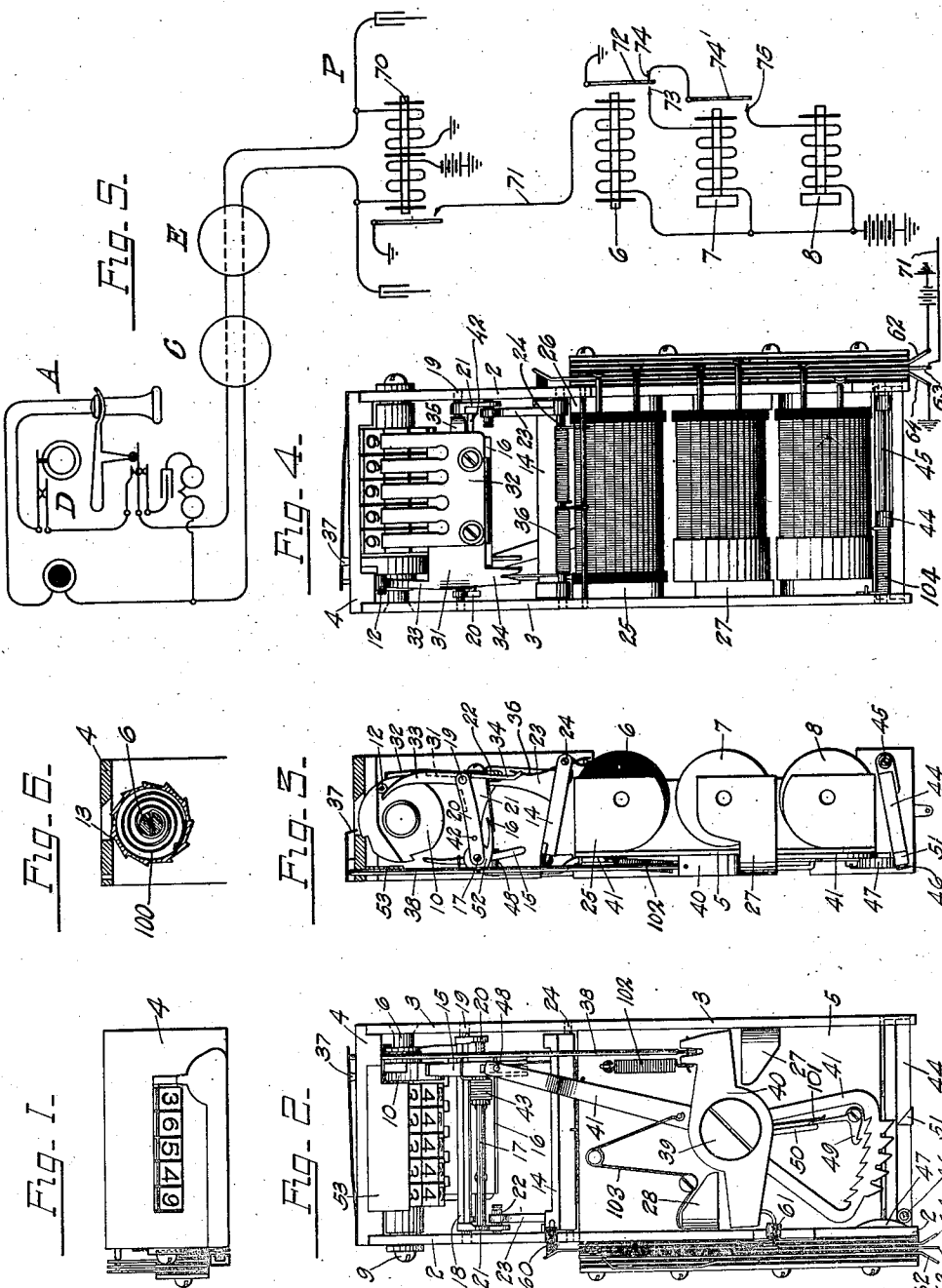


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 CALL INDICATOR FOR AUTOMATIC TELEPHONE SYSTEMS.
 APPLICATION FILED JULY 10, 1916. RENEWED JULY 28, 1919,

Patented May 2, 1922.

1,414,686.



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CALL INDICATOR FOR AUTOMATIC TELEPHONE SYSTEMS.

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Specification of Letters Patent.

Patented May 2, 1922.

Application filed July 10, 1916, Serial No. 108,324. Renewed July 28, 1919. Serial No. 313,825.

To all whom it may concern:

Be it known that I, JOHN G. BLESSING, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Call Indicators for Automatic Telephone Systems, of which the following is a specification.

My invention relates to call indicators for automatic telephone systems and has for its object the provision of a compact device of this character which is capable of registering before an operator a plurality of digits in a called number in response to the operation of a calling subscriber's impulse sender.

Such indicators are not altogether new, having been shown and their functions set forth and explained in a number of issued patents, among which may be mentioned the patent to Clement, No. 1,105,589, and the patent to McBerty, No. 1,117,511. My improved call indicator, however, possesses many new and desirable features not found in previous devices. It comprises, briefly, a plurality of indicating number wheels which are successively set by a single operating pawl in accordance with a plurality of series of impulses. Further invention resides in the mechanical arrangement and design of the various parts whereby a very compact construction is obtained.

These features together with others not specifically mentioned will appear more clearly and will be more readily understood from an inspection of the detailed specification and the accompanying drawings.

In the drawings, Fig. 1 represents an end view of my improved call indicator, Figs. 2 and 4 are top and bottom views, respectively, while Fig. 3 is a side view with one of the frame plates removed and the end piece cut away to more clearly show the mechanism. Fig. 5 is a circuit diagram showing the wiring connections of the device by which it may be controlled from a subscriber's telephone. Fig. 6 is a detailed showing of one of the number wheels.

Referring now to Figs. 1, 2, 3, 4, and 6, the various parts are mounted in a frame which comprises two brass side plates 2 and 3 which are separated the proper distance and rigidly connected by the end piece 4 and the top mounting plate 5. The frame is given additional strength and rigidity by the cores of the magnets 6, 7, and 8 which

are secured at opposite ends to the frame plates 2 and 3 by countersunk screws (not shown). An opening in the end piece 4, clearly shown in Fig. 1, enables the operator to perceive the number which has been registered by the setting of the number wheels. In Fig. 1 the various number wheels are assumed to have been set in accordance with the digits which appear. When all the wheels are at rest no numbers are to be seen for the space just to the right of tooth 13 (Fig. 6) is a blank.

Adjacent to the end piece 4, the shaft 6, passing through the plate 3 and secured at the other end to plate 2 by the screw 9, affords a means for mounting the number wheels and the release control wheel 10. Each number wheel and also the release control wheel is provided with a miniature clock spring such as the spring 100 shown in Fig. 6 by means of which they are normally held in the position shown in Fig. 2. Each clock spring is carried on the inside of its associated wheel and is fastened at one end to the wheel and at the other end to the shaft 6, as may be seen clearly by reference to Fig. 6. The normal position of the number wheels is determined by the ratchet tooth 13 of each wheel which, being somewhat higher than the rest, engages the lower edge of the opening in the end piece 4. The normal position of the release control wheel 10 is determined by the roller 12 carried on one side of wheel 10 near its periphery and which normally rests against the end piece 4 as shown in Fig. 4. The clock springs are tensioned properly by turning the shaft 6. The screw 9 is first loosened and the shaft 6 is then rotated in a counter clock-wise direction (see Fig. 6) whereby all the springs are tightened, after which the shaft 6 is locked by means of the screw 9.

The operating pawl 15 is rotatably and slidably mounted upon a reciprocating carriage which comprises a cross bar 18 and a rod 17 secured together at one end by the piece 20 and at the other end by the triangular shaped piece 21. The carriage is pivoted on a rod 19 which passes through frame plates 2 and 3 and through bearings in pieces 20 and 21. A small rod 42 extends from end piece 20 to end piece 21 parallel to rod 17 and a short distance below it. The downwardly extending end of spring 43 is slipped behind this rod, the

spring being first given sufficient tension to bring pawl 15 into engagement with the number wheels when it is moved forward. While the lower end of spring 43 is concealed from view in Fig. 2, the method of tensioning this spring is similar to the method employed in tensioning spring 36, which is clearly shown in Fig. 4. The movement of the reciprocating carriage is controlled by the armature 14 of the magnet 6 through the medium of arm 23 which engages a roller 22 mounted on the lower corner of the triangular piece 21. The armature 14 is pivoted on a rod 24 passing through the frame plates as shown. It will now be easily understood that when the armature 14 is attracted by pole pieces 25 and 26 of magnet 6 the upper end of arm 23 (Fig. 3) will be moved to the left, thereby rotating the carriage in a clockwise direction about the rod 19 as an axis and bringing the pawl 15 into engagement with the notch on wheel 10.

For retaining the number wheels in set position and also to prevent backward rotation during setting, there is provided a comb 32 of spring brass which is attached by screws to the plate 31. The plate 31 is provided at each end with an upturned portion, one of which is indicated by reference character 35, by means of which the plate 31 is pivoted on the rod 19 just inside the end pieces 20 and 21 of the reciprocating carriage. A tail piece 34 is engaged by the spiral spring 36 whereby the plate 31 is normally held with the arm 33 resting against the roller 12 carried on wheel 10. By referring now more particularly to Fig. 3 it will be seen that when the release control wheel 10 is rotated by the pawl 15 the roller 12 will engage the arm 33 and will rotate the plate 31 in a counter clock-wise direction about the rod 19 as an axis, whereby the teeth of the comb 32 are brought into position to engage the teeth of the number wheels.

The release control wheel 10, when rotated is locked by the spring dog 37 under the control of magnet 7. The pole pieces 27 and 28 of magnet 7 are bent inwardly and lie upon the top of plate 5. The armature 40 is pivoted on the larger portion of the off-set pivot screw 39 which is screwed into the top mounting plate 5. When the magnet 7 is energized the armature 40 is rotated in a clock-wise direction, thereby withdrawing the rod 38 from engagement with the spring dog 37 which latter is thus allowed to engage the detent in the wheel 10 when the same is rotated.

It has been mentioned before that the pawl 15 is slidably mounted on the rod 17 of the reciprocating carriage. In Fig. 2 the pawl 15 is shown in its normal position. It is movable from right to left in succes-

sive stages under the control of the armature 44 of magnet 8. The armature 44 is rotatably and slidably pivoted on the rod 45. A roller 46 carried by armature 44 engages a curved cam like projection on the frame plate 2 when the armature is attracted thereby moving the armature endwise from left to right (Fig. 2) at the same time it is moved around its pivot. The lever 41 is pivoted on the pivot screw 39 independent of armature 40 and carries at one end a pin 48 which fits in a slot in the pawl 15. It will be readily apparent from the foregoing that when the armature 44 is attracted the cam 51 will engage the first tooth in the rear end of lever 41 whereby the lever 41 will be rotated about pivot 39 to shift the pawl 15 into position adjacent the first number wheel. The lever 41 is held in its successive positions by the dog 49. Arm 50 carried on the armature 40 normally holds the dog 49 out of engagement with the inner teeth of lever 41. The spring 103 returns the lever 41 to normal as soon as the arm 50 knocks the dog 49 out of engagement with its associated teeth.

A few details relating to the operation of pawl 15 will now be given, which could not be conveniently explained before. The front stop for this pawl comprises a rearwardly extending portion 53 of the end piece 4 and is provided to prevent the pawl 15 from disengaging the notches in the number wheels (Figs. 2 and 3). The back stop, by which the pawl when retracted is raised from engagement with the number wheels, comprises a cross bar 16 rigidly attached to the plate 31. It will be seen from Fig. 3 that the pawl 15 is provided with a downwardly extending tail piece 52 which engages the cross bar 16. Now whenever the plate 31 is shifted by the release control wheel 10 the cross bar 16 attached to the said plate will allow the pawl to rotate slightly under the tension of spring 43 so that the end of the pawl will be able to engage the teeth of the number wheels when the pawl is thrust forward. The notch on the release control wheel 10 which the pawl engages is set forward somewhat further than the first teeth of the number wheels so that the pawl will be able to engage it before the cross bar 16 has been shifted.

It is understood that the various armatures, dogs, etc. are provided with suitable springs by which they are returned to normal position at the proper time. Referring to Figure 2, the spring 102 is for restoring the armature 40 to normal, the spring 103 is for restoring the lever 41 to normal position, and the spring 101 is for pressing the dog 49 into engagement with the inner teeth in the lower end of the lever 41 when the armature 40 is attracted, while the spring 104

(Fig. 4) is for restoring the armature 44 to normal position and may be similar to the spring 36.

The contact springs by which the circuits of magnets 7 and 8 are controlled are mounted on frame plate 2 by four screws (Figs. 2 and 4). The springs are arranged so that no wiring is necessary. Connection to the magnet coils is made by means of projecting spring clips which are formed integral with the springs and which engage the terminals of the coils as shown in Fig. 4. Three terminals indicated in Fig. 2 by reference characters 62, 63, and 64 are connected, respectively, to ungrounded pole of battery, conductor 71 (Fig. 5), and ground. The armature 14 of magnet 6 is provided with a bushing 60 by means of which the three springs corresponding to armature 72 and contacts 73 and 74 of Fig. 5 are controlled. The armature 40 of magnet 7 is likewise provided with a bushing 61 by means of which springs corresponding to armature 74' and contact 75 of Fig. 5 are controlled. While the arrangement of contact springs and terminals shown herein is very compact and convenient, this precise construction need not be adhered to so long as the proper circuits are retained.

Having explained the mechanical construction of my improved call indicator I will now describe briefly its operation in registering a call. The magnets of the call indicator respond to impulses received in the same manner as do the principal controlling relays of a connector switch in an automatic telephone system of the type with which the indicator is adapted to be used. Such a system is shown in the patent to Newforth, No. 13,901, reissued April 13, 1915, and it may be stated that the magnets 6, 7, and 8 of my improved call indicator correspond insofar as their operation is concerned to the line, release, and control relays shown in the connector switch of that patent. To proceed and referring to Fig. 5 of the drawings when the subscriber at the automatic substation A removes his receiver preliminary to making a call, his line is extended in well known manner through the medium of an individual line switch C to a selector switch E. The calling subscriber may now manipulate his calling device D, which may be of the type shown in the British patent to Dicker No. 29,654 of 1910, in accordance with the first digit of the desired number. A series of interruptions of the line circuit is thus produced whereby the selector E is operated to extend the line conductors to the operator's cord circuit P, of which only a fragmentary portion is shown. The controlling relay 70, in bridge of the two strands of the cord and in series with a battery, is then energized over the calling subscriber's loop.

Upon attracting its armature, the relay 70 completes a circuit from ground by way of conductor 71 to the magnet 6 of the call indicator. Magnet 6, upon energizing, attracts the armature 14 with the following results: The reciprocating carriage is operated to rotate the release control wheel 10 through the medium of pawl 15; and a circuit is completed for the magnet 7 which extends from ground by way of armature 72, contact 73 and winding of the said magnet 7 to the ungrounded pole of battery. Magnet 7, upon energizing, rotates its armature 40, thereby withdrawing the rod 38 from engagement with the spring dog 37 to permit the latter to engage and retain the release control wheel 10 in operated position. The release control wheel when rotated shifts the plate 31 so that the teeth of the comb 32 engage their respective number wheels and also at the same time the cross bar 16 moves backward as previously described. As a further result of the operation of armature 40 the arm 50 is moved to the left to free the dog 49. As a still further result a circuit is prepared for magnet 8 by the engagement of armature 74' with contact 75.

The calling subscriber may now operate his calling device in accordance with the second digit of the desired number thereby producing a series of interruptions in the circuit of relay 70. By the alternate retraction and attraction of its armature, relay 70 produces a corresponding series of interruptions in the circuit of magnet 6. At each retraction of its armature magnet 6 closes a circuit for magnet 8 as follows: Grounded armature 72, contact 74, armature 74', contact 75, and the winding of magnet 8 to the ungrounded pole of battery. Magnets 7 and 8 are each provided with a heavy slug of copper to make them slow acting so that they retain their armatures during vibrations of the armature of magnet 6. When the magnet 8 is energized at the first retraction of the armature of magnet 6, the armature 44 controls the lever 41 to shift the pawl 15 into position before the first number wheel. It will be plain now that the intermittent attractions of armature 14 which follow immediately after its first retraction result in the setting of the first number wheel in accordance with the second digit of the number called since the first series of impulses operated the selector E to extend the line conductors to the cord circuit P. At the end of the series of interruptions the magnet 8 is deenergized, the lever 41 being retained in position by the dog 49.

As the calling subscriber calls the remaining digits of the wanted number the apparatus responds as before for each digit; it being understood that at the first deenergization of magnet 6 in each series, the magnet 8 shifts the pawl 15 into position before

the next number wheel. It follows, accordingly, that the number wheels are set successively to indicate to the operator the number called. The connection may be completed by the insertion of the plug in which the cord circuit P is assumed to terminate in the multiple jack of the called line, or in any other well known manner. Connecting apparatus suitable for this purpose is well known and since my invention is not limited to use in connection with any particular type of apparatus it is not thought to be necessary or advisable to show these circuits in detail.

When the calling subscriber replaces his receiver the call register is restored to normal position by the deenergization of relay 70 and the consequent deenergization of magnet 6. The armature of magnet 6 upon restoring, breaks the circuit of magnet 7 which latter, upon deenergizing, forces the dog 37 out of engagement with the release control wheel 10 through the medium of rod 38. When the release control wheel returns to normal, the plate 31 carrying the comb 32 restores, whereby the number wheels are released. As a further result of the deenergization of magnet 7, the arm 50 knocks the dog 49 out of engagement with the teeth of lever 41, whereby the pawl 15 is returned to its normal position.

It will be seen from the foregoing that I have devised an exceedingly compact and convenient call indicator of the character described. While the device is shown in its preferred form, it is probable that modifications, particularly in the controlling circuits, may be made without departing from the spirit of the invention. I desire, therefore, to include and have protected by Letters Patent all forms and modifications of my invention which may come within the scope of the appended claims.

What I claim as my invention is:

1. In an indicating device a plurality of number wheels rotatably mounted on a shaft, a reciprocating carriage disposed parallel to said shaft, an operating pawl slidably mounted thereon, and means for shifting said pawl sidewise along said carriage into successive positions corresponding each to a different number wheel.

2. In an indicating device a plurality of number wheels rotatably mounted on a shaft, a reciprocating carriage disposed parallel to said shaft, an operating pawl slidably mounted thereon, means for shifting said pawl sidewise along said carriage into successive positions corresponding each to a different number wheel, and means for operating the carriage when the pawl is in each position to set the corresponding number wheel.

3. In a call indicator, the combination with a plurality of number wheels and an operating pawl therefor, of a carriage com-

prising a slide for said pawl, means for moving said pawl sidewise along said slide from one wheel to the next, and means for giving said carriage a reciprocating motion to bring said pawl repeatedly into engagement with the wheel with which it is associated.

4. In an indicating device, the combination with a plurality of indicators and a magnet, of means whereby said magnet is enabled to set said indicators separately, said means comprising a reciprocating carriage controlled by the armature of said magnet, an operating member mounted thereon, and means for moving said member to a plurality of positions on said carriage, said member being adapted to set a different indicator in each position.

5. In a call indicator, the combination with a plurality of number wheels, of a common operating member for said wheels, detents for retaining said wheels in operated position and normally out of operative relation therewith, means for operating said member to set said wheels, and means controlled in the first movement of said member to bring said detents into operative relation with said wheels.

6. In a call indicator, a plurality of number wheels, retaining pawls normally out of engagement with said wheels, a common operating pawl, a circuit containing a magnet for actuating said pawl, means controlled by said pawl upon the first closure of said circuit for bringing said retaining pawls into engagement with said wheels, and means controlled by said magnet upon the first succeeding interruption of said circuit for shifting said pawl into association with the first of said number wheels.

7. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels one at a time, and means comprising mechanism operated by a slow acting magnet and a pawl mechanism for holding the wheels in their advanced position.

8. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels one at a time, and means comprising mechanism operated by a slow acting magnet and a pawl mechanism for holding the wheels in their advanced position, said first means comprising a quick acting magnet.

9. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels one at a time, and means comprising mechanism operated by a slow acting magnet and a pawl mechanism for holding the wheels in their advanced position, said first means comprising a quick acting magnet, the circuit of said slow acting magnet controlled by said quick acting magnet.

10. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels, a pawl mechanism for holding them in their advanced position, and a slow acting magnet for controlling said mechanism to remove the mechanism from said wheels to permit the wheels to be restored to normal.

11. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels, a pawl mechanism for holding them in their advanced position, and a slow acting magnet for controlling said mechanism to remove the mechanism from said wheels to permit the wheels to be restored to normal, said first means comprising a quick acting magnet, the circuit of said slow acting magnet controlled by the quick acting magnet.

12. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels one at a time, said means comprising mechanism operated by a slow acting magnet, and a pawl mechanism for holding said wheels in advanced position together with a second slow acting magnet for removing said pawl mechanism from said wheels to permit their restoration to normal position.

13. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels one at a time, said means comprising mechanism operated by a slow acting magnet, and a pawl mechanism for holding said wheels in advanced position together with a second slow acting magnet for removing said pawl mechanism from said wheels to permit their restoration to normal position, said first means comprising a quick acting magnet, the circuits of both of said slow acting magnets controlled by said quick acting magnet.

14. In an indicating device for recording calls in a telephone system, a set of indicator wheels, means for advancing said wheels one at a time, said means comprising mechanism operated by a slow acting magnet, and a pawl mechanism for holding said wheels in advanced position together

with a second slow acting magnet for removing said pawl mechanism from said wheels to permit their restoration to normal position, said first means comprising a quick acting magnet, the circuits of both of said slow acting magnets controlled by said quick acting magnet, the circuit of one of said slow acting magnets being closed when the quick acting magnet is deenergized and the circuit of the other slow acting magnet being closed when the quick acting magnet is energized.

15. In a telephone system, an indicating device having a number wheel corresponding to each digit of a called number, a retaining pawl for said wheels, a driving pawl, a magnet for operating said driving pawl to first cause said retaining pawl to engage all of said wheels and for then operating said driving pawl to rotate said wheels successively to set up on said wheels a called subscriber's number.

16. In a telephone system, an indicating device, having a number wheel corresponding to each digit of a called number, a retaining pawl for said wheels, a driving pawl, a magnet for operating said driving pawl to first cause said retaining pawl to engage all of said wheels and for then operating said driving pawl to rotate said wheels successively to set up on said wheels a called subscriber's number and means for then operating said retaining pawl to release said wheels.

17. In a telephone system, an indicating device having a number wheel corresponding to each digit of a called number, a retaining pawl for said wheels, a driving pawl, a magnet responsive to successive series of impulses to first cause said retaining pawl to engage said wheels and for then operating said wheels successively to set up the called subscriber's number, means operated by said magnet between successive series of impulses for shifting said driving pawl from one wheel to the next, and means controlled by said magnet for thereafter releasing said wheels.

Signed by me at Chicago, Cook County, State of Illinois, this 29th day of June, 1916.

JOHN G. BLESSING.