

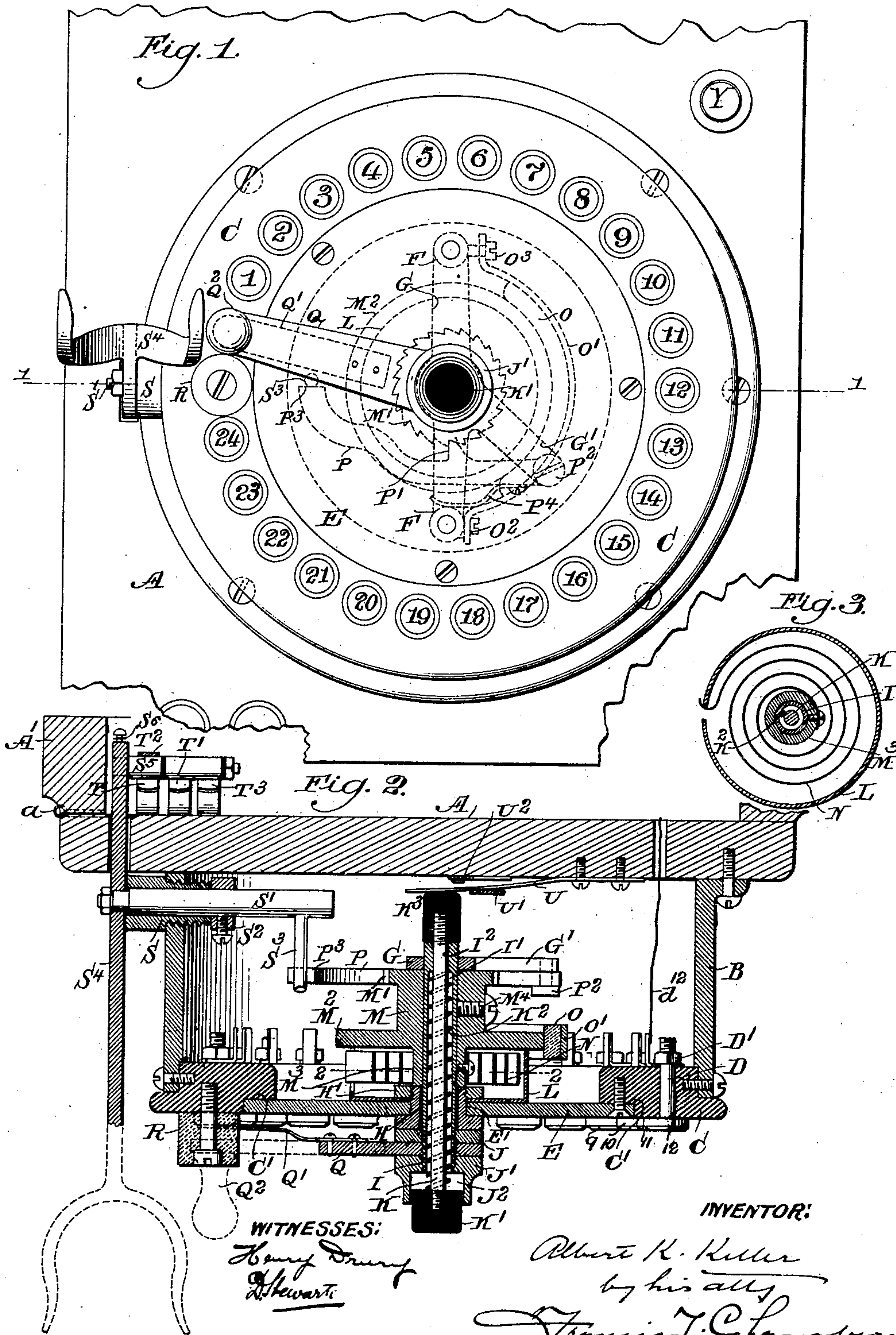
A. K. KELLER.

SWITCH BOX FOR INTERCOMMUNICATING TELEPHONE SYSTEMS.

(Application filed July 1, 1897.)

(No Model.)

3 Sheets—Sheet 1.



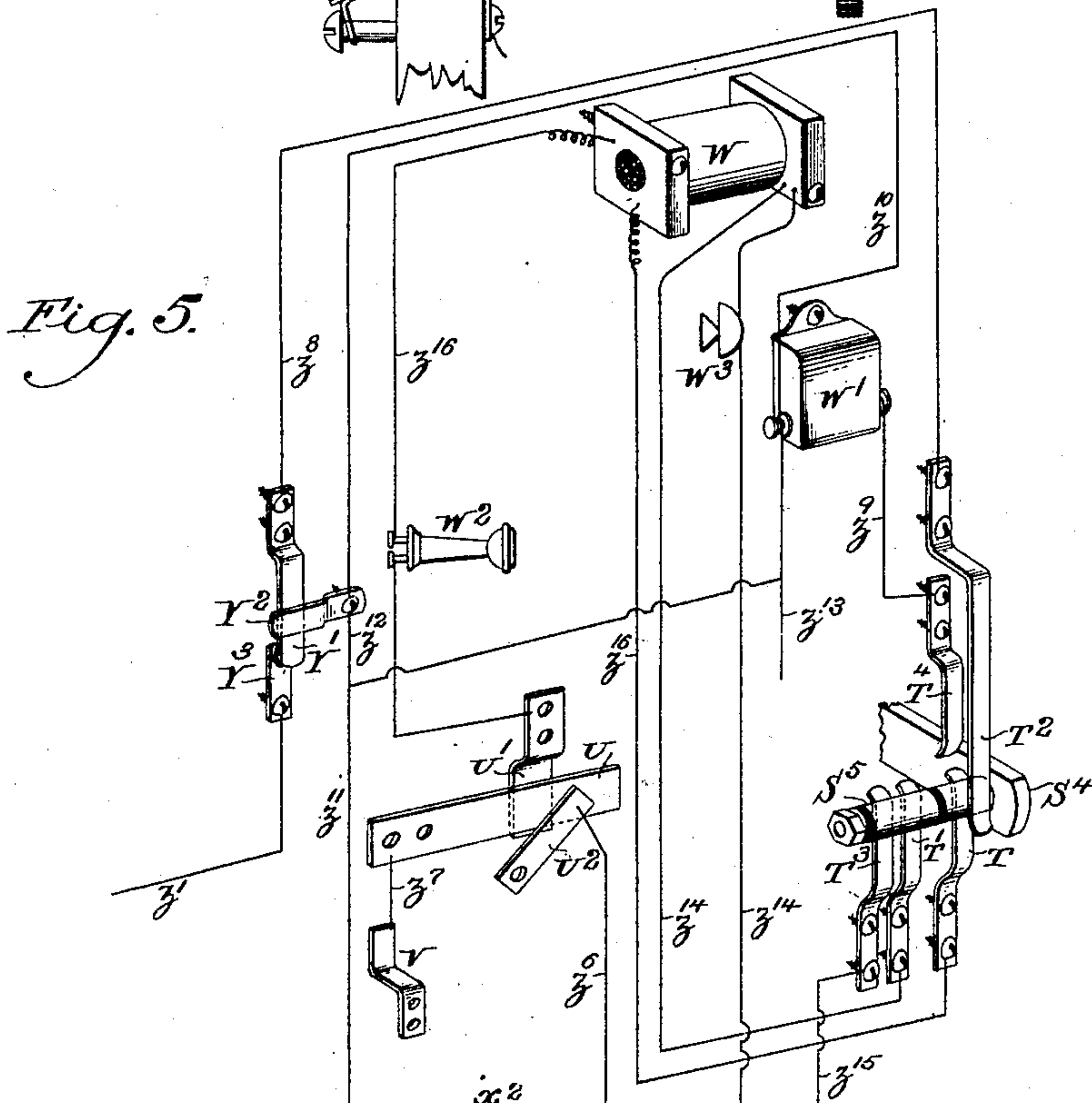
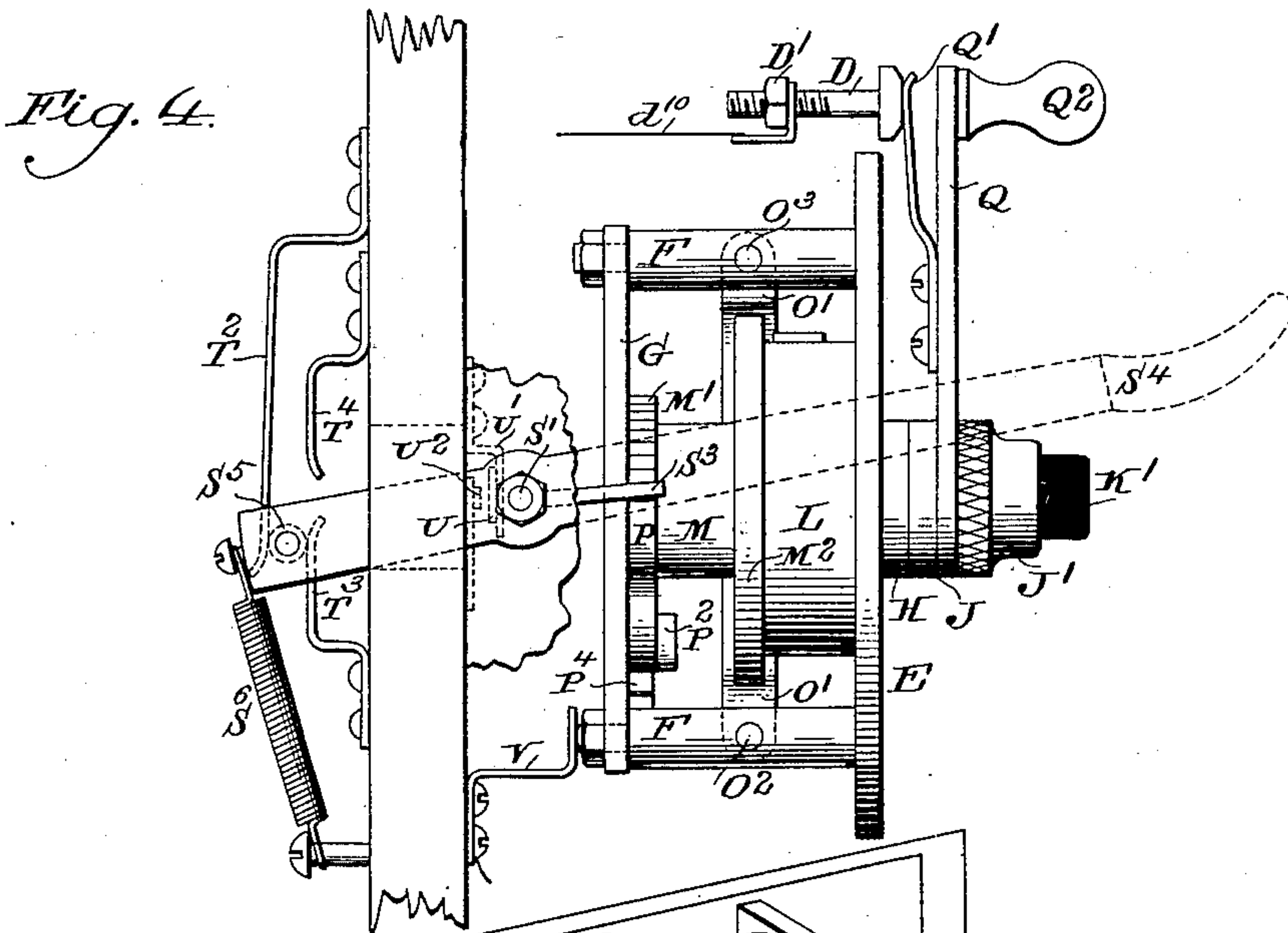
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Witnesses.

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Albert K. Keller

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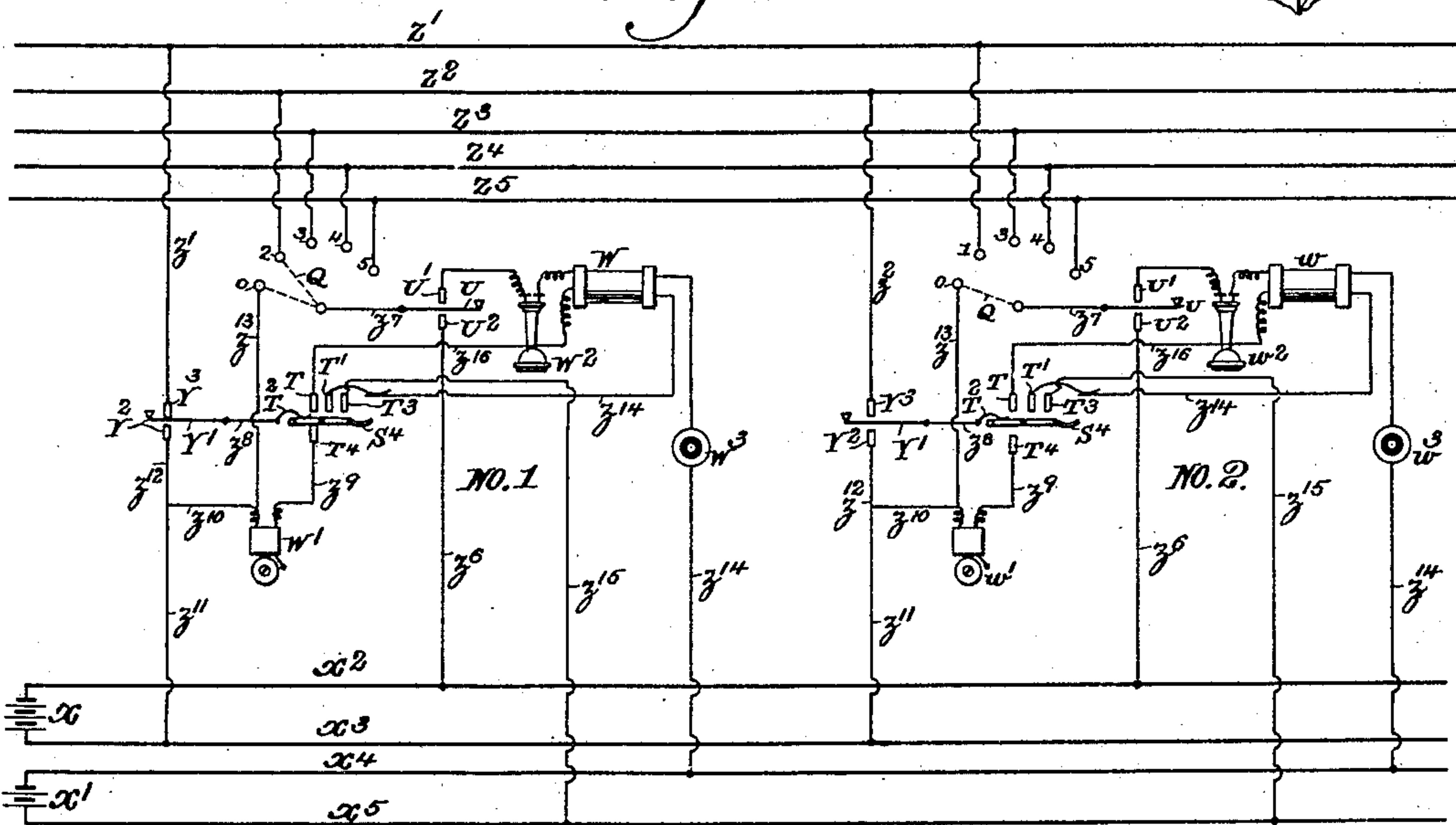
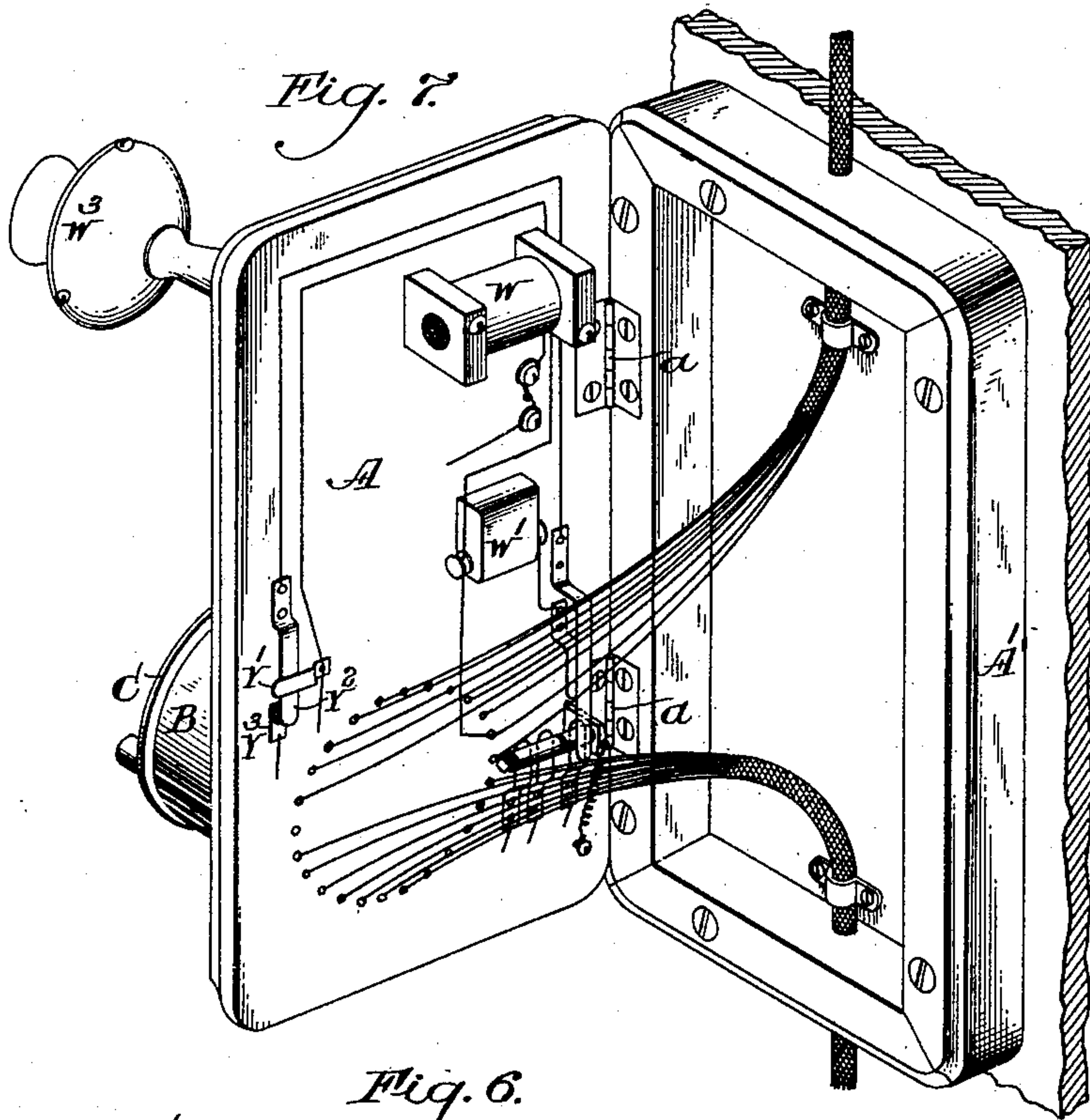
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3 Sheets—Sheet 3.



Witnesses.

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UNITED STATES PATENT OFFICE.

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SWITCH-BOX FOR INTERCOMMUNICATING TELEPHONE SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 644,204, dated February 27, 1900.

Application filed July 1, 1897. Serial No. 643,083. (No model.)

To all whom it may concern:

Be it known that I, ALBERT K. KELLER, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Switch-Boxes for Intercommunicating Telephone Systems, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to telephone systems in which the "stations," so to speak, are each provided with a switch-box by which a user is enabled to call and communicate with another user without the intervention of a central exchange.

My invention has for its object to generally simplify and improve the character of the switch-boxes used in this system; and the particular features of construction in which my invention consist will be best understood as described in connection with the drawings in which they are illustrated, and in which—

Figure 1 is a front view of the switch-box, some of the interior mechanism being illustrated in dotted lines. Fig. 2 is a horizontal cross-section taken on the section-line 1 1 of Fig. 1. Fig. 3 is a vertical cross-section taken on the section-line 2 2 of Fig. 2. Fig. 4 is a side elevation of certain portions of the mechanism of the switch-box. Fig. 5 is a diagram illustrating the electrical connections of the switch-box. Fig. 6 is a diagram illustrating the electrical connections of two switch-boxes in the system, and Fig. 7 is a perspective view showing the arrangement of wall-boards upon which I prefer to secure my improved switch-box.

A indicates what I will call a "base-board," to the front of which the call-box is secured, as shown in Figs. 1 and 2. The various line-wires leading from the call-box extend through this base-board, as shown in Fig. 7, and the call-bell and induction-coil belonging to the call-box may also be conveniently secured upon the inner side of the base-board A, as shown in said figure. To enable the line-wires to be gotten at conveniently, I use in addition to the base-board A what I may call a "wall-board" A', to the front of which the

board A is secured, and which, together with the board A, forms a covered chamber, as indicated at A², into which the line-wires are closed and from which the cables made up of the line-wires extend. Preferably the base-board A is hinged to the wall-board A', as indicated, thus enabling the operator to get at the line-wires with the least possible trouble and danger of confusion.

B is the rim of the call-box, which is preferably made of cylindrical form, as shown, to form the walls of the box.

C is an annular ring of non-conducting material, to which the various line-wires are attached—for instance, as shown at d¹², Fig. 2—these line-wires being in turn electrically connected with the system of contact-buttons arranged in a circle and numbered in the case illustrated in the drawings from 1 to 24. Preferably these contact-buttons (the stems of which I have indicated at D, Fig. 2, D' being nuts screwing upon the ends of the button-stems) are also secured to the non-conducting ring C, as shown in the drawings, and the said ring in turn secured to the outer edge of the rim B, and when this mode of construction is adopted the metallic center plate E, to which, as will be explained, most of the operative mechanism of the box is attached, is conveniently secured to the inner edge of of the ring C, as shown.

C' indicates a recess to receive the plate E, so that the outer face of the plate will be flush with the outer face of the ring C. The plate E has an opening E' at its center and has secured to its inside posts F F, which support upon their farther ends a plate G, said plate having, as shown, a laterally-projecting arm G', the purpose of which will be hereinafter explained.

H is a bushing passing through the central perforation E' of the plate E and secured in place by a nut H', which also serves to clamp and hold the spring-casing L against the inner face of the plate E.

I is a tubular shaft, the perforation extending through which is, as shown, of two diameters, the larger portion being indicated at I' and the smaller portion at I².

J and J' are threaded washers or nuts screwing on the outer end of the shaft I and secur-

ing between them the lever-arm Q, to which is attached the spring-contact Q' and the handle Q². The outer end of the washer or nut J' is chambered, as indicated at J², to receive a
 5 push-button K', which is attached to the end of a rod K, passing through the tubular shaft I, in which is also placed a spring K², which, acting against the push-button K', forces said push-button normally outward. To the inner
 10 end of the rod K is secured a non-conducting end piece K³, which also serves, as shown, as a stop, which when it abuts against the end of the tubular shaft prevents the spring K² from forcing the push-button farther outward.
 15 L, as already stated, is a casing for a spring, the spring being that indicated by the letter N and being attached (see Figs. 2 and 3) at one end to the casing and at the other end to the neck M³ of a sleeve M, which sleeve is
 20 permanently attached to the tubular shaft I, as by a binding-screw M⁴. Formed or attached to the sleeve M is a ratchet M' and also a friction-disk M². It will be evident, of course, that the sleeve M is secured between the plate
 25 E and the plate G, while said plate G also serves as a bearing for the tubular shaft I, as is best shown in Fig. 2. The action of the spring N is to turn the sleeve M and the shaft I to the left or in the reverse direction to that
 30 in which the hands of a watch move, and of course the turning of the shaft I turns also the lever-switch Q Q', the spring Q' of which is arranged so as to come in contact with each of the contact-buttons Nos. 1 to 24 as the
 35 switch-lever moves around on the face of the switch-box.

O is a brake which is attached to a strap O', said strap being in turn attached at each end to the posts F F', as indicated at O² and
 40 O³, Fig. 1, and I have indicated at O³ how the tension of the brake-band, which rests upon the brake-disk M², can be adjusted at will. The function of this brake is to moderate the action of the spring N and prevent the shaft
 45 and switch-lever from turning too rapidly, and especially from striking with too-great force upon the buffer R, which is provided as a stop at the point where the switch-lever should normally rest.

50 P is a lever-arm secured to the arm G' of the plate G, as indicated at P², and having a ratchet-engaging tooth P' so placed as to engage with the teeth of the ratchet M' when the lever-arm is moved inward, a spring P⁴
 55 being supplied to normally press this lever-arm inward, as indicated in Fig. 1. The free end P³ of the lever P rests against a pin S³, which in turn is secured to a shaft S', said shaft passing through a non-conducting bush-
 60 ing S, secured in a lateral opening in the rim B and having attached to its outer end a telephone-receiver hook S⁴, S² indicating a bearing-piece secured upon the shaft S' and serving, with the hook S⁴, to hold it in proper po-
 65 sition.

S⁵ indicates a contact-pin secured to and moving with the hook S⁴, and S⁶ is a spring

arranged to normally throw the hook end of the hook upward, as shown in Fig. 4, the tension of the spring being so regulated that the
 70 weight of the receiver will depress the hook.

T and T' are two contact-springs which rest against the pin S⁵ when the hook is in its elevated position, (shown in Fig. 4,) a through
 75 contact being made in this position with the contact-spring T². The depression of the hook breaks contact with T and T' and, maintaining contact with T³, makes additional contact with the spring T³.

U is a contact spring or switch lying between contact-plates U' and U², (see Figs. 2
 80 and 5,) and in its elevated position—that is to say, when it rests in contact with plate U'—it rests also against the non-conducting end piece K³, actuated through rod I by the
 85 push-button K'. Pressure on said push-button depresses the switch-spring U, breaking contact with U' and making contact with U².

X and X' (see Figs. 5 and 6) indicate batteries or other sources of electrical currents, 90 the battery X serving to supply current to the call-bells and the battery X' to supply current to the local transmitter-circuits of the different stations.

V, Figs. 4 and 5, is a spring-contact which 95 when the plate E is in place rests against some portion carried by it and in electrical connection with it.

W indicates an induction-coil; W', the call-bell; W², a telephone-receiver, and W³ a tele- 100 phone-transmitter.

Y is a push-button connecting with the spring Y', which is normally in contact with the spring Y³, but by the action of the push-
 105 button breaks this contact and makes contact with the spring Y².

Z', Z², Z³, Z⁴, and Z⁵ are separate lines, of which one is provided for each call-box in the system and each of which is connected in the first place, as by a line z' or z², (see Fig. 6,) 110 with the switch-lever of its peculiar call-box, preferably, as shown, through springs Y³ and Y', for reasons which will hereinafter be explained. The other connections from each line are to the contact-buttons bearing the
 115 number of the call-box or station to which the line peculiarly belongs. Thus in Fig. 6, where stations Nos. 1 and 2 are shown, the line Z' is connected through line z' and springs Y³ and Y' with the lever S⁴ of station No. 1, while it 120 is also shown as connected with the contact-button No. 1 in the station No. 2 and would be similarly connected with each other call-box in the system.

The electrical connection of the different 125 parts will be best followed as described in connection with the operation of the system. Thus, referring to Fig. 6, the operator at call-box No. 1 desiring to call box No. 2 first re-
 130 moves his receiver from the hook S⁴, and the upward motion of the lever turning its rock-shaft S' moves the pin S³ in such position as to disengage the end P³ of the pawl-lever P, permitting the pawl P' to come into operative

engagement with the ratchet M', whereupon the operator in station No. 1 turns the switch-lever Q until the spring rests in contact with the button No. 2. He then presses on the push-button K', pushing down the spring U, breaking its contact with the spring U', and making contact with the spring U², the motion of the switch-lever in rising having brought the springs T' and T³ into electrical connection with each other and the spring T into electrical connection with the line-wire z' Z'. It will be observed that the battery X' is connected through line z¹⁵, springs T' and T³, and line z¹⁴ with the primary wires of the induction-coil W, passing thence through the transmitter W³ to the line X⁴, thus completing the circuit through the transmitter-circuit from the battery X'. The lines being in this position and the spring U brought into contact with the spring U² by the action of the push-button K², the current passes from the battery X through line X², line z⁶, springs U² and U, line z⁷, lever Q, and contact-button 2 to line Z², and thence through line z², spring-contacts Y³ and Y', line z⁸, springs T² and T⁴ to line z⁹, which connects with the bell W' of No. 2 station and through the bell with lines z¹⁰ and z¹¹, the latter of which connects with the wire X³ of the battery X. The action of the push-button is thus to ring the bell W' in the station No. 2. Allowing proper time for the operator at station No. 2 to remove his receiver from the hook, the operator at station No. 1 presses the push-button Y and brings the spring Y' into contact with the spring Y², thus closing a line-circuit, which may be traced as follows, beginning with station No. 1: spring Y², lines z¹² z¹¹ to wire X³, thence, referring now to station No. 2, through lines z¹¹ z¹⁰ to the zero contact-button, (indicated by the figure 0,) thence through lever Q, line z⁷, springs U and U⁸ to line z⁷, which passes through the receiver and induction-coil of station No. 2, thence through springs T and T², line z⁸, springs Y' and Y³, line z², line-wire Z² to contact-button 2 on station No. 1, thence through lever Q, line z⁷, springs U and U⁸, line z⁷, passing through the receiver and induction-coil of station No. 1 to springs T and T², and thence through line z⁸ and springs Y' and Y² to line z¹², thus closing the circuit. The operator at station No. 1 by means of this talking-circuit informs the operator at station No. 2 that it is station No. 1 which desires to talk with him, whereupon the operator at station No. 2 moves his lever Q into contact with the button No. 1, and the push-button Y in station No. 1 being released a talking-circuit between the two stations is established, as follows: Beginning with z' of station No. 1 the circuit is traced as follows: through line z', contact-button No. 1 to station No. 2, thence through lever Q, line z⁷, springs U and U', line z¹⁶, passing through the receiver and induction-coil of station No. 2, springs T and T², line z⁸, springs Y' and Y³, line z², line-wire Z² to contact-button No. 2

of station No. 1, and then through lever Q, line z⁷, springs U and U', line z¹⁶, passing through the receiver and induction-coil of station No. 1, springs T and T², line z⁸, and springs Y and Y³ to line z', thus closing the circuit between the two stations and in such a way that the other lines cannot be connected with them.

A simpler talking-circuit could be provided for where it is not desired to prevent other stations from listening in.

The system above described is the one designed for the best service obtainable in an intercommunicating system such as my invention relates to.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A telephone switch-box having contact-buttons arranged in a circle, in combination with a centrally-pivoted lever-switch adapted to make contact with each such button as it is turned, a catch adapted to hold the lever in contact with each button, a constantly-acting spring tending to return the lever to normal zero position and a catch-releasing device arranged, when operated, to release the lever and permit the spring to return it to normal position, together with a calling push-button mounted upon a spindle, said spindle being carried upon and concentric with the axis of the lever-switch, and coöperating contacts for the push-button, substantially as described.

2. A telephone switch-box having contact-buttons arranged in a circle, in combination with a centrally-pivoted lever-switch adapted to make contact with each such button as it is turned, a reciprocating calling push-button carried upon a spindle arranged upon and concentric with the axis of the lever-switch, a catch adapted to hold the lever in contact with each button, a constantly-acting spring tending to return the lever to normal zero position, and a brake arranged to moderate the rotative motion due to the spring, substantially as described.

3. A telephone switch-box having a dial or face carrying a series of contact-buttons arranged in a circle, a lever-switch adapted to be swept over the buttons to make contact with any desired one of them, a hollow spindle upon which the switch is carried to rotate, and a push-button, with a spindle or rod therefor passing through the hollow spindle, and coöperating contacts for the push-button within the box, substantially as described.

4. In a telephone switch-box the rim B having a non-conducting annulus as C secured to it in combination with a series of contacts arranged in a circle in said annulus, a plate as E detachably connected to form the front of the box, a rotating spindle secured to plate E, and extending through said plate, a switch-lever Q attached to the outer end of said spindle and adapted to make contact with the circularly-arranged contacts aforesaid, mechan-

ism for engaging and disengaging the spindle and retracting-spring secured to plate E, said mechanism and spindle being removable from the box with plate E, mechanism for operating the engaging and disengaging mechanism attached to plate E secured to the walls of the box and arranged to come into operative relation when the plate is secured in place and electrical connections also arranged to connect parts secured to the plate to parts secured to the box when the plate is secured in place, all substantially as specified and so as to permit the ready removal and replacement of the plate and attached parts from and in the box.

5. In a telephone switch-box the rim B in combination with a non-conducting annulus C secured to its outer edge and having a series of contact-buttons secured in it, a plate E detachably connected to the inner edge of the annulus C, a rotating spindle secured to plate E and extending through said plate, a switch-lever Q attached to the outer end of said spindle and adapted to make contact with the circularly-arranged contacts aforesaid, mechanism for engaging and disengaging the spindle and a retracting-spring secured to plate E, said mechanism and spindle being removable from the box with plate E, mechanism for operating the engaging and disengaging mechanism attached to plate E secured to the walls of the box and arranged to come into operative relation when the plate is secured in place and electrical connections also arranged to connect parts secured to the plate to parts secured to the box when the plate is secured in place, all substantially as specified and so as to permit the ready removal and replacement of the plate and attached parts from and in the box.

6. In a telephone switch-box the rim B hav-

ing a non-conducting annulus as C secured to it in combination with a series of contacts arranged in a circle in said annulus, a plate as E detachably connected to form the front of the box, a tubular rotatable spindle supported on plate E, a lever-switch Q secured to the outer end of the spindle and adapted to make contact with the buttons, a push-button rod K extending through the hollow spindle and supported by it, mechanism for engaging and disengaging the spindle to prevent or permit its rotation and a spring arranged to return the switch-lever to normal position when the spindle is disengaged also supported on plate E, and coacting mechanism and connections secured to the box and arranged to come into operative relation to parts supported on plate E when said plate is secured in place.

7. A wall-board as A' in combination with a base-board A hinged to it at one edge said boards being formed as described to inclose a wire-space A², and a telephone call-box secured to the front of base-board A and having its line-wires extending through said board and into the cavity inclosed by boards A and A'.

8. In a telephone switch-box a circular series of contacts forming terminals for line-wires, a centrally-pivoted rotating lever-switch adapted to make contact with the contacts as it is turned, a calling push-button and a spindle therefor carried on and concentric with the axis of the rotating switch, and co-operating contacts for the push-button, substantially as described.

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Witnesses:

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