Nov. 13, 1923. 1,474,053

E. H. MARTIN

TELEPHONE METER

Filed Sept. 25, 1920 3 Sheets-Sheet 1

Fig. 1.

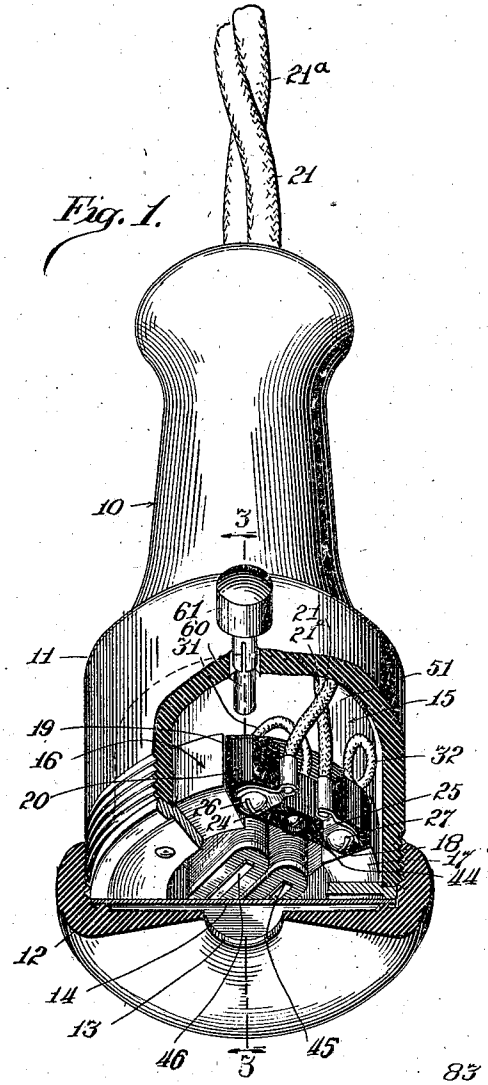


Fig. 2.

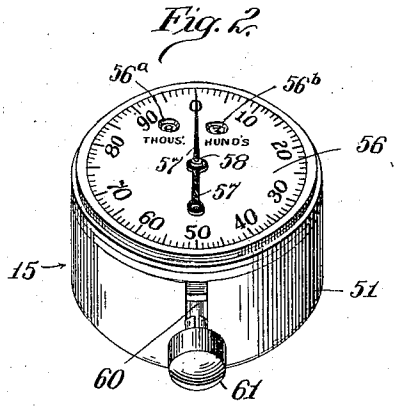


Fig. 3.

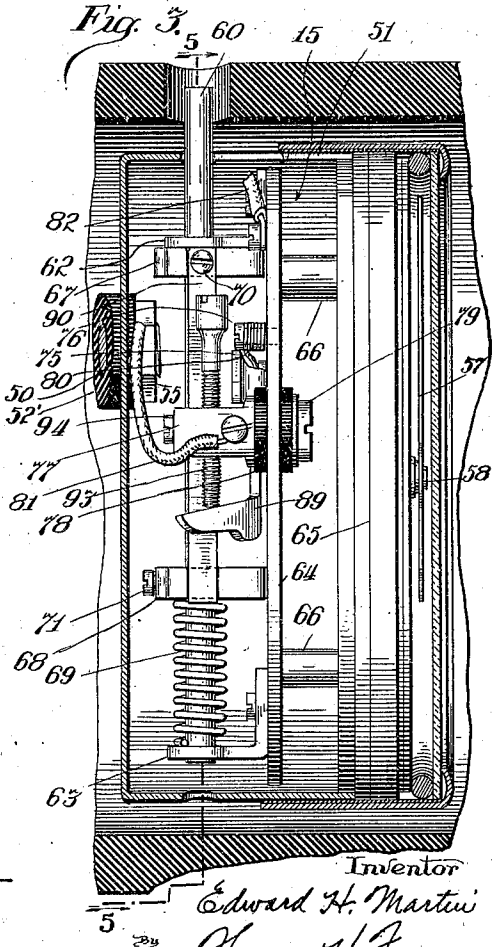
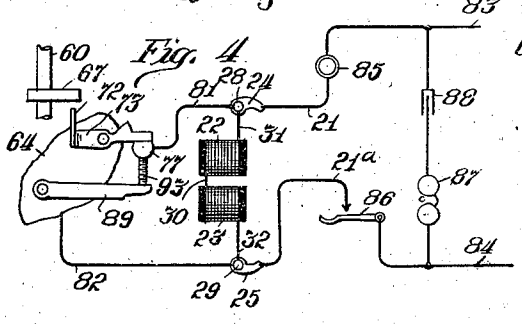


Fig. 4.



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Fig. 5.

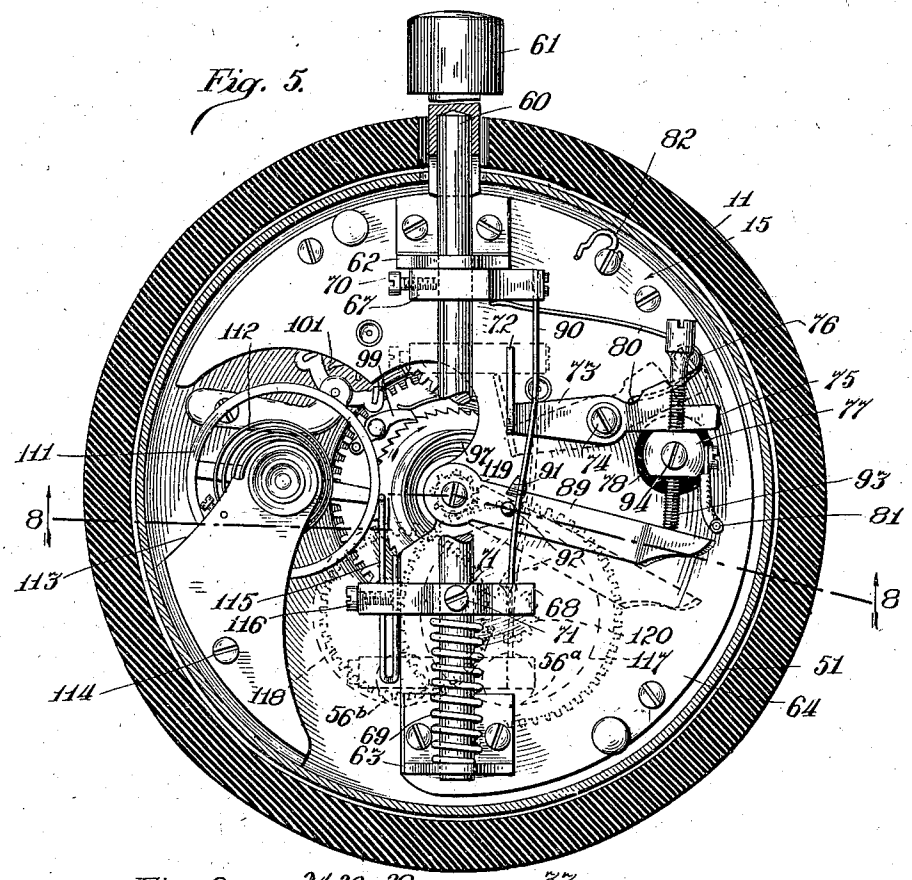
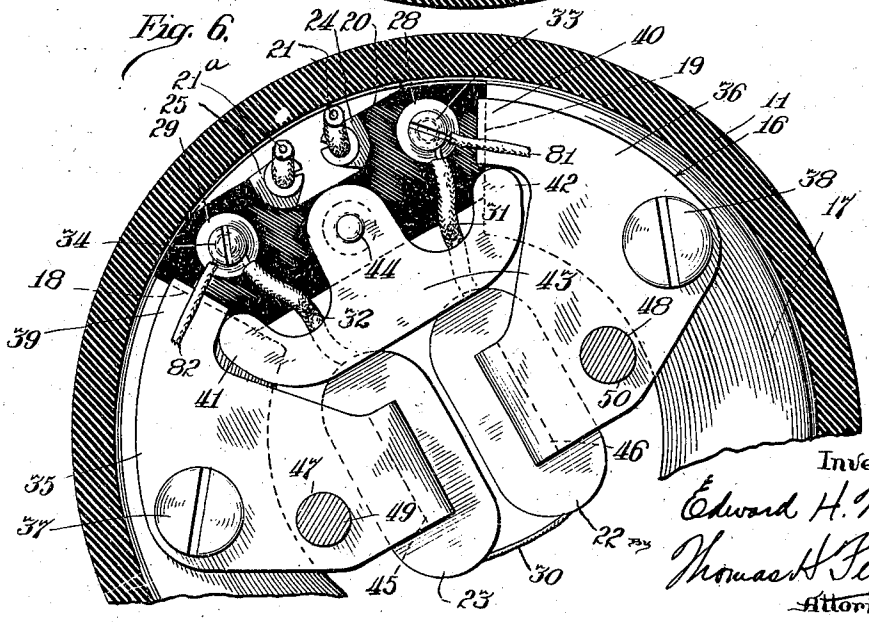


Fig. 6.



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Fig. 7.

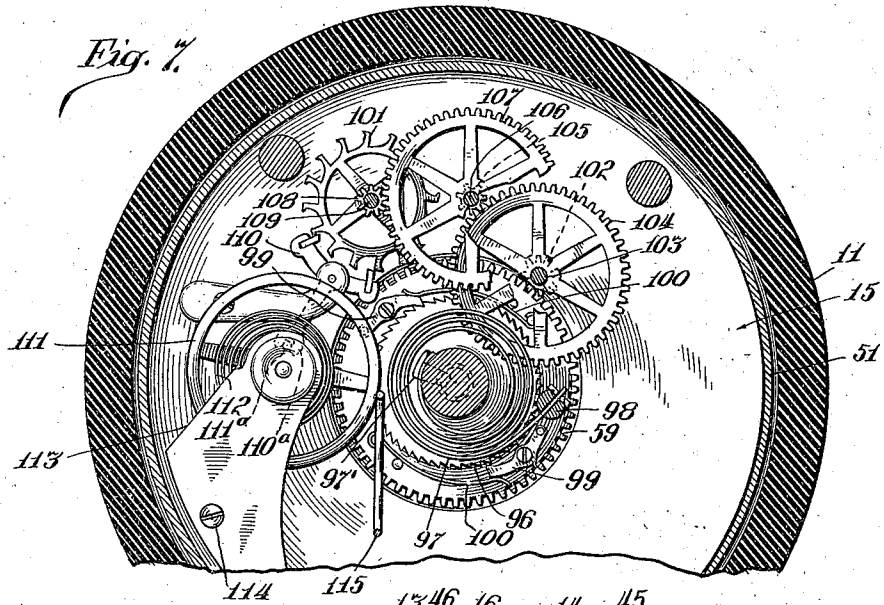
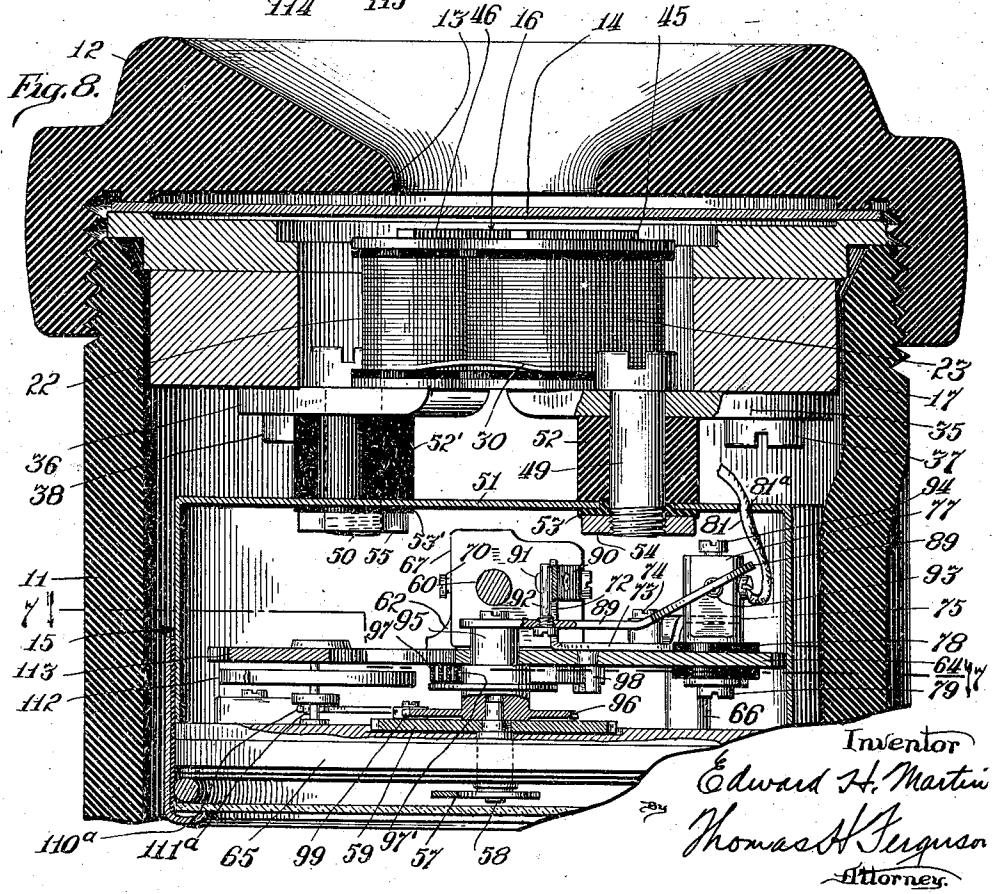


Fig. 8.



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Patented Nov. 13, 1923. 1,474,053

UNITED STATES PATENT OFFICE.

EDWARD H. MARTIN, OF LOS ANGELES, CALIFORNIA.

TELEPHONE METER.

Application filed September 25, 1920. Serial No. 412,729.

To all whom it may concern:

Be it known that I, EDWARD H. MARTIN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented certain new and useful Improvements in Telephone Meters, of which the following is a specification.

The present invention relates to telephone meters and in certain aspects has to do more particularly with that class of meters which are positioned within the telephone receiver shell and are controlled by devices carried by the shell. The general object of the invention is to provide novel circuits and mechanism for measuring the time the receiver is in service. With this object in view I preferably employ a clock train which may be wound up by depressing a mechanically operated member protruding from the shell of the receiver and by means of the clock train and the actuating member open and close circuits which affect the listening circuit to render it effective or ineffective according as the meter mechanism is counting time or not. The invention also includes the physical arrangement of parts of the completed structure, the arrangements of the circuit by which the listening circuit is brought into service or excluded, the relations of the parts by which the various functions are performed, and certain details of construction and arrangement, all of which will be found fully set forth in the following detailed description, accurately illustrated in the accompanying drawings and exactly defined in the appended claims.

The present invention is an improvement upon the inventions disclosed and claimed in my prior Patents No. 1,018,435 granted February 27, 1912, and No. 1,059,745 granted April 22, 1913.

In the accompanying drawings Fig. 1 is a perspective view of a telephone receiver constructed in accordance with the present invention, a portion of the shell being broken away and other parts being in section to show the magnet structure and the meter mechanism contained therein; Fig. 2 is a perspective view of the meter mechanism removed from the receiver shell; Fig. 3 is a vertical section of a portion of the receiver shell and parts of the contained meter mechanism, the plane of section being indicated by the line 3—3 of Fig. 1; Fig. 4 is a diagram of the receiver circuits in association with the transmitter switch hook, call bell and other parts of the usual substation telephone circuit; Fig. 5 is an elevation of the meter mechanism in the receiver shell, parts being shown in section on a plane indicated by the line 5—5 of Fig. 3 and all being viewed in the direction indicated by the arrows adjacent to said line; Fig. 6 is an elevation of the magnet and terminal structures in the receiver shell, the shell being shown in section and the parts being viewed in a direction opposite to that indicated by the arrows accompanying line 5—5 of Fig. 3; Fig. 7 is a transverse sectional view of the meter mechanism showing the train of gearing and the escapement by which the time operation of the meter is obtained, the plane of section being indicated by the line 7—7 of Fig. 8; and Fig. 8 is a longitudinal section of the diaphragm end of the receiver showing the magnet structure in association with the meter mechanism and other parts of the receiver, the plane of section being indicated by line 8—8 of Fig. 5. Throughout these views like characters refer to like parts.

Referring to the drawing in detail, 10 designates the receiver shell which differs slightly from the usual construction in having the enlarged portion 11. A cap 12 of the usual construction is flanged and threaded upon the lower end of the enlarged portion 11. The receiver shell 10 and the cap 12 are composed of the usual insulating material employed in the construction of telephone receivers. The cap 12 is provided with a central opening 13 and when it is screwed down upon the shell it retains the diaphragm 14 in position as is usual. Within the enlarged portion 11 of the receiver shell we have the meter mechanism, designated generally as 15, and the magnet and terminal structure, designated generally as 16.

The magnet and terminal structure 16 includes a permanent magnet 17 of steel or other suitable magnetic material which closely fits within the shell and extends throughout the greater portion of the periphery but has its pole faces 18 and 19 spaced apart. Insulation in the form of an insulating block 20 is located between the pole faces 18 and 19 and carries the terminals for the receiver cord conductors 21 and 21ª and the electromagnet windings 22 and 23. The conductors of the receiver cord are respectively soldered to terminals 24, 25 which are in turn secured to the block 20 by

screws 26 and 27 respectively. These screws are threaded respectively into metal pieces 28 and 29 which are firmly imbedded in the insulation composing the block 20. The windings 22 and 23 of the electromagnet of the receiver are connected in series by conductor 30. Their terminals 31 and 32 are connected to the conducting pieces 28 and 29 by terminal screws 33 and 34 which are threaded into threaded openings in the pieces 28 and 29 respectively. By this construction the circuit is completed from one cord strand 21 through terminal 24, conducting piece 28, wire 31, the winding of magnet 22, conductor 30, the winding of magnet 23, wire 32, conducting piece 29, and terminal 25, to the other cord strand 21[a].

The arcuate permanent magnet 17 is provided with polar extensions 35 and 36 which are mounted upon the upper side of the magnet and secured in place by screws 37 and 38. These polar extensions have projecting portions 39 and 40 which co-operate with extensions 41 and 42 to hold the insulating block 20 in place. The latter projections are on a member 43 which is provided with a threaded aperture for the passage of a screw 44 which extends through the insulating block 20 and securely holds the two together. The interlocking projections 39, 40, 41 and 42 prevent the withdrawal of the insulating block outward from the center of the structure in a radial direction, and the projections 39 and 40 of the polar extensions 35 and 36 extend over the edge of the insulating block 20 so as to prevent its removal in a direction lengthwise of the receiver.

The polar extensions 35 and 36 extend toward the center of the structure and there the ends are bent so as to extend in the direction of the axis of the receiver and far enough so as to closely approach the diaphragm 14. These bent ends of the polar extensions form cores for the windings 22 and 23 and their ends form pole faces 46 and 45 respectively.

The polar extensions 35 and 36 are also provided with threaded openings 47, 48 for the passage of screws 49, 50 by which to secure the casing 51 of the meter mechanism 15. Thus the polar extensions 35 and 36 become a supporting means for the meter mechanism. Suitable spacing sleeves 52, 52′ and washers 53, 53′ of insulation are positioned around the screws 49 and 50, and nuts 54 and 55 upon the ends of the screws clamp the casing 51 firmly in place while maintaining it insulated from the magnet structure. The opposite side of the casing 51 is provided with a dial 56 upon which a suitable scale is inscribed for the purpose of measuring the time the mechanism is in service. Such a scale may be a scale of minutes or other time indicating units. As shown in the drawing the scale is one totaling one hundred minutes. A pointer 57 is centrally positioned upon the dial and co-operates with the scale to indicate the reading upon it. This gives only a portion of the whole reading. The remainder of the reading is obtained by looking through the "thousands" and "hundreds" openings 56[a] and 56[b] in the dial and observing the exposed figures upon the counting wheels. Thus with a reading of 5260 minutes, the 5 would be determined by an observation through the "thousands" opening 56[a], and 2 by an observation through the "hundreds" opening 56[b], and the 60 by observing the position of the pointer 57 upon the scale. As before noted, the indicated time is the time of duration of the listening circuit and it therefore follows that the indicated time is the exact time the subscriber has used his telephone receiver. The pointer 57 is secured to the end of a pintle 58 which is journaled in the casing of the mechanism and carries at its other end a gear wheel 59 to which it is fixed. The rotation of the latter wheel causes a rotation of the pointer 57. As we shall see, motion is transmitted to this wheel 59 through timing mechanism consisting of a train of gears and an escapement wheel. The mechanism is initially set in operation by a manually movable member 60 which acts to store energy in a coiled spring as the result of a simple manual movement. In contrast to this the energy thus stored is applied to the pointer and counting wheels through a retarding means including a train of gearing.

The plunger 60 is provided with a removable head 61 and reciprocates in bearings 62 and 63 located upon the frame plate 64. This plate is spaced from plates 65 which are located directly behind the dial. This spacing is accomplished by posts or spacing blocks 66. The plunger 60 carries a head 67 and a head 68. A coiled spring 69 is located between the head 68 and the bearing 63 and serves, when unhindered, to return the plunger to its normal position. The head 67 is firmly secured upon the plunger 60 by a set screw 70. A similar set screw 71 secures the head 68 to the plunger. The head 67 is adapted to engage with the upturned end 72 of a lever 73 pivoted to the frame plate 64 by a pivot screw 74 and having a contact end 75 which moves between a stop 76 and an insulated contact post 77. Both the stop 76 and the post 77 are secured to the frame plate 64 and the post 77 is suitably insulated from the plate 64 by insulation 78. The post 77 is secured in position by a screw 79 which passes through the insulation 78 and an opening in the plate 64 into threaded engagement with an opening in the interior of the post 77. The lever 73 is spring-pressed and, when unhindered, maintains contact with the post 77 by means of a

spring 80 which is coiled about the post 76 and has one end extending so as to engage the underside of the head 67 and the other end extending so as to engage the upper face of the tail 75 of the lever 73. When the plunger 60 is depressed then the head 67 engages the upturned end 72 of the lever 73 and forces that end downward against the tension of the spring 80 and thereby breaks electrical connection between the tail 75 of the lever 73 and the insulated post 77.

As more clearly shown in Fig. 4, the insulated post 77 is electrically connected by an insulated wire 81 to one of the terminals upon the insulating block 20, such as terminal 24, while the lever 73 is electrically connected through the frame plate 64 and an insulated wire 82 to the other terminal clip, such as 25. The connection between wire 81 and terminal 24 is made through the metal block 28 in the insulating member 20. The bared end of the wire is attached to the block by screw 33 as clearly shown in Fig. 6. Similarly wire 82 is connected to block 29 by screw 34 and circuit is thus completed with terminal 25. The wires 81 and 82 are covered with insulation and pass through suitable openings in the casing 51, one of which is shown at 81a. As shown in the diagram of Fig. 4, the windings 23 and 24 are normally short-circuited by the connection through the engaged lever 73 and post 77. When the plunger 60 is depressed the head 67 moves lever 73 out of contact with the post 77 and thereby breaks the short-circuit around the windings 23 and 24 of the receiver and thereby in so far as this short-circuit is concerned, frees the listening circuit through the receiver windings 22 and 23 and the line limbs 83 and 84. In this connection it may be pointed out that these line limbs are connected to the terminals 24 and 25 respectively, the one through the telephone transmitter 85 and the other through the telephone switch hook 86. For signaling purposes a call bell 87, in series with a condenser 88, is bridged across the line limbs. When the receiver is removed from its hook and before the plunger 60 is depressed the listening circuit is impotent. As soon as the plunger is depressed, the normal short-circuit provided by lever 73 and post 77 is removed.

Returning again to the operation of the meter mechanism, we find that the head 67 not only operates the short-circuiting lever 73 but also actuates a spring winding arm 89 so as to store energy for the operation of the meter mechanism. When this arm is once depressed it is freed for a return movement under the retarding action of the gear train and escapement which form an important part of the meter mechanism. Upon its return to normal the arm 89 closes a second short-circuit about the receiver magnet windings 22, 23 which is independent of that controlled by the lever 73. This latter short-circuit, however, is not established until the listening circuit has been in use for a definite time, such as three minutes, a commonly accepted limit for conversation over a telephone circuit.

The lever 89 is actuated through a pawl carried by the head 67. This pawl is in the form of a leaf spring 90 which is secured at one end to the head 67 and passes at its other end into a notch in the head 68, which serves to guide it in its to and fro movements. This pawl spring 90 carries a projection 91 which engages a pin 92 upon the lever 89.

As the plunger moves downward the projection 90 engages the pin 92 and remains in engagement with it until the arm 89 has been carried to its dotted line position, as shown in Fig. 5. When this position is reached the projection 91 slips off of the pin 92 and thereupon frees the lever 89 for its return movement.

Normally the free end of the arm 89 engages a contact screw 93 which passes through a transverse opening in the post 77 and is secured in a desired position by a set screw 94. As shown by the diagram of Fig. 4, these parts when in their normal position short-circuit the windings of the receiver magnet. As soon as the arm 89 is moved out of engagement with the screw 93 the short-circuit at this point is removed. It is not again established until the arm 89 returns to its screw engaging position. This cannot happen until the retarding mechanism and time measuring mechanism have allowed it to do so.

Referring now to the operation of the retarding mechanism, it will be seen that the arm 89 is fixed to a hub 95 which is journaled in the frame plate 64 and carries a ratchet wheel 96 which lies in close proximity to the gear wheel 59 which drives the pointer 57 of the time measuring mechanism. The same hub 95 is surrounded by a coiled spring 97. One end of this spring is secured to the hub 95 by a pin 97'. The other end of the spring is secured to the frame plate 64 by a post 98. It will be seen that since the post 98 is fixed, any rotation that is given to the hub 95 will wind up the spring 97 and store energy in it for use in subsequently driving the gear train. As the arm 89 is moved away from the contact post 77 and the spring is thereby wound up, the ratchet wheel 96 will be rotated in the direction of the arrow as the parts are illustrated in Fig. 5. Retaining pawls 99 are pivoted to the gear wheel 59 and spring pressed by springs 100 so as to engage the teeth of the ratchet wheel 96 and thus prevent the spring 97 from unwinding without driving the gear train. As the spring 97 unwinds it carries the pointer actuating gear wheel 59 with

it but its return is retarded by the train of pinions and gear wheels which extend from gear wheel 59 to escapement wheel 101. Particularly considered, this train includes a pinion 102 mounted on shaft 103 with gear wheel 104, a pinion 105 mounted on shaft 106 with gear wheel 107 and a pinion 108 mounted on shaft 109 with the escapement wheel 101. Gear wheel 59 meshes with pinion 102, gear wheel 104 meshes with pinion 105 and gear wheel 107 meshes with pinion 108. This is a usual clock train. The movement of its wheels is controlled by escapement wheel 101 which in turn is controlled by a pallet 110 and a balance wheel 111. The balance wheel is provided with the usual hair spring 112 and it is suitably journaled between the frame plate 65 and segmental frame plate 113 lying in the same plane as plate 64 and secured to the base plates 65 of the meter structure by any suitable means as by means of the screw 114.

The balance wheel 111 must be set in motion so as to oscillate to and fro to actuate the pallet 110 to gradually allow the spring 97 to unwind and thereby gradually bring the contact arm 89 back to normal position wherein it will engage contact screw 93 and short-circuit the windings of the receiver magnet. In order to start the balance wheel 111 an engaging member 115 is provided. This member is ordinarily a piece of steel which yieldingly exerts a slight pressure upon the periphery of the wheel 111 as it engages it. The member 115 is carried by the head 68 of the plunger 60 and is secured in desired position by a set screw 116. Normally the member 115 engages the balance wheel 111 and prevents any movement. When the plunger is depressed the member 115 is carried downward out of engagement with the wheel 111. As it moves in this direction it carries the wheel with it and places the spring 112 under tension so that as soon as the member 115 passes out of engagement with the wheel 111 the spring 112 returns the wheel and starts it oscillating. The oscillations are continued by the action of the wheel 101 upon pallet 110 and the movements of the latter are applied to the balance wheel 111 by the tail 110^a of the pallet 110 engaging a projecting pin 111^a on the hub of the wheel 111, as shown in dotted lines in Fig. 7. This is a well known form of escapement and need not be further described. The oscillations, as before noted, allow the spring to slowly unwind and to return to its contact closing position.

At this point attention may be directed to the relation of the counting wheels whose figures are viewed through the openings 56^a and 56^b in the face of the dial. These counting wheels include the "hundreds" wheel 117 and the "thousands" wheel 118, the latter viewed through opening 56^a and the former through opening 56^b. Wheel 117 is driven by pinion 119 on the same shaft as the pointer wheel 59 and wheel 118 is driven by pinion 120 on the same shaft as wheel 117. The counting train has its wheels so proportioned that the "hundreds" wheel 117 makes one tenth of a revolution for each revolution of the pointer wheel 59 and the "thousands" wheel 118 makes one tenth of a revolution for each revolution of the "hundreds" wheel 117.

A series of consecutives numbers on these wheels in positions to come opposite the openings 56^a and 56^b indicate the extent of movement of each of these wheels and thus serve to count time against the user of the receiver in the way previously pointed out. Such a counting train is broadly old and consequently I have not taken pains to show the same in great particularity.

To review the operation briefly, it will be observed that in the normal condition of the substation apparatus the switch hook 86 will be in open position and a path will be provided for ringing current through the call bell 87. When a party answers a call he will remove his receiver from its hook and thereupon connect the line limbs 83 and 84 through the transmitter 85 and the windings 22 and 23 of the receiver. But at that time the windings 22 and 23 will be short-circuited by the contact post 77 engaging both levers 73 and 89. Now before the party can receive any communication through his receiver it will be necessary for him to break these normal short-circuits. He does this by depressing the head 61 upon the plunger 60 and, as before noted, causes lever 73 to move out of engagement with post 77 and contact arm 89 out of engagement with the contact screw 93 carried by the post 77. This downward movement of the plunger also frees and starts the balance wheel 111 and the energy stored in the main spring 97 is gradually applied to the pointer operating wheel 59. The listening circuit thus established continues either until the party allows the plunger 60 to return to its normal position or, if he maintains the plunger depressed, until the contact arm 89 returns to its normal position. The party must keep the plunger depressed if he is going to use the listening circuit. If he seeks to prevent the meter from registering by removing the pressure upon the head of the plunger 60 then lever 73 will establish its short-circuit and thus render the listening circuit impotent. On the other hand if the party maintains the plunger depressed the listening circuit will be maintained until the spring runs down and thus allows contact arm 89 to establish its short-circuit. When this occurs the party may again depress his plunger and set the mech-

anism again in operation. If he concludes his conversation before the meter mechanism has run down then the restoration of the plunger stops the balance wheel 111 and prevents the spring 97 from fully unwinding. This stops the meter mechanism and consequently prevents a false record against the party. As soon as the receiver is again taken up for use and the plunger depressed so as to free the balance wheel and open the short-circuits then the spring will be free to apply its stored energy whether stored during its previous use or stored by the renewed operation of the plunger. Any movement of the plunger which is sufficient to open the short-circuits will allow the receiver to be used. But any such movement will necessarily result in storing some energy in the spring and bring about the operation of the time mechanism. In this way an accurate record is kept of the time the listening circuit is in use. The counting train is not returned to normal but continues in its travel in the same direction and consequently each use of the listening circuit is timed and the time added to the preceding total. In other words. the record made is cumulative and gives the total time the listening circuit has been in service. Readings may be made from month to month of the meter mechanism and charges made accordingly, just as in the case of recording and charging for water, electricity and other commodities or services.

It will be understood that in carrying out my invention other arrangements of parts may be employed than those shown, and other retarding mechanism may also be used instead of the clock train here disclosed. However, I have disclosed what I consider the preferred form of the invention. Likewise various modifications and alterations may be made in the mechanism herein shown without departing from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A telephone receiver comprising a shell, a diaphragm carried by said shell, an actuating magnet for said diaphragm mounted in said shell adjacent to said diaphragm, electrical connections within said shell for establishing a listening circuit through said magnet, spring wound meter mechanism carried by said shell, and means responsive to a single manual operation to wind said meter mechanism and to insure the subsequent recording operation of the same coextensively with the existence of said listening circuit.

2. A telephone receiver comprising a shell, a diaphragm carried by said shell, an actuating magnet for said diaphragm mounted in said shell adjacent to said diaphragm, circuit connection within said shell for said magnet, spring wound meter mechanism mounted within said shell, and a manually operated member mounted upon said shell and operative to wind said mechanism, control its restoration and vary said circuit connections.

3. A telephone receiver comprising a shell, a diaphragm carried by said shell, an actuating magnet for said diaphragm mounted in said shell adjacent to said diaphragm, circuit connections within said shell for establishing a listening circuit through said magnet, spring wound meter mechanism within said shell, a manually operated control member mounted on said shell, means responsive to the movement of said member to vary said circuit connections, means responsive to the same movement of said member to wind said meter mechanism and to free the same for operation during the existence of the listening circuit, and means actuated by said mechanism to vary said connections whenever said mechanism runs down.

4. A telephone system including a telephone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling said connections, spring wound meter mechanism, and a manually operated member mounted on said receiver and operative to wind said mechanism, control its restoration and vary said connections.

5. A telephone system including a telephone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling said connections, spring wound meter mechanism operative independently of the electrical condition of said line, and a manually operated member mounted on said receiver and operative to wind said mechanism, control its restoration and vary said connections.

6. A telephone receiver comprising a shell, a diaphragm carried by said shell, an actuating magnet for said diaphragm mounted in said shell adjacent to said diaphragm, electrical connections within said shell for establishing a listening circuit through said magnet, spring wound meter mechanism carried by said shell, and a manually operated member mounted upon said shell and operative to wind said mechanism and to allow its unwinding only coextensively with the existence of said listening circuit.

7. A telephone system including a telephone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling a listening circuit for said receiver, spring wound meter mechanism, and a manually operated member on said receiver operative independently of the position of said receiver for

winding said mechanism and controlling its subsequent operation so as to insure a recording action coextensively with the existence of said listening circuit.

8. A telephone system including a telephone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling said connections, meter mechanism, a manually operated control member independent in its movement of said switch-hook, and means responsive to the operation of said member to store energy for the operation of said mechanism, to control the operation of said mechanism by said stored energy and to vary said connections.

9. In a telephone system including a telephone line, a receiver, means for including the magnet windings of said receiver in a listening circuit with said line, contacts for controlling a circuit in shunt of said windings, time measuring mechanism for closing a circuit in shunt of said windings after a lapse of a definite time interval, and a manually controlled member operable by one movement to actuate said contacts to open said shunt and by the same movement to store energy in said time measuring mechanism.

10. A telephone system including a telephone line, a receiver, means for including the magnet windings of said receiver in a listening circuit with said line, contacts for opening and closing paths in shunt of said windings, a time measuring device for controlling one of said shunt paths, and a manually operated member for controlling another of said shunt paths and for storing energy for the operation of said device.

11. A substation telephone circuit including a receiver adapted to be included in a listening circuit, contacts for varying that circuit, and time recording mechanism for operating said contacts comprising a spring, means for placing said spring under tension, a gear train and an escapement for retarding the restoration of said spring to normal, and recording means operated in response to the restoring action of said spring.

12. A substation telephone circuit including a receiver adapted to be included in a listening circuit, contacts for varying that circuit, and time recording mechanism for operating said contacts comprising a spring, means for placing said spring under tension, a gear train and an escapement for retarding the restoration of said spring to normal, recording means operated in response to the restoring action of said spring, and manually controlled means for directly engaging the escapement wheel to stop the recording and for oscillating the escapement wheel to start the recording.

13. In a telephone meter, the combination of a spring, a manually operated reciprocating member and associated parts for quickly restoring energy in said spring, delay mechanism including a gear train and an escapement for timing the restoration of the spring to its normal condition, means for indicating the time, and means actuated by said reciprocating member for engaging and disengaging the escapement wheel to respectively stop and start said delay mechanism.

14. A telephone receiver comprising a shell, a diaphragm carried by said shell, an actuating magnet for said diaphragm mounted in said shell adjacent to said diaphragm, circuit connections within said shell for establishing a listening circuit through said magnet, spring wound meter mechanism for measuring the duration of said listening circuit, an actuating member for winding said meter mechanism, means controlled by said mechanism to disable said listening circuit by short-circuiting said magnet, after a definite time interval, and means controlled by said member for removing a normal short-circuit from about said magnet.

15. A telephone receiver comprising a shell, a diaphragm carried by said shell, an actuating magnet for said diaphragm mounted in said shell adjacent to said diaphragm, circuit connections within said shell for establishing a listening circuit through said magnet, spring wound meter mechanism for measuring the duration of said listening circuit, an actuating member for winding said mechanism, means controlled by said mechanism to disable said listening circuit after a definite time interval, and means controlled by said member for removing a normally disabling condition of said lisetning circuit.

16. A telephone system including a telephone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling said connections, spring wound meter mechanism for measuring the duration of the listening circuit through the receiver, and a manually operated member mounted on said receiver and operative to wind said mechanism, control its restoration and render said listening circuit potent or impotent.

17. A telephone system including a telephone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling said connections, spring wound meter mechanism for measuring the duration of the listening circuit through the receiver, a manually operated member mounted on said receiver and operative to wind said mechanism, control its restoration and render said listening circuit potent or impotent, and make and break short-circuits about the receiver magnet.

18. A telephone system including a tele-

phone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling said connections, meter mechanism for measuring the duration of the listening circuit through the receiver, a manually operated control member, and means responsive to the operation of said member to store energy for the operation of said mechanism, to control the operation of said mechanism by said stored energy and to render said listening circuit potent of impotent.

19. A telephone system including a telephone line, a telephone receiver, electrical connections between said line and receiver, a switch-hook for controlling said connections, meter mechanism for measuring the duration of the listening circuit through the receiver, a manually operated control member, and means responsive to the operation of said member to store energy for the operation of said mechanism, to control the operation of said mechanism by said stored energy, to render said listening circuit potent or impotent, and to make and break short-circuits about the receiver magnet.

20. A telephone system including a telephone line, a receiver, means for including the magnet windings of said receiver in a listening circuit with said line, manually controlled contacts for opening and closing a short-circuit about said windings, time measuring mechanism for closing a short-circuit about said windings after the lapse of a definite time interval, and means for storing energy in said time measuring mechanism each time said contacts are actuated.

21. In a telephone receiver, the combination of a flat arcuate permanent magnet terminating in spaced pole faces, polar extensions from points of said magnet near said pole faces toward the center of the space partially encircled by said magnet and there terminating in electromagnet cores, windings for said cores, a casing secured to said polar extensions and extending away from said magnet, meter mechanism within said casing, a dial at the unattached side of said casing and a poitner actuated by said mechanism to indicate readings on said dial.

In testimony whereof, I hereunto subscribe my name this 24th day of September, A. D., 1920.

EDWARD H. MARTIN.