in metallic contact with the frame-
 work of the mechanism and through the lat-
 ter with the body of the angle-lever 10, from
 60 which latter a return-conductor 129 leads to
 conductor 116 and thence back to the right
 main line. When, therefore, it is desired to
 take a reading from central, the exchange
 operator asks the subscriber to depress the
 65 plunger or push button 13, so as to cause the

angle-lever and the contact carried thereby to
 wipe across the series of disks. The opera-
 tion of the angle-lever closes a circuit which
 may be traced from ground at central over
 the right main line to conductor 116, thence
 70 to the angle-lever 10 and framework of the
 register from any given point on any of the
 disks to and through the plunger 23 and spring
 24, and thence back by conductor 128 to con-
 ductor 124 and to ground. The making and
 75 breaking of this circuit by the contact-plun-
 ger 23 as it wipes across the projections of
 the disks operates an instrument at central
 which records the impulses. The reading-
 plunger 13 is automatically returned by the
 80 expansion of the spring 29, and the return of
 the angle-lever will repeat the impulses back-
 wardly unless the circuit be interrupted.

From the foregoing it will be understood
 that by means of the construction and arrange-
 85 ment shown the subscriber's toll instrument
 may be made to keep accurate count of those
 calls only which he should be charged for
 without necessitating any personal inspection
 on the part of the telephone company. At
 90 the same time it will be seen that the sub-
 scriber is absolutely powerless to manipulate
 the register, (it being understood, of course,
 that the register will be kept locked,) but, on
 the contrary, must leave the matter of rebat-
 95 ting or throwing off calls entirely to the cen-
 tral operator. On the other hand, the sub-
 scriber will not be given a connection with
 another subscriber until he has registered his
 call, and the central-exchange operator can-
 100 not throw off more than a single call at a time.
 The arrangement which prevents the register
 from being set back more than once at a time
 is also an important safeguard against the
 possibility of the register being set back a
 105 plurality of steps by accidental closing of the
 circuit through the magnet controlling the
 same—as, for example, by a charged wire be-
 coming broken and swinging against the line-
 wire repeatedly.

While I have herein shown and described a
 practical and preferred embodiment of the in-
 vention, yet it will be obvious that the details
 of construction may be varied without de-
 115 parting from the principle thereof, and I do
 not, therefore, limit myself to these details
 except to the extent that they are made the
 subject of specific claims.

I claim as my invention—

1. In combination, a tally mechanism, means
 120 for actuating said mechanism manually, a set-
 back mechanism comprising an electromag-
 net, a circuit extending therethrough, and a
 member movable by the armature of said mag-
 net, said setting-back mechanism being con-
 125 structed to remain in functionally-inoperative
 position after actuation by said magnet, and
 interconnections between said setting-back
 mechanism and said manually-operable mech-
 130 anism whereby the operation of the latter

serves to restore the former to operative position.

2. In combination, a tally mechanism comprising one or more registering-disks, a ratchet and push-button mechanism for stepping said disks forward step by step, a ratchet mechanism for setting said disks back step by step, comprising a shiftable member and a pawl operatively connected therewith, and means for actuating said stepping-back mechanism comprising an electromagnet, an armature for said magnet arranged to actuate said shiftable member during its closing movement, an electric circuit extending through said magnet and means operable by said push-button mechanism for restoring said shiftable member to its normal position, substantially as described.

3. In a register, the combination of a tally-disk provided with a pair of oppositely-disposed ratchet-wheels, a manually-shiftable member arranged to operate adjacent to one of said ratchets and provided with a pawl normally held free from the path of the ratchet-teeth, an electrically-operable shiftable member mounted to move adjacent to the other ratchet-wheel and provided with a pawl normally held out of the path of the ratchet-teeth,

an electromagnet, the armature of which is arranged to operatively engage said electrically-shiftable member and operative circuit connections, for the purpose set forth.

4. In a register, the combination of a tally-disk provided with a pair of oppositely-disposed ratchet-wheels, a manually-shiftable member arranged to operate adjacent to one of said ratchets and provided with a pawl normally held free from the path of the ratchet-teeth, an electrically-operable shiftable member mounted to move adjacent to the other ratchet-wheel and provided with a pawl normally held out of the path of the ratchet-teeth, an electromagnet, the armature of which is arranged to operatively engage said electrically-shiftable member, operative circuit connections, and operative connections between said manually-shiftable member and said electrically-shiftable member, whereby the operation of the former serves to restore the latter to functionally-operative position, for the purpose set forth.

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