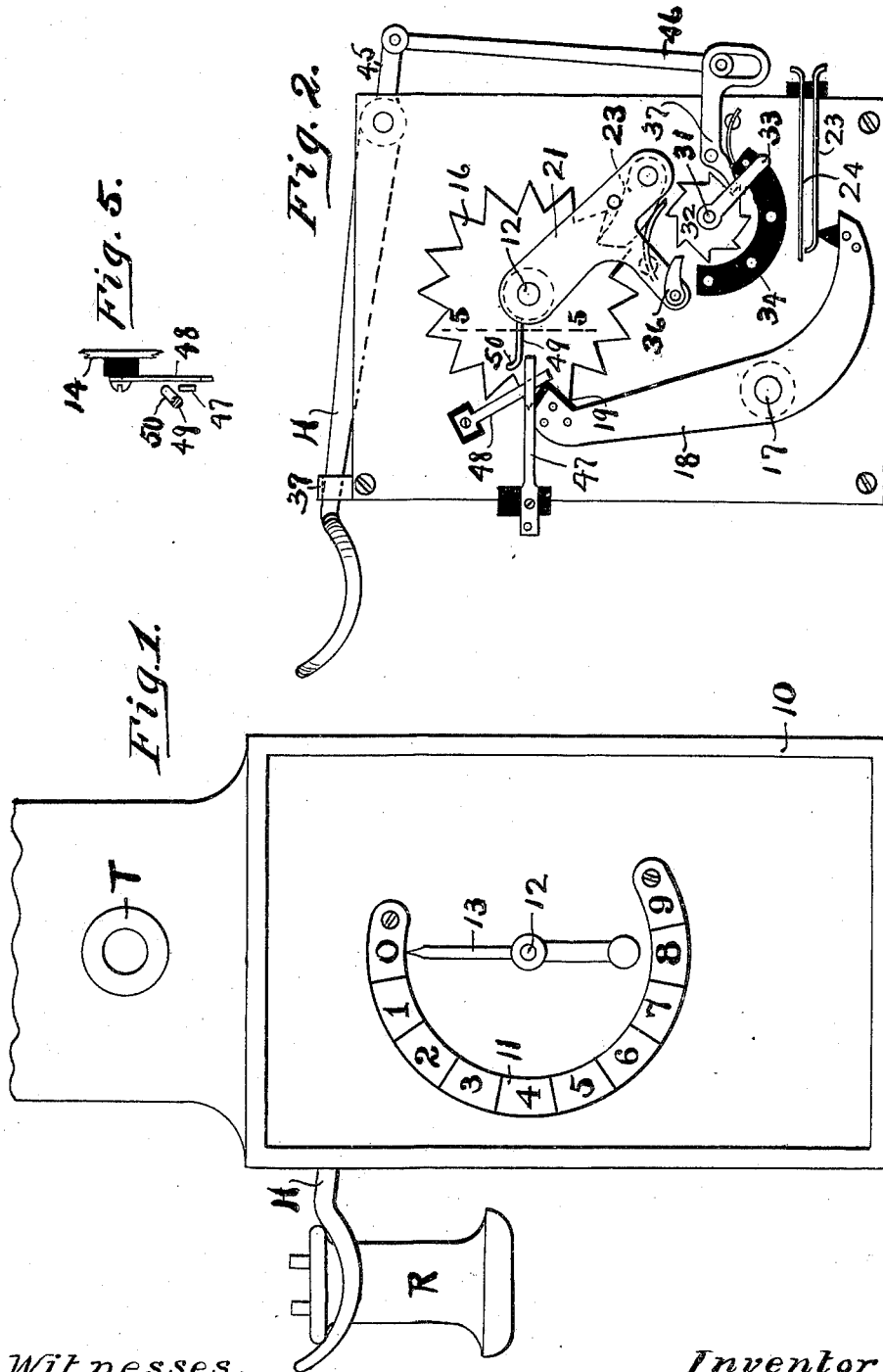


F. A. LUNDQUIST.  
CALLING DEVICE FOR TELEPHONE EXCHANGES.

(Application filed Jan. 8, 1900.)

(No Model.)

3 Sheets—Sheet 1.



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Fig. 6.

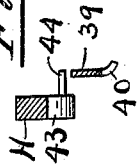


Fig. 3.

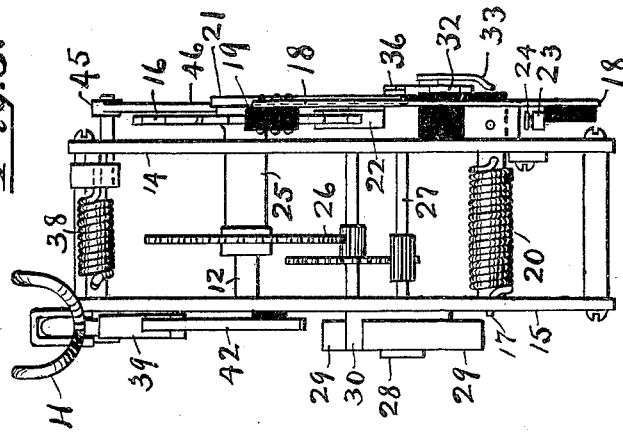
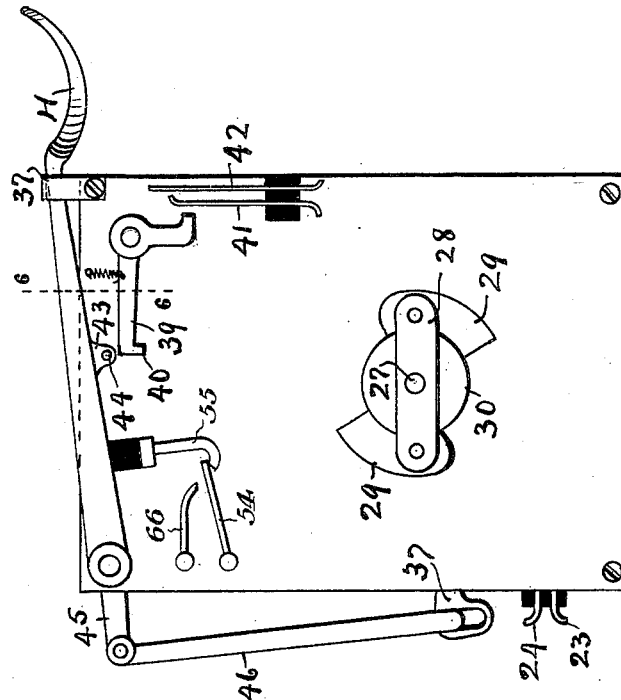


Fig. 4.



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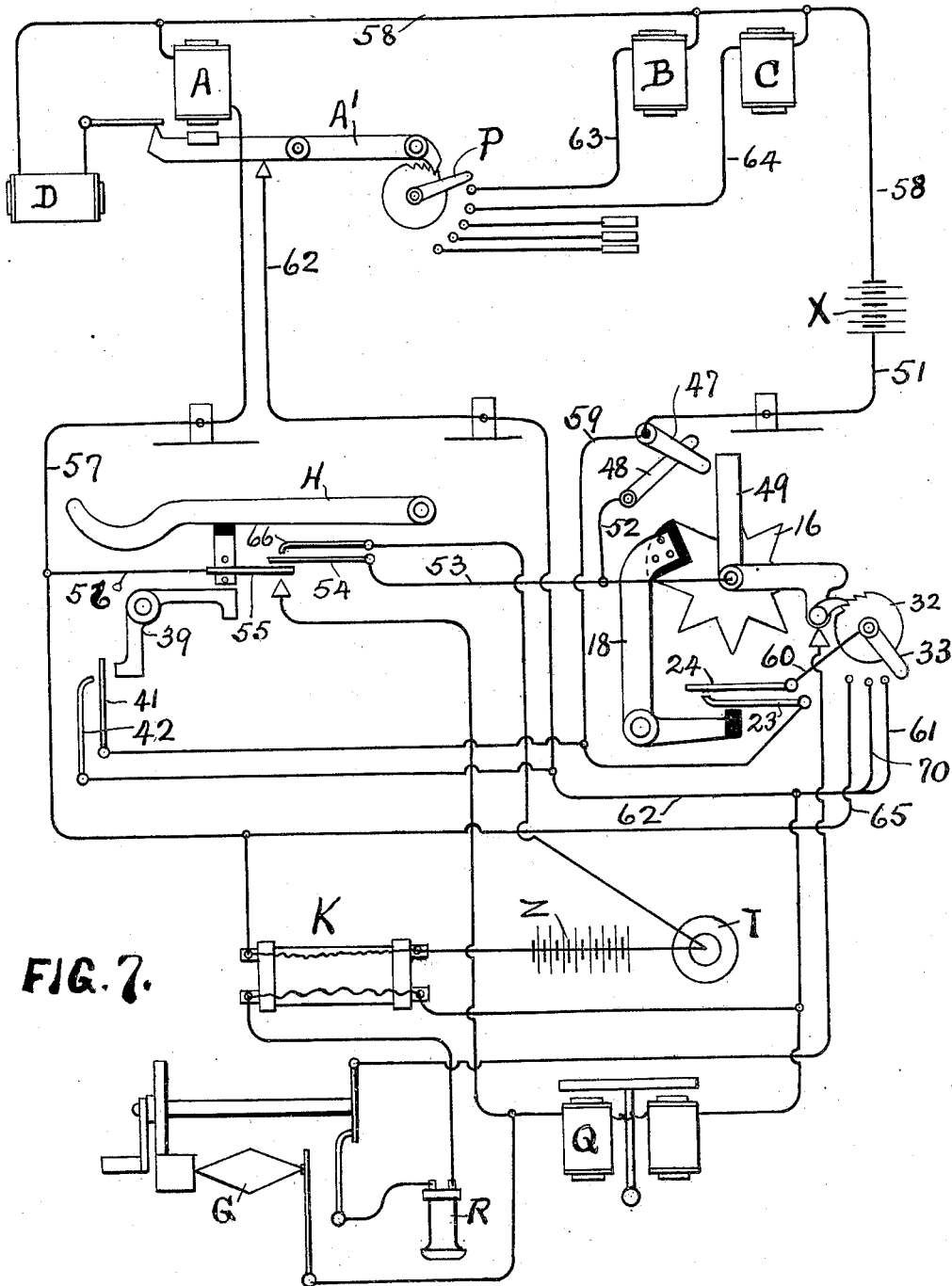


FIG. 7.

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# UNITED STATES PATENT OFFICE.

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## CALLING DEVICE FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 676,956, dated June 25, 1901.

Application filed January 8, 1900. Serial No. 692. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK A. LUNDQUIST, a citizen of the United States of America, and a resident of Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in Calling Devices for Telephone-Exchanges, of which the following is a specification.

My invention relates to calling devices for automatic telephone-exchanges, and has for its object improvement in devices heretofore used for the purpose.

In the accompanying drawings, Figure 1 is an elevation of a telephone-box. Fig. 2 shows the mechanism inside of the box. Fig. 3 is a side elevation of the mechanism. Fig. 4 is a rear elevation of the mechanism. Fig. 5 is a partial section on line 5 5 of Fig. 2. Fig. 6 is a partial section on line 6 6 of Fig. 4, and Fig. 7 is a general diagram showing the electrical circuits at the telephone and part of those at the central office.

On the front of the telephone-box 10 is a numbered dial 11. Secured on a spindle 12 is a pointer 13, which may be moved by hand over the dial 11. The spindle 12 is supported in the plates 14 and 15, and loosely mounted on said spindle is a star-wheel 16, the spacing of the teeth of which corresponds to the spacing of the numbers on the dial 11. Pivoted at 17 is an arm 18, provided with an insulated piece 19 at its free end, which engages the teeth of the star-wheel 16. A spring 20 on the spindle 17 serves to hold the insulating-block 19 in engagement with the star-wheel 16 and hold it from moving except when a force is applied which will deflect the spring 20. Secured to the spindle 12 is an arm 21, on which is a pawl 22, that engages the star-wheel 16. When the pointer 13 is moved by hand in the direction from "1" toward "9," the pawl 22 rides over the teeth of the star-wheel 16 and by dropping into the space between the teeth tends to stop the pointer 13 at the numbers on the dial 11. This stopping action is made pronounced by the arrangement and form of the pawl 22 and the teeth of the star-wheel 16, and also by a considerable tension of the spring acting on said pawl. By this means there is a variable resistance in moving the pointer 13 from "0" toward "9,"

which resistance suddenly increases when the pointer 13 is at its normal and intended stopping-places. When the pointer 13 is moved in the opposite direction, the pawl 22 acts to rotate the star-wheel 16, and consequently to vibrate the arm 18. The other end of the arm 18 extends adjacent to two contact-strips 23 and 24, so that each vibration of the arm 18 produces electrical contact between 23 and 24. A sleeve 25 connects the star-wheel 16, through a train of gears 26, to a spindle 27. The arrangement is such that when the star-wheel 16 rotates the spindle 27 will also rotate, but at a much higher speed. Secured on the rear end of the spindle 27 is a cross-bar 28, to the ends of which are pivoted the weights 29. Surrounding the spindle 27 and secured to the plate 15 is a disk 30, so located with respect to the weights 29 that the revolution of said weights will cause them to produce friction on the disk 30, and thus tend to reduce their speed. This friction is caused by the superior centrifugal force of the long arms of the weights 29 over the short arms, which superior centrifugal force causes the long arms to move outward and the short arms to move inward and press upon the stationary disk 30.

The parts just described act as a governor to prevent electrical contacts being too rapidly made between 23 and 24. On a stud 31 is a ratchet-wheel 32, which carries a pointer 33, adapted to sweep over the contact-points 34. A suitable spring holds the pointer 33 normally in the position indicated in Fig. 2. On the arm 21 is a pawl 36, which upon the beginning of a movement of the pointer 13 from "0" toward "9" acts to turn the ratchet-wheel 32 one tooth, and consequently the pointer 33 from its normal position to the first contact-point or from one contact-point to the next one. A holding-pawl 37 serves to keep the ratchet-wheel 32 from returning to its normal position until released.

Pivoted to the plates 14 and 15 is the receiver-hook H, the movement of which is limited by the stop 37. The weight of the receiver R holds the hook at its lower position, and a spring 38 holds it at its upper position when the receiver is removed. Pivoted adjacent to the hook H is a lever 39, which is normally

held in the position shown in Fig. 4. One end of the lever 39 is provided with a curved lip 40, and the other end serves to make electrical connection between the strips 41 and 42 when the lever 39 is depressed. On the hook H is a lug 43, provided with a pin 44, which upon the descent of the hook H engages the top of the lever 39, so as to push it down a short distance, when it slips off of the said pin and rises to its normal position. When the hook H rises, the pin 44 engages the curved lip 40 and pushes the lever 39 outward, which lever is made thin and flexible to permit it to bend for this purpose. It will be apparent from this description that a descent of the hook H causes a contact between strips 41 and 42, but an ascent of said hook is without effect upon the strips 41 and 42. Insulatingly secured to the hook H is a contact-piece 55, arranged to close connection between the springs 54 and 66 when the hook is elevated. Secured to the spindle of the hook H is an arm 45, from which a rod 46 extends downward to the pawl 37, the arrangement being such that a descent of the receiver-hook releases the pawl 37 and permits the pointer 33 to be returned to its normal position.

Secured at any convenient place on one of the plates 14 or 15 are two contact-strips 47 and 48, which are adjacent to each other, but which are not normally in electrical connection. Secured in any convenient way to the spindle 12, as by means of the arm 21, is an arm 49, which has a curved and inclined end 50, adapted to come into contact with strip 47. When moving in one direction, the arm 49 passes over strip 47 and the end 50 presses 47 into contact with 48, the arm 49 passes under strip 47 and does not make such contact between 47 and 48.

The operation is as follows: The receiver is removed and the pointer 13 is moved by hand from "0" to any number on the dial 11 and back again to "0." At the first movement of the pointer 13 the pawl 36 moves the ratchet-wheel 32, and consequently the pointer 33, one step into electrical connection with the first contact-point 34. The pointer 33 is insulated from the adjacent mechanism and is connected by a suitable wire to contact-strip 24. At the instant when the pointer 33 is being advanced to the first contact-point the arm 49 closes contact between 47 and 48, when a current flows: X, 51, 47, 48, 52, 53, 54, 55, 56, 57, A, 58, X. This operates the magnet A and causes the pawl on the armature-lever A' to advance the pointer P to the contact-point which forms the terminal of the line 63. Then upon the return movement of the indicating-pointer 13 the star-wheel 16 is rotated, causing a series of contacts between 23 and 24. At each such contact the current flows: X, 51, 59, 23, 24, 60, 33, 61, 62, A', P, 63, B, 58, X. The next manual movement of the pointer 13 again closes 47 and 48, which results, as before, in advancing the pointer P one step into

connection with line 64, while at the same time pawl 36 advances pointer 33 one step into connection with line 70. As line 70 also connects to line 62, the reverse movement of the pointer 13 sends a series of impulses over the same line, as before, except that they pass from pointer P through line 61 and magnet C to battery X. The third forward movement of the pointer 13 similarly advances the pointers P and 33 one step, and the reverse movement sends a series of impulses, as follows: X, 51, 59, 23, 24, 60, 33, 65, 57, A, 58, X. This advances pointer P any required number of steps over succeeding contact-points. In making the forward movement of the pointer 13 over the dial 11 the pawl 22 acts to indicate to the person making the movement when the said pointer is exactly at a number, and thus tends to prevent the person operating the pointer from stopping at some intermediate point, which may be too far or not far enough to get the right number of contacts between 23 and 24. The forward movement may be either fast or slow; but on the return movement the governor is brought into action to prevent the movement being too rapid. When the receiver is hung up, the descent of the hook H acts to trip the pawl 37 and permit the ratchet-wheel 32 and pointer 33 to return to their normal positions. During the descent of the hook H the pin 44 engages the lever 39 and causes it to close the connection between 41 and 42, which we may assume are connected to a releasing-magnet.

The devices herein explained are located at the telephone and not at a central exchange. They are also operated mechanically for the purpose of making electrical connections which shall produce electrical operations of distant devices, which distant devices shall connect the telephone with some other telephone.

What I claim is—

1. The combination with a numbered dial and a pointer adapted to be moved by hand over said dial, of a star-wheel having teeth spaced to correspond with the spacing of the numbers on said dial, and a pawl moved by said pointer and coöperating with the teeth of said star-wheel, said star-wheel and pawl being arranged in respect to each other so that when the pointer is moved in one direction they will furnish a variable resistance, tending to stop said pointer at certain designated points, substantially as described, and when the pointer is moved in the opposite direction said pawl will drive said star-wheel.

2. In a calling device for telephones, a numbered dial and a pointer therefor, a contact-closing device and a star-wheel for operating it, and connections between said pointer and said star-wheel, said connections serving to stop the pointer at different numbers on the dial when the pointer is moved in one direction, and to drive said star-wheel when the pointer is moved in the opposite direction, substantially as described.

3. In a calling device for a telephone, a contact-closing device and a pivoted lever for operating it, a star-wheel arranged to vibrate said lever, a pointer provided with connections to said star-wheel, said connections being arranged so that when said pointer is turned in one direction they will act to stop it at definite positions, and when turned in the opposite direction they will drive said star-wheel, and a governor acting to control the speed of said star-wheel when so driven.

4. A pointer movable by hand over the face of a numbered dial, a switch consisting of a pointer and a series of contact-points therefor, means whereby a movement of said hand-operated pointer from its normal position will mechanically shift said switch to a new position, and means whereby the return of said pointer to its normal position will make a series of electrical contacts adapted to send electrical impulses through said switch.

5. The combination with a receiver-hook and an indicating-pointer, of a switch and connections for shifting it by a movement of said pointer from its normal position, a contact-closing device operated by the return of said pointer to its normal position and adapted to send electrical impulses through said

switch, and connections from said receiver-hook to said switch for releasing it and permitting it to return to its normal position after having been moved by said pointer.

6. A frame supporting a receiver-hook and an indicating-pointer, a switch supported on said frame and consisting of an insulated contact-making pointer and a series of contact-points therefor, devices connected to the indicating-pointer for shifting said contact-making pointer from one position to the next when the indicating-pointer is moved from its normal position, a star-wheel rotated by the return of said indicating-pointer to its normal position, a contact-closing device operated by the rotation of said star-wheel and adapted to send electrical impulses through the contact-making pointer, a governor for controlling the speed of the star-wheel, and a tripping device operated by the receiver-hook for releasing the contact-making pointer so as to permit it to return to its normal position.

Signed by me at Chicago, Illinois, this 30th day of December, 1899.

FRANK A. LUNDQUIST.

Witnesses:

CHAS. O. HATCH,  
CASPER L. REDFIELD.