

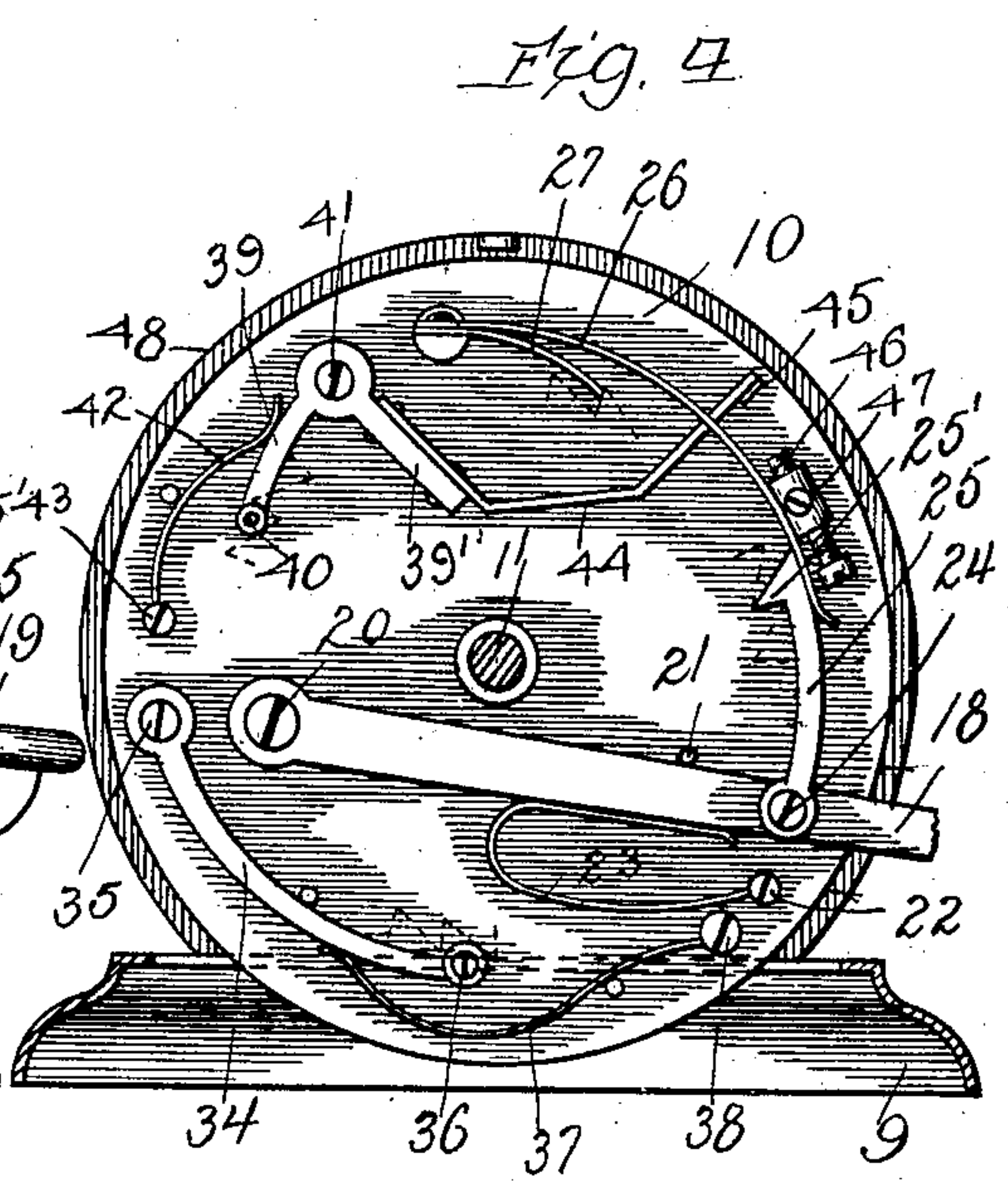
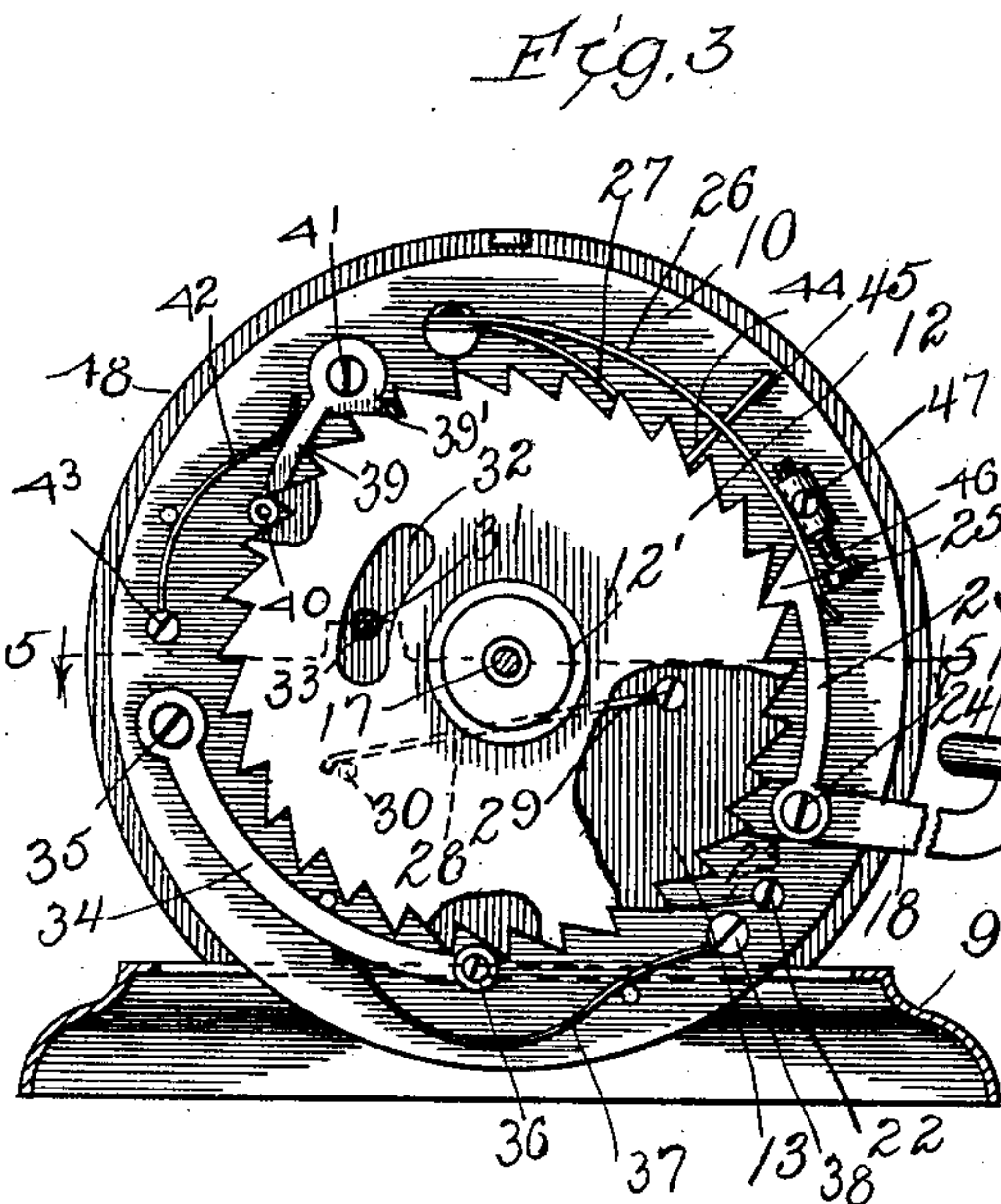
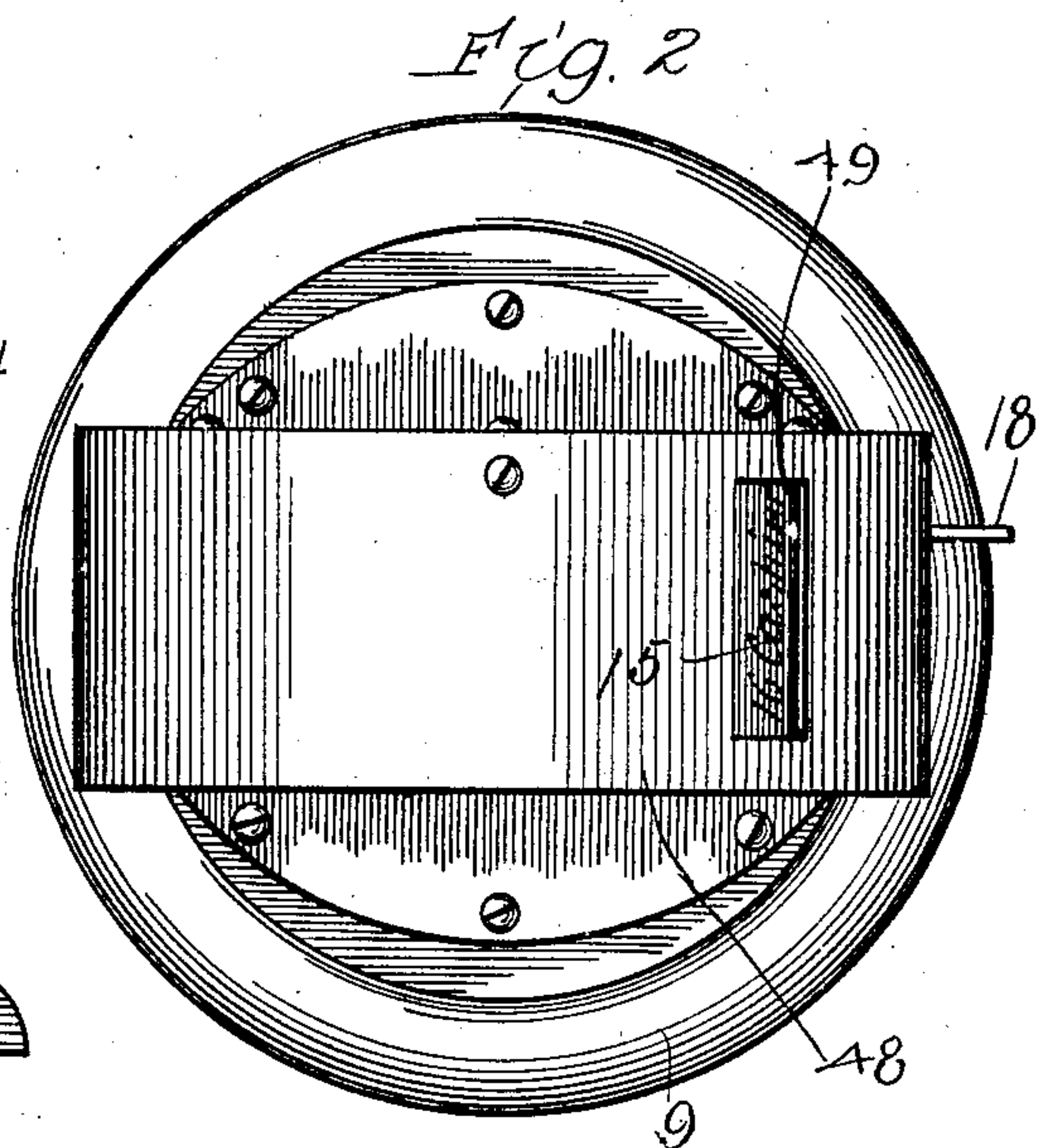
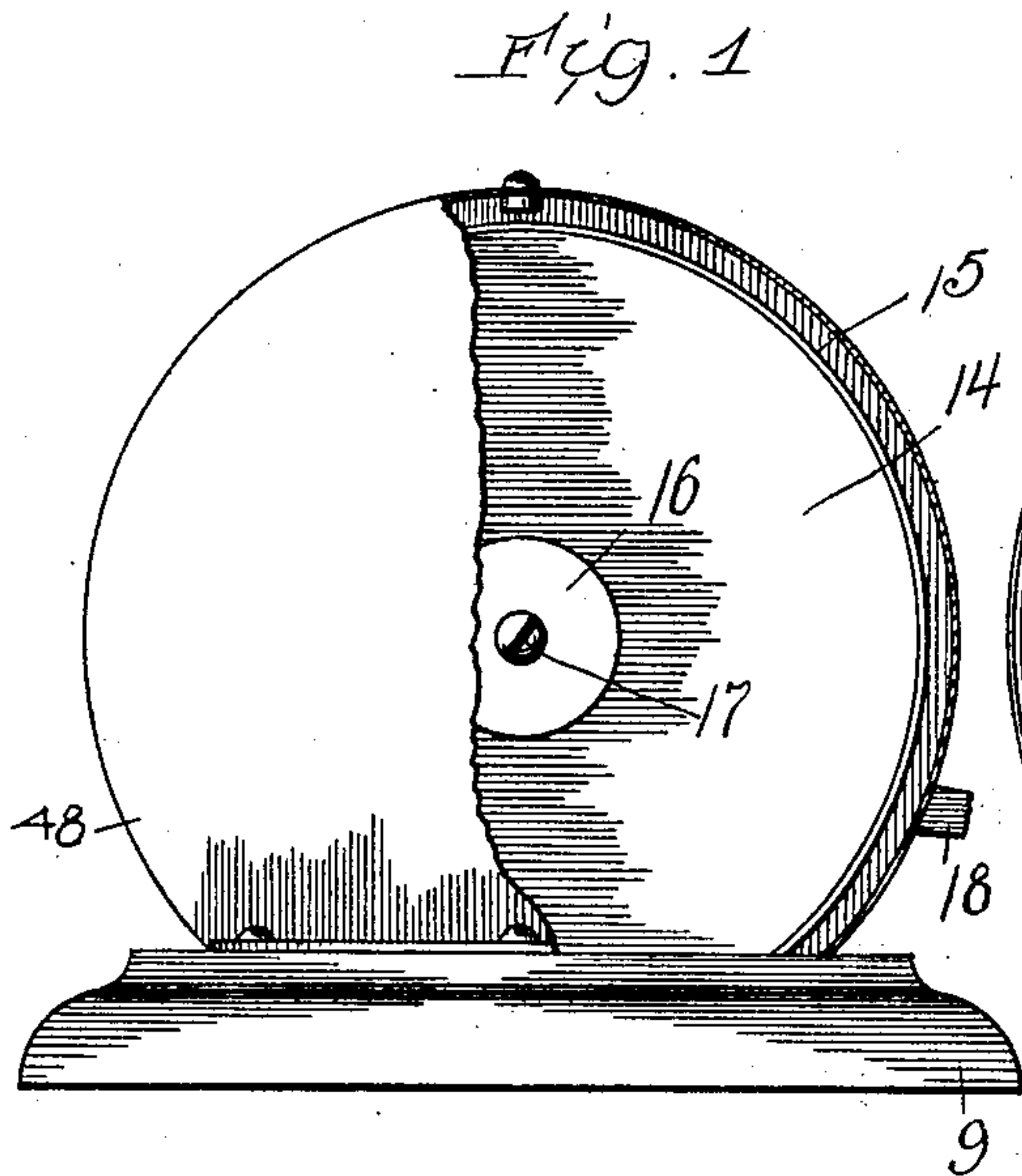
No. 829,736.

PATENTED AUG. 28, 1906.

F. J. RAVLIN & J. LOFGREN.  
INTERCOMMUNICATING TELEPHONE APPARATUS.

APPLICATION FILED JAN. 15, 1906.

2 SHEETS—SHEET 1.



Witnesses:  
Ray White.  
Harry R. L. White

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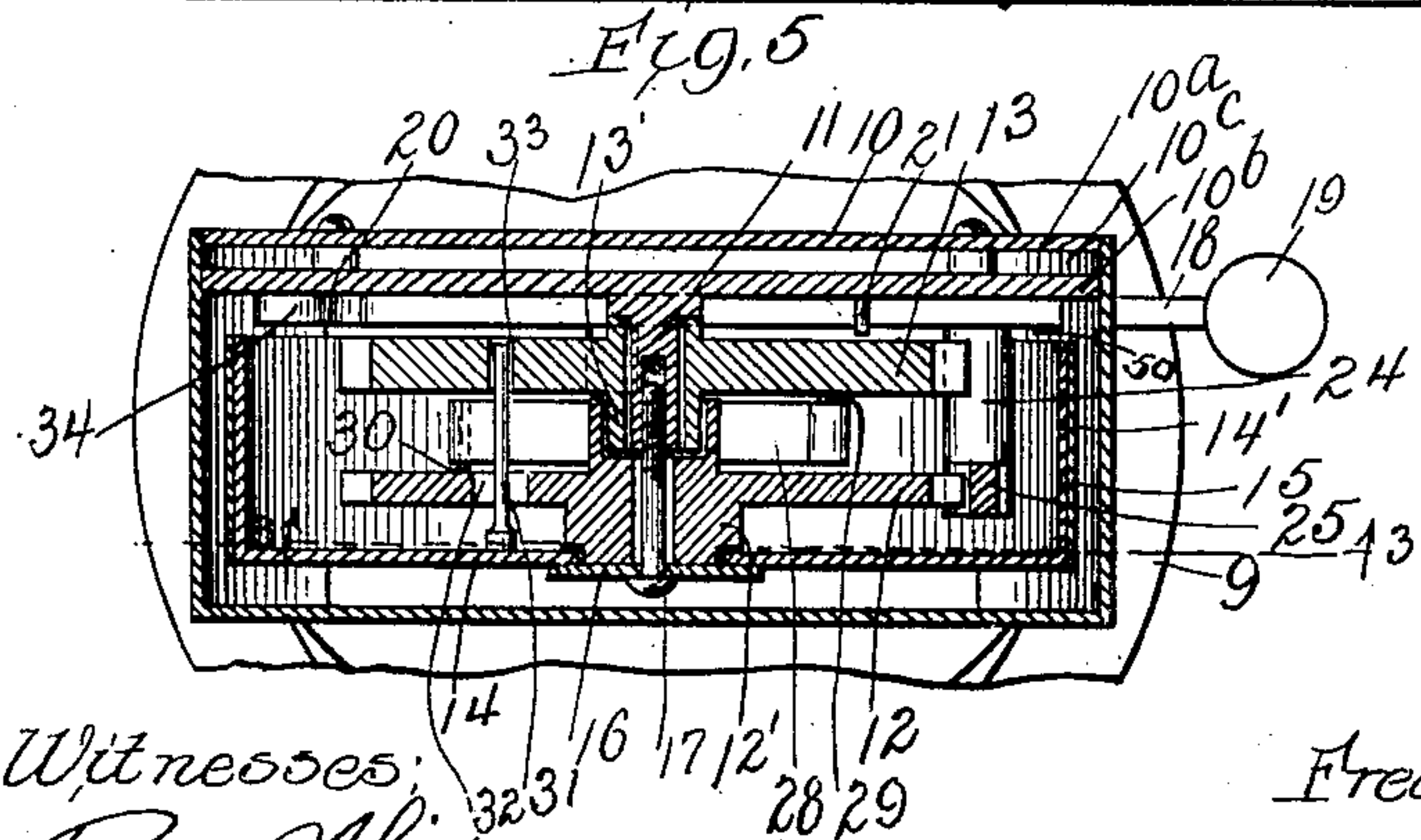
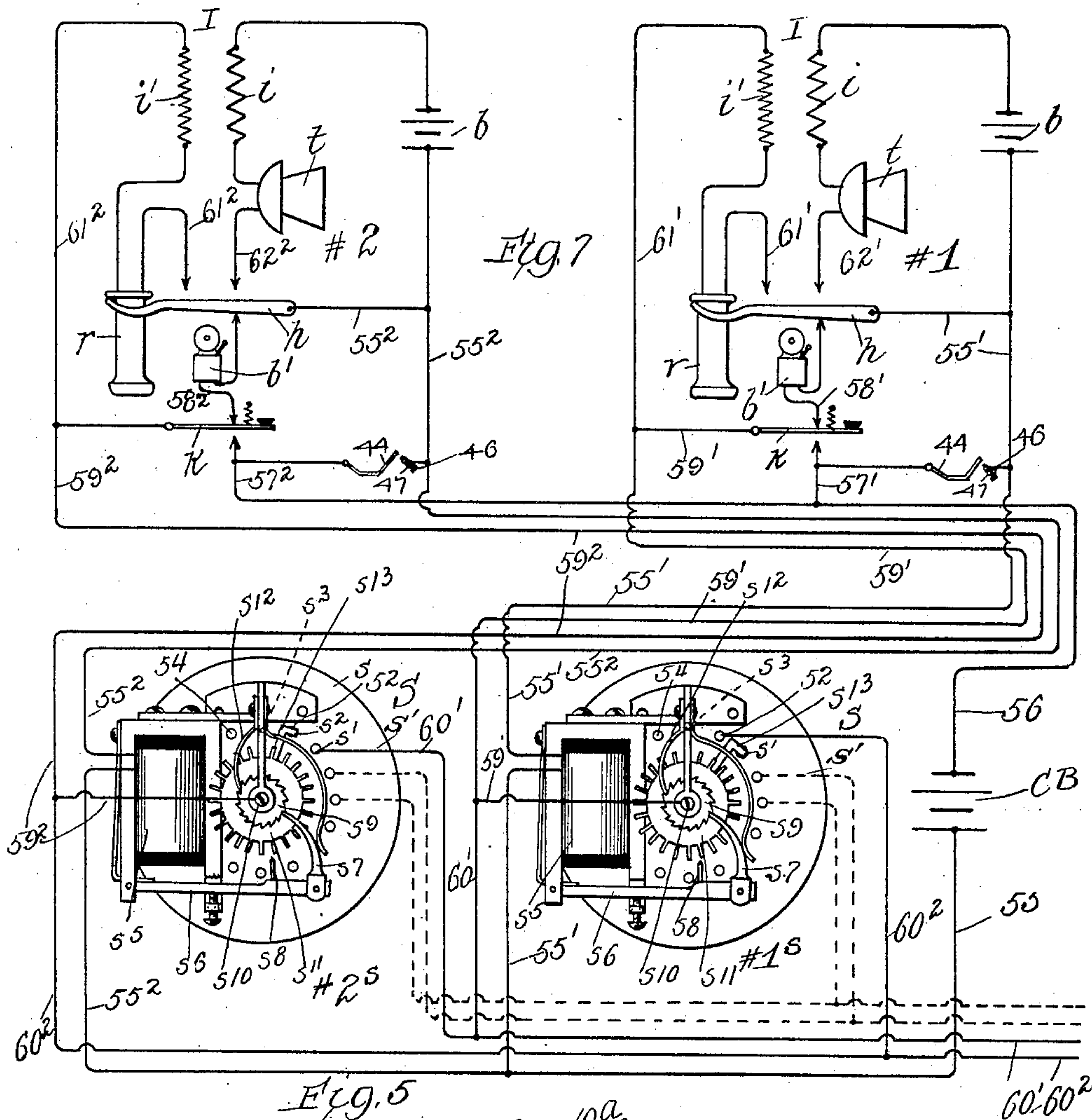
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Attys.



# UNITED STATES PATENT OFFICE.

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ASSIGNORS OF ONE-FOURTH TO ARTHUR T. AVERILL AND ONE-  
FOURTH TO GLENN M. AVERILL, OF CEDAR RAPIDS, IOWA.

## INTERCOMMUNICATING TELEPHONE APPARATUS.

No. 829,736.

Specification of Letters Patent.

Patented Aug. 28, 1906.

Application filed January 15, 1906. Serial No. 296,001.

*To all whom it may concern:*

Be it known that we, FRED JOHN RAVLIN and JOHN LOFGREN, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Intercommunicating Telephone Apparatus, of which the following is a specification.

Our invention relates to improvements in intercommunicating telephone apparatus, and has for its salient object to provide a system embodying improved calling-switch mechanism and selector-switches.

More specifically, an object of our invention is to provide a calling-switch wherein is provided a manually-operable part, a step-by-step indicator, a switch proper, and means for effecting a rapid make-and-break action of the switch upon each operation of the manually-operable part, the time of snap action of the switch being independent of the time of operation of the manually-operable part.

A further object of our invention is to provide a selective signaling apparatus of generally improved construction and arrangement.

Other and further objects of our invention may best become apparent to those skilled in the art from the following description, taken in conjunction with the accompanying drawings, wherein—

Figure 1 is a side elevation of the calling-switch with part of the casing broken away. Fig. 2 is a plan view thereof. Fig. 3 is a view substantially on line 3 3 of Fig. 5—that is to say, a view of the mechanism with the indicator removed and parts broken away. Fig. 4 is a like illustration of the devices with the ratchet-wheels removed. Fig. 5 is a transverse section on line 5 5 of Fig. 3. Fig. 6 is a detail of one of the pawl-rollers. Fig. 7 is a diagrammatic view of an intercommunicating system embodying our invention.

Throughout the drawings like characters of reference refer always to like parts.

To describe first the calling-switch mechanism, 9 indicates a base whereon is mounted a supporting-plate 10, preferably composed of two members 10<sup>a</sup> and 10<sup>b</sup>, spaced apart, as at 10<sup>c</sup>, for the reception of wiring and suitably secured together. Projecting from the center of the supporting-plate 10 is a stud 11, which affords support for a secondary ratchet-wheel 13 and a primary ratchet-wheel 12.

In the specific construction shown the secondary ratchet is mounted directly upon the stud 11 and is provided with a boss 13', whereon is loosely mounted for independent rotation the ratchet 12. The ratchet 12 is likewise provided with a boss 12', whereon is loosely mounted for rotation the indicator 14, preferably a sheet-metal disk having an inturned peripheral rim 14' bearing upon its surface the printed index-strip 15. A washer 16, carried by a screw 17, taking into a threaded aperture in the boss 11, serves to retain these parts generally in their associated position.

The manually-operating device comprises a hand-lever 18, extending without the casing structure, to be described, and provided with a finger-piece 19. Said lever is pivoted, as at 20, upon a suitable support carried by the plate 10, and stops 21 and 22 are provided upon said support for limiting the movement of the lever 18. A spring 23 of suitable construction normally holds the lever in its uppermost position.

24 indicates a stud projecting laterally from the lever 18 and carrying at its free extremity a pawl 25, the nose 25' whereof is adapted and arranged for engagement with the teeth of the primary ratchet 12. A spring 26 is provided, bearing upon the pawl 25 to maintain it constantly in engagement with the ratchet 12, and a latch-spring 27 is also provided for preventing reverse or retrograde movement of the ratchet 12. Yielding or lost-motion connection is afforded between the primary ratchet 12 and the secondary ratchet 13 by means of a spring 28, secured to ratchet 13 and bearing against a pin 30, carried by the primary ratchet 12. The connection is such that forward movement of the wheel 12 puts the spring 28 under tension to move the ratchet 13 in like direction, while ratchet 13 may be moved forward independently of the ratchet 12. The indicator 14 is arranged for movement with the secondary ratchet 13, connection being established by means of a pin 31, secured to the indicator-wheel 14 and taking through an elongated curved slot 32 in the ratchet 12 into a hole 33 in the ratchet 13.

Means are provided for making the step-by-step movement of the ratchet 13 with a fast snap action, such means comprising an



arm 34, pivoted, as at 35, to the support 10 and provided at its free extremity with a roller 36, engaging the toothed edge of the member 13. A spring 37, suitably secured to the supporting member, as at 38, presses the roller-carrying arm 34 constantly toward its ratchet 13. A similar curved arm 39, provided with a roller 40, preferably of smaller diameter than roller 36, is pivoted, as at 41, and provided with a spring 42, mounted on the support 10, as at 43, for the purpose of maintaining the roller constantly pressed against the ratchet 13. The member 39 serves as a detent to prevent retrograde movement of the ratchet and has an additional function as a portion of the switch mechanism, as will be hereinafter made apparent. It will be observed, however, that the parts are so collocated that the ratchet 13 has to make only a short advance movement considerably less than a full step of the length of one tooth before the crown of the tooth with which the large roller 36 engages passes the dead-center point of the roller, so that the tension of spring 37 is thereafter exerted through the roller 36 to snap the ratchet ahead until the roller 36 may drop into contact with the next succeeding tooth. During the period of movement of the ratchet preceding this snap action the small roller 40 of the member 39 will not have reached the crown of the tooth whereon it is rolling; but the last part of its travel up the incline of the coacting tooth and its succeeding drop into contact with the tooth there following are effected during the interval when the ratchet 13 is snapping rapidly forward under the impulse of the spring 37, acting through arm 34 and roller 36.

The switch device is arranged for actuation by the secondary ratchet 13 during the interval when it is effecting its snap action, and for convenience the movable element of the switch member may be associated with the arm 39. In the specific construction shown 39' is an arm extending from the same hub as arm 39 and carrying at its extremity a contact-spring 44, having a contact-point 45, adapted for contact with an anvil 46, preferably an adjustable screw bearing on stud 47, secured to support 10, the two contacts being in insulated relation with each other. The arrangement of parts is preferably such that in effecting its contact with the member 46 the contact-spring 44 sweeps downward and inward, so as to make a wiping contact upon its anvil, and the parts are so proportioned that contact is effected during the interval when the roller 40 is moving over the crown of the coacting tooth of ratchet 13 during the time when said ratchet is making its snap portion of its step forward.

It will now be apparent that each time the lever 18 is depressed, moving the primary

ratchet 12 forward the length of one tooth, the spring 37 is put under tension sufficient to move the ratchet 13 a distance such that the roller 36 rides to the crown of its coacting tooth of the secondary ratchet 13, so that the secondary ratchet, as heretofore described, is snapped forward through the action of the arm 39, thereby causing the contact-spring 44 to make sharp wiping contact with its anvil, the contact being practically instantaneous only.

It will be understood that the indicator 15 bears numbers or other suitable indications of the station with which connections may be sought and that such designations occur in spaced relation similar to the spacing of the teeth of the ratchet.

A casing 48, provided with an indicator view-aperture 49 and a slot 50 to permit the play of the operating-lever 18, is arranged to cover the actuating mechanism, so that the exterior view is substantially shown in the left in Fig. 1.

The apparatus heretofore described may be utilized in various selective call systems; but for illustration we have in Fig. 7 shown a system wherein the apparatus above described may be embodied.

In the drawings, No. 1 and No. 2 indicate two stations of an intercommunicating telephone system, there being provided at each station any usual or preferred station equipment, that herein shown comprising the transmitter *t*, the receiver *r*, the induction-coil *I*, having its primary winding *i* in series with the transmitter and a local battery *b* and having its secondary coil *i'* in series with the receiver *r*, a switch-hook *h*, a bell *b'*, a ringing-key *k*, and the calling-switch hereinbefore described, the contact parts whereof are diagrammatically shown at 44 and 46.

At some suitable central point are provided the selector-switches for effecting connection between the several individual lines, one of said switches being provided for each station-line and each switch being of any suitable step-by-step construction, a convenient form of such switch being shown at *S*. In such construction *S'* indicates a base-board, preferably of insulating material, wherein are mounted the contacts *s'* *s*<sup>2</sup> *s*<sup>3</sup>, &c., shown as half in number to the teeth of the ratchet of the calling-switch. *s*<sup>5</sup> indicates an electromagnet having an armature *s*<sup>6</sup>, which bears upon its extremity a pawl *s*<sup>7</sup> and is provided with a dog *s*<sup>8</sup>, the pawl *s*<sup>7</sup> being arranged to coact with a ratchet *s*<sup>9</sup>, having teeth corresponding in number with the contacts *s'* *s*<sup>2</sup>, &c., said ratchet being mounted upon a suitable shaft *s*<sup>10</sup>, bearing also a toothed wheel *s*<sup>11</sup>, arranged for coaction with the tooth or dog *s*<sup>8</sup>. A spring *s*<sup>12</sup> is provided to dog the ratchet *s*<sup>9</sup> against reverse movement. The arrangement of these parts is such that each time the armature *s*<sup>6</sup> is attracted its pawl *s*<sup>7</sup>



advances the ratchet  $s^9$  one tooth, the upward movement of the armature carrying the dog  $s^8$  in between the adjacent teeth of the wheel  $s^{11}$ , so that the ratchet may not by momentum be driven too far. This escapement we have found in practice to work perfectly. Mounted upon the shaft  $s^{10}$  is a switch-arm  $s^{13}$ , having a contact part arranged to sweep over the switch-points  $s' s^2$ , &c.

10 The circuits of the devices described may conveniently be run as follows: From the central battery C B extends a wire 55, having parallel branches  $55' 55^2$ , &c., extending to the coils of magnets  $s^5$  of the selectors  
15  $1^s 2^s$ , &c. From the respective coils the branch wires  $55' 55^2$ , &c., extend to the switch-hooks  $h$  of the respective stations No. 1, No. 2, &c. From the opposite side of the battery extends a common battery-wire  
20 56, having parallel branches  $57' 57^2$ , &c., extending to the open lower contact-points of the ringing-keys  $k$  of the respective stations 1 and 2, &c. Between the common battery-wire and the wire of the set constituting a  
25 branch of wire 55 is bridged the contact device 44 46 of the calling-switch. From the upper contact of the ringing-key  $k$  connection is made by wire  $58'$  and  $58^2$  in the respective sets with the bottom contacts of the  
30 switch-hooks  $h$  normally closed by said hooks. The keys  $k$  of the several sets are connected by wires  $59' 59^2$ , respectively, with the movable contacts  $s^{13}$  of their respective central-station switches, branches  $60'$  and  $60^2$   
35 being run to the contacts of the several switches of the system corresponding to the station number. It will of course be understood that, as indicated in dotted lines, the same system of wiring may be carried out  
40 for any number of switches. The upper switch-hook contacts of the several telephone sets are connected by wires  $61' 61^2$ , &c., through the receivers  $r$  and induction-coil windings  $i'$  to the wires  $59' 59^2$ , &c. The re-  
45 maining upper contacts are connected by wires  $62' 62^2$  through the transmitters  $t$ , coils  $i$  of the induction-coils I, and batteries  $b$ , with the wires  $55' 55^2$ , &c.

The operation of the system as above described will be as follows: Assuming that a  
50 person at station No. 1 desires to call station No. 2, the finger-key 19 of the calling-switch is vibrated to operate the switch, as heretofore described, until the number of the station desired appears opposite the view-open-  
55 ing 49 in the casing of the calling mechanism. Assuming the switch to have stood with the number "1" in view, but a single reciprocation of the hand-lever 18 is necessary, such movement closing the switch-contacts 46 and 44  
60 for a moment, as heretofore described, and completing a circuit as follows: from the switch-contact 44 by wire  $55'$ , through the magnet  $s^5$  of switch  $1^s$ , to the central battery  
65 C B, and back by wires 56 and  $57'$  to the

movable contact 44. The momentary energization of the magnet  $s^5$  causes the switch member  $s^{13}$  to be advanced one point, as heretofore described, to make connection with the wire  $60^2$ . Now the calling party  
70 at station No. 1 depresses his key  $k$ , establishing a ringing-circuit, as follows: from the key  $k$  by wire  $59'$  to the switch-contact  $s^{13}$ , through the wire  $60^2$ , with which, it will be remembered, said contact coacts, thence by  
75 wire  $59^2$  to the key  $k$  of station No. 2, thence by wire  $58^2$  through the bell  $b'$ , (which is of relatively high resistance,) and thence by switch-hook  $h$  and wire  $55^2$  through the coil  
80  $s^5$  of switch  $2^s$  (which is of relatively low resistance) and to the battery C B, the circuit being completed through wire 56 and its connection  $57'$  to the key  $k$  of the calling party again. Thus the central battery C B supplies current to ring the bell at station No. 2,  
85 and while the magnet-coil  $s^5$  is included in said circuit said magnet is not sufficiently energized to perform its function as a means of moving the switch-arm  $s^{13}$ , for the reason that the bell  $b'$  is of such high resistance as to  
90 prevent such activity of the magnet. Now as the party at the called station removes his receiver from the hook in answer to the ring a talking-circuit is established as follows:  
95 commencing at the switch-hook of the calling-subscriber, through wire  $55'$ , coil  $s^5$  of switch  $1^s$ , wire  $55^2$ , coil  $s^5$  of switch  $2^s$ , to the switch-hook of station No. 2, thence through receiver  $r$  and one winding  $i'$  of the induction-coil, through wires  $61^2$  and  $59^2$  to the wire  $60^2$ ,  
100 thence through the switch-arm  $s^{13}$  of switch  $1^s$  and wires  $59'$  and  $61'$ , through the secondary  $i'$  of the induction-coil I at station No. 1, and back to the switch-hook at such station. Obviously the transmitters are included in  
105 closed local circuits including their respective batteries.

While for purposes of a full disclosure we have herein set forth our invention in some detail, it will become apparent to those  
110 skilled in the art that numerous changes in the construction and arrangement of the devices might be made without departure from the spirit and scope of our invention.

Having thus described our invention, what  
115 we claim, and desire to secure by Letters Patent of the United States, is—

1. In a calling-switch of the character described, a manually-movable member, a rotatable member associated therewith to receive initial movement therefrom, but capable of forward movement independently of the manually-movable member, means for snapping forward the rotatable member after its initial movement by the manually-movable member, and contact devices associated with said rotatable member for actuation thereby to rapidly make and break contact during the snapping action of said rotatable member.  
120  
125  
130



2. In a switch of the character described, a manually - movable member, a primary ratchet associated with said movable member for step-by-step movement, a secondary  
5 ratchet having yielding connection with the primary ratchet to receive its initial movement from said primary ratchet, independent means for rapidly advancing the secondary ratchet subsequently to its initial move-  
10 ment by the primary ratchet, and contact devices operated by said secondary ratchet during the last said portion of its movement.

3. In a device of the character described, a manually-operated lever, a primary ratchet,  
15 a pawl carried by said lever for coaction with said ratchet to advance the same step by step, a secondary ratchet having lost-motion connection with the primary ratchet for initial movement therewith in a forward direction,  
20 and subsequent forward movement independently of the primary ratchet, a spring-pressed arm bearing on the secondary ratchet, arranged to exert its pressure to move said ratchet rapidly forward after a predeter-  
25 mined initial movement by the primary ratchet, and a contact device controlled by said secondary ratchet arranged to close its circuit during the period when the secondary ratchet advances rapidly under the impulse  
30 of the spring-pressed arm.

4. In a switch of the character described, a manually-operable lever, a primary ratchet, a pawl carried by said lever associated with the primary ratchet to advance it step by  
35 step, a secondary ratchet, spring connections between the primary and secondary ratchet, whereby the secondary ratchet receives initial movement from the primary ratchet and is capable of forward movement independ-  
40 ently of the primary ratchet, means coöperating with said secondary ratchet for rapidly snapping the same forward independently of the primary ratchet after a predetermined initial movement by the primary ratchet,  
45 contact devices associated with said secondary ratchet for actuation thereby during the rapid portion of its movement, means for preventing retrograde movement of the primary and secondary ratchets, and an indicator as-  
50 sociated with the secondary ratchet for movement therewith.

5. In a device of the character described, a manually-operable lever, a primary ratchet 12, a pawl carried by the manually-operable lever associated with the primary ratchet to  
55 advance the latter step by step, a secondary ratchet 13 coaxially arranged with the primary ratchet and having a like number of teeth, a spring 28 interposed between the pri-  
60 mary and secondary ratchets, means for preventing retrograde movement of the primary and secondary ratchets, a swinging arm 34 provided with a roller 36, and a spring 37 constantly pressing said roller against the sec-  
65 ondary ratchet, said parts being so arranged that the roller 36 rides over the crown of the coacting tooth before the secondary ratchet has completed a movement to the full length of the tooth, whereby said parts act inde-  
70 pendently of the primary ratchet to advance the secondary ratchet rapidly through the latter portion of its step movement, and contact devices associated with the secondary ratchet for operation thereby during the interval of  
75 its movement under the influence of the arm 34 and its associated parts, as heretofore described.

6. In a device of the character described, a support 10, a lever-arm 18 pivoted thereon, coaxially - arranged primary and secondary  
80 ratchets 12 and 13, a pawl 25 carried by the lever 18 coacting with ratchet 12, an arm 34 coacting with the secondary ratchet 13, a spring 37 for said arm, an arm 39 coacting with said ratchet, a movable contact mem-  
85 ber 44 carried by said arm, a coacting contact part, spring connections 28 between the primary and secondary ratchet, an indicator connected with said secondary ratchet 13 for movement therewith, a casing covering the  
90 operating parts and having an aperture therein through which the lever 18 projects, said casing having also a view-aperture through which a portion of the indicator may be seen.

In testimony whereof we hereunto set our  
95 hands.

FRED JOHN RAVLIN.  
JOHN LOFGREN.

In presence of—

MARY F. ALLEN,  
GEORGE T. MAY, Jr.