C. L. GOODRUM.

COIN COLLECT SYSTEM.

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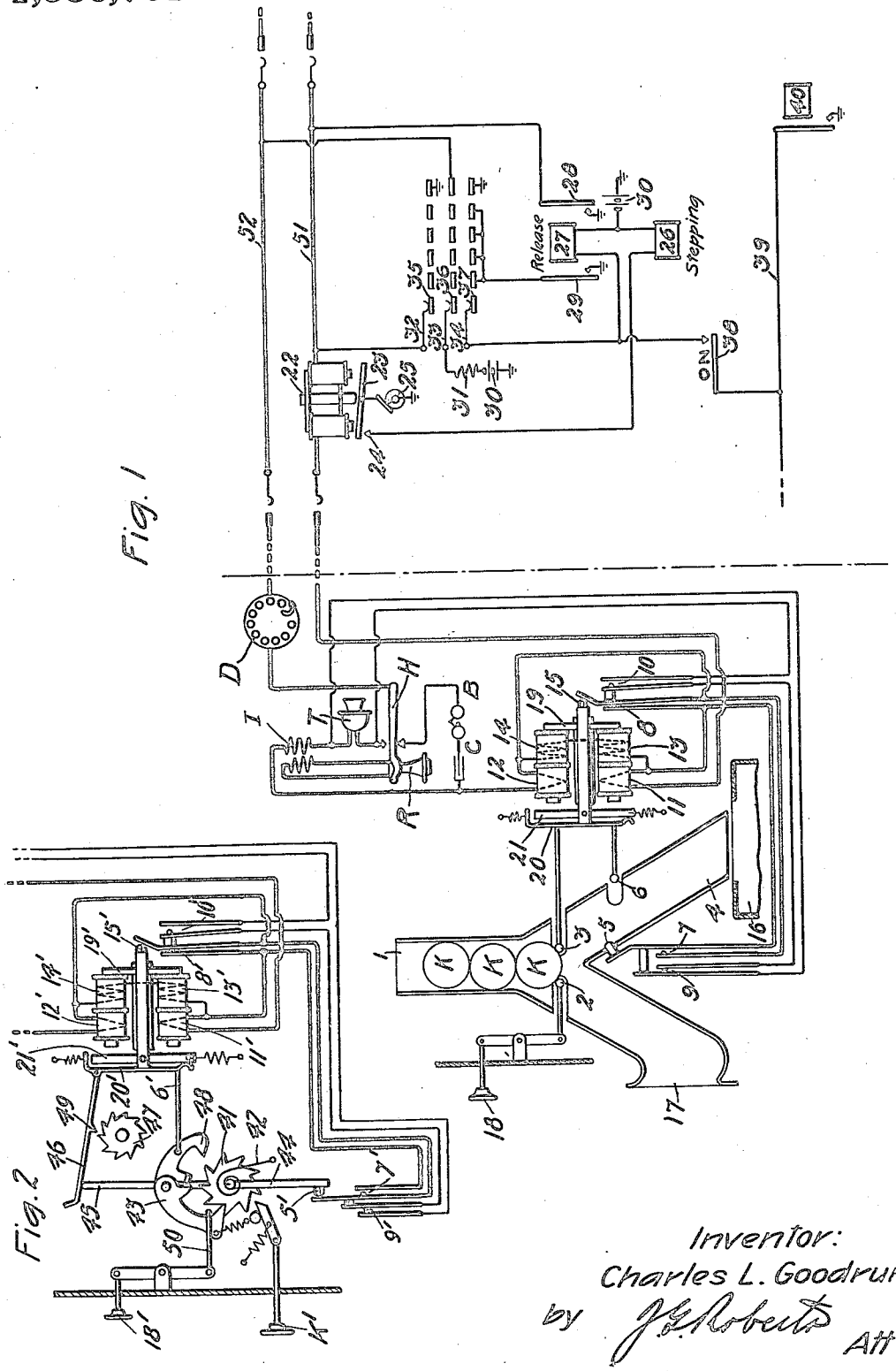

Inventor:
Charles L. Goodrum
by J. E. Roberts
Att'y.

UNITED STATES PATENT OFFICE.

CHARLES L. GOODRUM, OF BROOKLYN, NEW YORK, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

COIN-COLLECT SYSTEM.

1,386,701. Specification of Letters Patent. Patented Aug. 9, 1921.

Application filed August 14, 1916. Serial No. 114,779.

To all whom it may concern:

Be it known that I, CHARLES L. GOODRUM, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Coin-Collect Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to telephone systems, and more particularly to coin collecting and metering systems for automatic telephone exchanges.

The object of this invention is to provide automatic means for charging a subscriber at the proper rate for the initial call and for each subsequent time unit he is engaged in conversation, and more particularly for doing this through the medium of the subscriber's two-conductor loop.

Heretofore coin collection and metering have been accomplished through the use of a ground return from the subscriber's station with necessarily complicated circuit arrangements and apparatus at the central office. This invention consists in an arrangement whereby these results are accomplished over the two conductors of a subscriber's line, with simplified and less expensive apparatus.

In a preferred form of the invention, use is made of a coin collector of the type in which a subscriber may place a coin of any denomination, whereupon such coin is translated into the proper number of coins of a given smaller denomination and these coins in turn diverted into the receiving chute. Each of these coins of a smaller denomination will allow conversation to be carried on for a time interval in accordance with the schedules of the operating company and at the end of each time interval another coin will be collected to pay for the ensuing time interval or fraction thereof. A coin collector of this type is disclosed in Patent No. 1,245,472, issued to Lattig and Goodrum, November 6, 1917.

By the use of such a piece of apparatus, certain new and useful features are embodied in an automatic telephone system, and by certain changes and modifications of the control circuits which will be readily comprehended and which will hereafter be fully described, it may be used in the system herein disclosed.

One feature of the invention is the complete control of the conversation by the subscribers. Should the calling subscriber place a single coin in the collecting device, it may or may not be sufficient to cover the time which he requires. If not sufficient, then the conversation will be automatically interrupted at the end of a predetermined time unit, and may only be resumed by the placing of another coin in the said collecting device. Should the calling subscriber anticipate the use of a longer time for his conversation, then he may place more than one coin or a coin of a larger denomination in the said collecting device, and no interruption will occur, as before, since the coins will be automatically collected at the end of each time unit. If, at the end of a conversation, all of the coins which he has deposited have not been collected, or if the full value of a coin of larger denomination has not been used, the balance will be automatically returned.

It is evident that while the invention herein disclosed relates to a coin collecting device, a call register device might be constructed on the same principle and be caused to operate in much the same manner, so that this invention is not to be limited to the specific construction and apparatus herein described.

Other novel and useful features will be made clear in the following specification and the appended claims.

In the drawing, Figure 1 represents diagrammatically the circuits and apparatus embodied in this invention, The diagram to the left of the broken line represents a coin collecting device and the usual transmitting, receiving and signaling apparatus. The diagram to the right of the broken line represents the central office circuits and the apparatus connected therewith for actuating the coin collecting device. Fig. 2 represents diagrammatically a registering device constructed to operate in substantially the same manner as the coin collecting device shown in Fig. 1.

In the subscriber's set are included a transmitter T, a receiver R, induction coil I, the usual polarized bell B, a condenser C, and the dial switch D.

The coin collecting device herein described is controlled by a polarized magnet 19 in control of an armature 21. The movement of armature 21 actuates a member 20, to

which are attached the coin arresting fingers 3 and 6 and an insulated button 15. As shown, the armature 21 and member 20 are in the normal position. The coins K inserted in the chute 1 are arrested by the fingers 2 and 3. If the refund finger 2 is operated prior to the energization of magnet 19, the coins K will travel into chute 17 to the subscriber. On the other hand, if the finger 3 is caused to recede by the energization of magnet 19, and if finger 2 is maintained in its normal position, a coin will travel down the chute 4 and will be arrested by the now inwardly projected finger 6 so that it comes to rest in such a position that contact 7 is closed and contact 9 is opened through the pressure exerted on the insulated button 5. When the magnet 19 is deenergized, the recession of finger 6 allows the coin to proceed downwardly through chute 4 and into coin box 16, thereby allowing the contacts 7 and 9 to resume their normal positions. While the magnet 19 is energized, contact 8 is open and contact 10 is closed through the movement of insulated button 15.

The function of contacts 7 and 8 is to short-circuit high resistance windings 13 and 14. Hence, these windings will be short-circuited while armature 21 is in its normal position, or while armature 21 is in its actuated position and there is a coin held in chute 4 by the finger 6. While the armature 21 is in its actuated position and there is no coin in chute 4, both contacts 7 and 8 are open and the high resistance windings 13 and 14 are admitted into the circuit in series with the two low resistance windings 11 and 12.

The function of contacts 9 and 10 is to short-circuit the transmitter, but since they are in series this will only take place when the armature 21 is in its operated position, and no coin is held in chute 4. In this case the subscriber may remove the shunt from around his transmitter by inserting a coin in the chute 1, when it will immediately pass into its arrested position in chute 4, due to the recession of finger 3 and the projection of finger 6. Should the subscriber fail to insert the coin he may faintly hear the called subscriber, but may not himself be heard.

The timing switch shown at the right of the broken line includes brushes 32, 33 and 34, terminals 35, 36 and 37, releasing magnet 27, stepping magnet 26 and off-normal contact 38. Such switch is placed in the circuit of the finder switch and a similar one placed in the circuit of the trunks between the first and second selector switches for the purpose of causing the collection of coins according to the rates of the operating company. The full description of these switches, their operation and the method whereby they cause the collection of coins is not included in these specifications, as they are fully described in the copending application of Lattig and Goodrum No. 52,512 filed September 24, 1915, the object here being to describe the substation charging device and how it is caused to operate over the two conductors of a subscriber's line without the use of the usual ground return.

Assume now that the subscriber wishes to make a call. He removes the receiver R from the hook H and proceeds to set up a connection through the agency of his dial switch D in a manner well known in the art. Current is supplied to the line through the usual line relay (not shown) in such a direction that the polarized magnets 19 and 22 are not operated. After the connection is established through the finder and selector switches, and the called subscriber removes his receiver from the hook, the polarity of the current traveling through the calling subscriber's set is reversed in a manner well known. Thereupon the polarized magnet 19 operates, and since the contacts 7 and 8 are now both open, the windings 13 and 14 are admitted into the circuits of the subscriber's loop. The interposition of this high resistance reduces the current flow to such proportions that polarized magnet 22 will not operate although the armature 21 of polarized magnet 19 still remains in its operated position. Since contact 9 and contact 10 are now closed, the transmitter T is short-circuited and while the subscriber may hear the called subscriber answer, he may not himself talk over the connection. By inserting a coin in the chute 1 so that in its travels it will finally rest on the insulated button 5 projecting into the chute 4, the contact 9 will be opened and the shunt around the transmitter removed. At the same time, contact 7 will be closed, thus cutting out of circuit the high resistance windings 13 and 14. The current flow through the subscriber's line is now increased to such proportions that the polarized magnet 22 operates. Thereupon a circuit is set up from grounded battery through the stepping magnet 26, contact 24, armature 23 of polarized magnet 22, interrupter 25, and thence to ground.

The stepping magnet 26 is thereupon actuated to shift the brushes 32, 33, 34 over the contacts 35, 36 and 37 under the control of interrupter 25. The time taken for the brushes to travel from their initial position to the last contact in each row is determined both by the rate of operation of the interrupter 25 and the number of idle terminals over which the brushes must pass before reaching the end. This has been fully described in the before mentioned copending patent application to Lattig and Goodrum No. 52,512 filed September 24, 1915. We will assume in this case that the time taken by the switch to complete its full travel is, say, three minutes. There-

fore, the brushes 32, 33 and 34 start on their travel when the stepping magnet is first actuated and continue for three minutes, when the last terminals are reached.

At this instant, conductor 51, which has battery connected to it through the well-known line relay, is connected to ground through the brush 32 and conductor 52 which has ground connected to it through the other winding of the said line relay, is connected to battery through the resistance 31 and the brush 33. The current flowing in the subscriber's line is thereby so reduced that the armatures of both polarized magnets 19 and 22 resume their normal positions. The current in the subscriber's line might be reduced through grounding both sides or by short-circuiting the line or by any other suitable method, but the method here described is preferably used in order to secure the proper operation of other relays and apparatus connected to the line. At the instant when the brushes 32, 33 and 34 come in contact with the last terminals 35, 36 and 37, a connection is established from grounded battery, release magnet 27, brush 34, contact 37 to ground. The release magnet 27 operates, placing ground on the intermediate contacts 37, thus maintaining a locking circuit for itself from grounded battery, release magnet 27, brush 34, contacts 37, left armature 29 and contact to ground. Brushes 32, 33 and 34 are therefore returned to their initial position, and since magnet 22 is unoperated, stepping magnet 26 is also unoperated. The instant that the release magnet 27 operates, brush 33 is removed from its last contact 36, and the current in the subscriber's line is again brought up to its initial value. The polarized magnet 19 now operates again, but if there is no coin in the chute 4, the transmitter becomes short-circuited and the high resistance windings 13 and 14 are interposed in the circuit to prevent magnet 22 from operating. If the subscriber wishes to continue the conversation, he places a second coin in the chute 1, and the operations just described are repeated.

Should the subscriber in the first place anticipate the use of a longer time than that allotted for the initial conversation, he may place more than one coin in the chute 1, so that when the brush 33 first comes in contact with the last terminal 36 in its row, and polarized magnets 19 and 22 resume their normal positions, the coin which is in chute 4 will be allowed to drop into the coin collecting box 16. This takes but an instant, as release magnet 27 operates immediately to remove brush 33 from its last contact 36, thereupon restoring the current flowing in the subscriber's line to its original value and operating polarized magnet 19. The extra coin which is stored in chute 1 immediately falls into the position in contact with insulated button 5, the polarized magnet 22 thereupon operates, and the brushes 33, 34 and 35 are again impelled forward by the stepping magnet 26 in the manner herein described. Therefore, the interruption to the conversation is so small that in practice it is not noticed, and the conversation is said to be continuous.

At any time during the conversation, before brushes 32, 33 and 34 have reached their final position, if either subscriber hangs up, the usual release magnet 40 will operate and establish a circuit from grounded battery, release magnet 27, off-normal contact 38, armature and contact of magnet 40 to ground. The timing switch is, therefore, released and the brushes 32, 33 and 34 returned to normal. The calling subscriber may recover the coins which have not been used by pressing the button 18 which so moves the pin 2 that the coins left in the chute 1 travel into the chute 17.

The refund finger 2 may be actuated by a button 18 or it may be connected through a lever to the switchhook H so that when the charged subscriber hangs up his receiver the extra coins in chute 1 will be returned.

It may also be actuated through the agency of a refund magnet in a manner similar to that described in the before mentioned patent application to Lattig and Goodrum No. 52,512 filed September 24, 1915.

It will readily be understood that the polarized relays 19 and 22 may be shunted by a suitable condenser which will not affect their operation, but which will counterbalance any deleterious effect these relays may have on the transmission efficiency of such circuits.

Referring now particularly to Fig. 2, the numerals 7′, 8′, 9′, etc., represent substantially the same elements as the corresponding numerals 7, 8, 9, etc., of Fig. 1.

The number disks, by means of which a tally is kept of the number of charges for which the subscriber at such a substation is responsible, are operated through the agency of a ratchet wheel 47. This ratchet wheel in turn is controlled by a polarized magnet 19′ through the agency of an armature 21′ and associated member 20′ which are here shown in their normal positions.

If the magnet 19′ is energized by current flowing in the proper direction, its armature will be actuated in such a manner that the normally closed contact 8′ is opened and the normally open contact 10′ is closed. The operation of these contacts will so change the circuit conditions in the substation that no conversation may be carried on, in a manner similar to that described in connection with the coin collecting device of Fig. 1.

If, however, the subscriber pushes the button K′ contacts 7′ and 9′ will be operated and hold the circuit conditions unchanged, also in a manner similar to that described in connection with the coin collecting device in Fig. 1.

Pressure exerted on the button K′ steps the ratchet wheel 41 around in a counter-clockwise direction against the force of the spiral spring 42. The ratchet wheel 41 is held in its new position through the agency of pawl 43. Arm 44, carrying a button 5′ of insulating material is rigidly secured to the ratchet wheel 41, and moves in accordance with the latter, operating through such movement the off-normal springs 7′ and 9′.

An arm 45, also rigidly connected to the ratchet wheel 41, serves to hold the pawl 46 out of engagement with the teeth of ratchet wheel 47 when the ratchet wheel 41 is in a normal position. When the button K′ is pushed one or more times, arm 45 is moved out of engagement with pawl 46 and the tooth 49 engages a tooth of the ratchet wheel 47. When, now, the armature of the magnet 19′ is actuated, this tooth 49 integral with the pawl 46 engages another tooth of the ratchet wheel 47 to move the latter forward when the magnet 19′ is again deënergized.

The off-normal movement of the member 20′ is communicated through an arm 6′ to the pawl 48 and thence to pawl 43. The ratchet wheel 41 is thereby escaped backward toward normal about one-half a step, where it is held by pawl 48. When the member 20′ is returned to normal the pawls 43 and 48 in their return movement escape the ratchet wheel the remaining part of the step.

If the subscriber has pushed the button K′ only once the first complete movement of the armature 21′ will allow the arm 44 to return to its normal position and thereby operate the off-normal contacts 7′ and 9′, thus disabling the sub-station. If, on the other hand, the subscriber has pushed the button K′ a number of times, the automatic apparatus may register a number of charges without interrupting the service.

At the end of the conversation the subscriber may push the button 18′, thereby lifting the pawl 43 from engagement with the teeth of the ratchet wheel 41 allowing the latter to return to normal if it has not already been escaped to that position, thus performing an equivalent function to that of refund button 18.

What is claimed is:

1. In a telephone exchange system, subscribers' two-conductor lines, substations having transmitting apparatus, means including said lines for establishing a connection between said substations, automatic means for periodically collecting toll at the substations, a polarized relay located at each of said substations, said relay being in series with its associated transmitting apparatus, means under the joint control of said toll collecting means and said polarized relay for disabling the transmitting apparatus at the charged substation, and token-controlled means at the calling substation for rendering the conversation continuous during the operation of said charging means.

2. In a telephone exchange system, subscribers' two-conductor lines, substations having transmitting apparatus, means including said lines for establishing a connection between substations, charging means located at each of said substations, automatic apparatus for periodically operating said charging means over the talking conductors of said subscribers' lines in series, a polarized relay in series with said transmitting apparatus, said relay being under the control of said automatic apparatus, contact members and a circuit arrangement including said contact members located at the substation, said circuit being under the joint control of said charging means and said polarized relay for disabling the transmitting apparatus at the charged substation, and token-controlled means under the control of the subscriber at said charged substation for rendering the conversation continuous during the operation of said charging means.

3. In a telephone exchange system, substations, charging means including a high impedance winding at said substations, means for automatically and periodically actuating said charging means, disabling means responsive to the actuation of said charging means for placing said high impedance winding in series with said substations, and means for automatically rendering ineffective said disabling means.

4. In a telephone exchange system, substations, charging means including a high impedance winding at said substations, means for automatically and periodically actuating said charging means, disabling means responsive to the actuation of said charging means for placing said high impedance winding in series with said substations, means responsive to the payment of a charge for restoring the normal condition of said substations, and means responsive to the prepayment of a charge for rendering ineffective said disabling means.

5. In a telephone exchange system, substations, charging means including a high impedance winding at said substations, means for automatically and periodically actuating said charging means, disabling means responsive to the actuation of said charging means for placing said high impedance winding in series with said substations, means responsive to the payment of a charge for restoring the normal condition of said substations, means responsive to the prepayment of a plurality of charges for

rendering ineffective said disabling means, and means for refunding excess prepaid charges.

6. In a telephone system, substations, charging means including a high impedance winding at said substations, means for automatically and repeatedly actuating said charging means, disabling means responsive to the actuation of said charging means for placing said high impedance winding in series with said substations, means for restoring said substations to normal condition, and means for rendering said disabling means ineffective.

7. In a telephone system, substations, charging means each including the winding of a polarized relay in series with said substations, automatic means for actuating said relay, a timing device for controlling said automatic means, disabling means responsive to said relay, and token-controlled means for rendering said disabling means ineffective.

8. In a toll collecting device, an electromagnet, a manually operable means, the collection of toll by said device being under the joint control of said electromagnet and said means, a set of contact springs under control of said electromagnet, and a set of contact springs under control of said means, said sets of contact springs being included in a circuit arrangement for controlling said magnet.

9. A toll collecting device under the joint control of an electromagnet and a manually operable means, a high impedance winding on said electromagnet, a set of contact springs under control of said electromagnet, and a set of contact springs under control of said means, said sets of contact springs being included in a circuit arrangement for controlling said high impedance winding.

10. A toll collecting device under the joint control of an electromagnet and a manually operable means, two coils on said magnet, a set of contact springs under control of said electromagnet normally short-circuiting one of said coils, and a set of contact springs under control of said means adapted to short-circuit the same said coil upon actuation.

11. In a telephone exchange system, substations under the joint control of an electromagnet and a manually operable means, means for automatically and repeatedly actuating said electromagnets, means responsive to the automatic actuation of said electromagnets for disabling said substations, means responsive to the actuation of said manually operable means subsequent to an actuation of said electromagnet for restoring the normal condition of said substations, means responsive to a plurality of actuations of said manually operable means prior to an automatic operation of said electromagnet for rendering ineffective said disabling means, and means for nullifying the effect of an excess number of manual actuations of said manually operable means.

In witness whereof, I hereunto subscribe my name this 12 day of August, A. D. 1916.

CHARLES L. GOODRUM.