No. 754,011. PATENTED MAR. 8, 1904.

C. H. PRÖTT.

COMMUTATOR FOR TELEPHONIC OR OTHER CIRCUITS.

APPLICATION FILED JUNE 14, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig: 2.

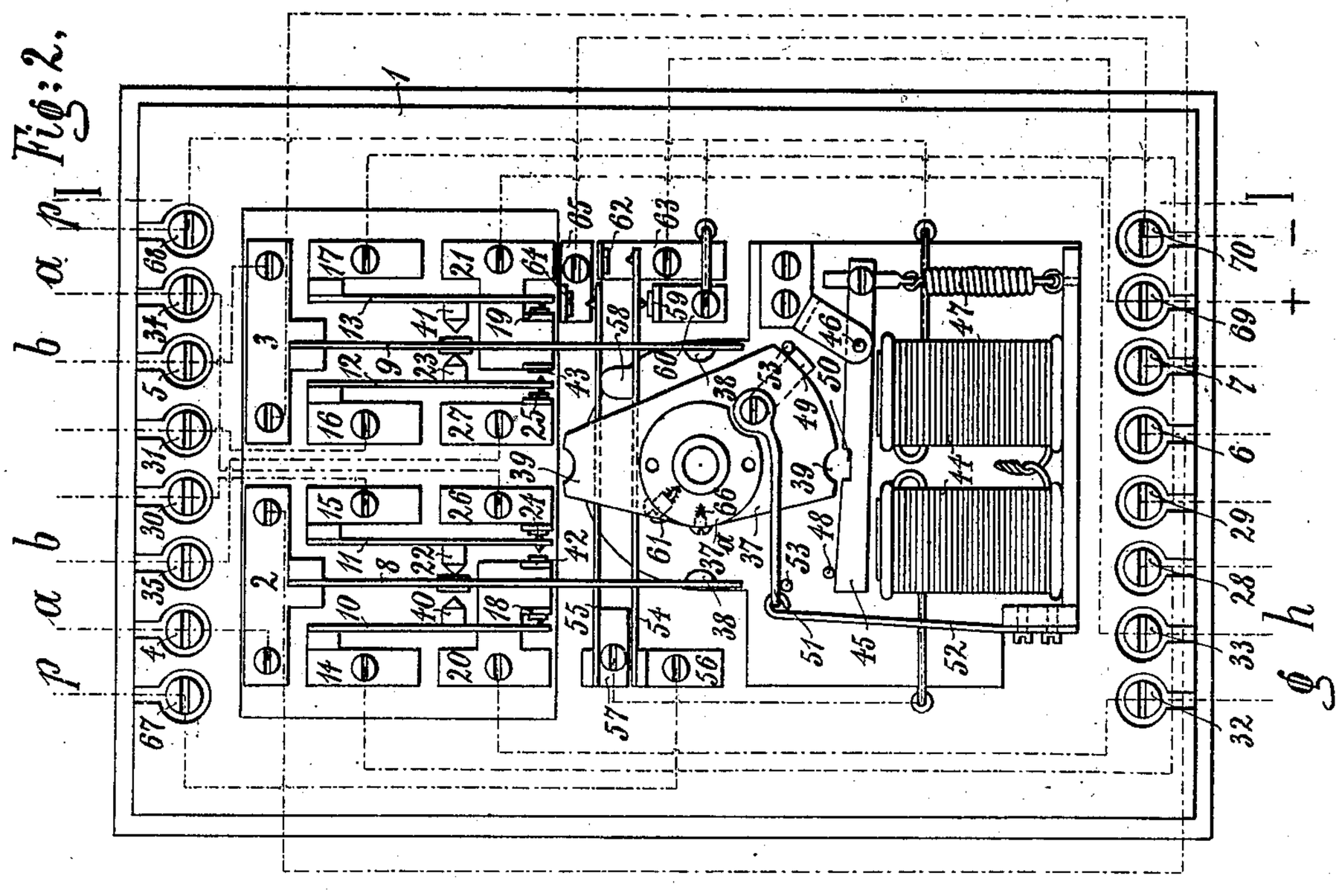
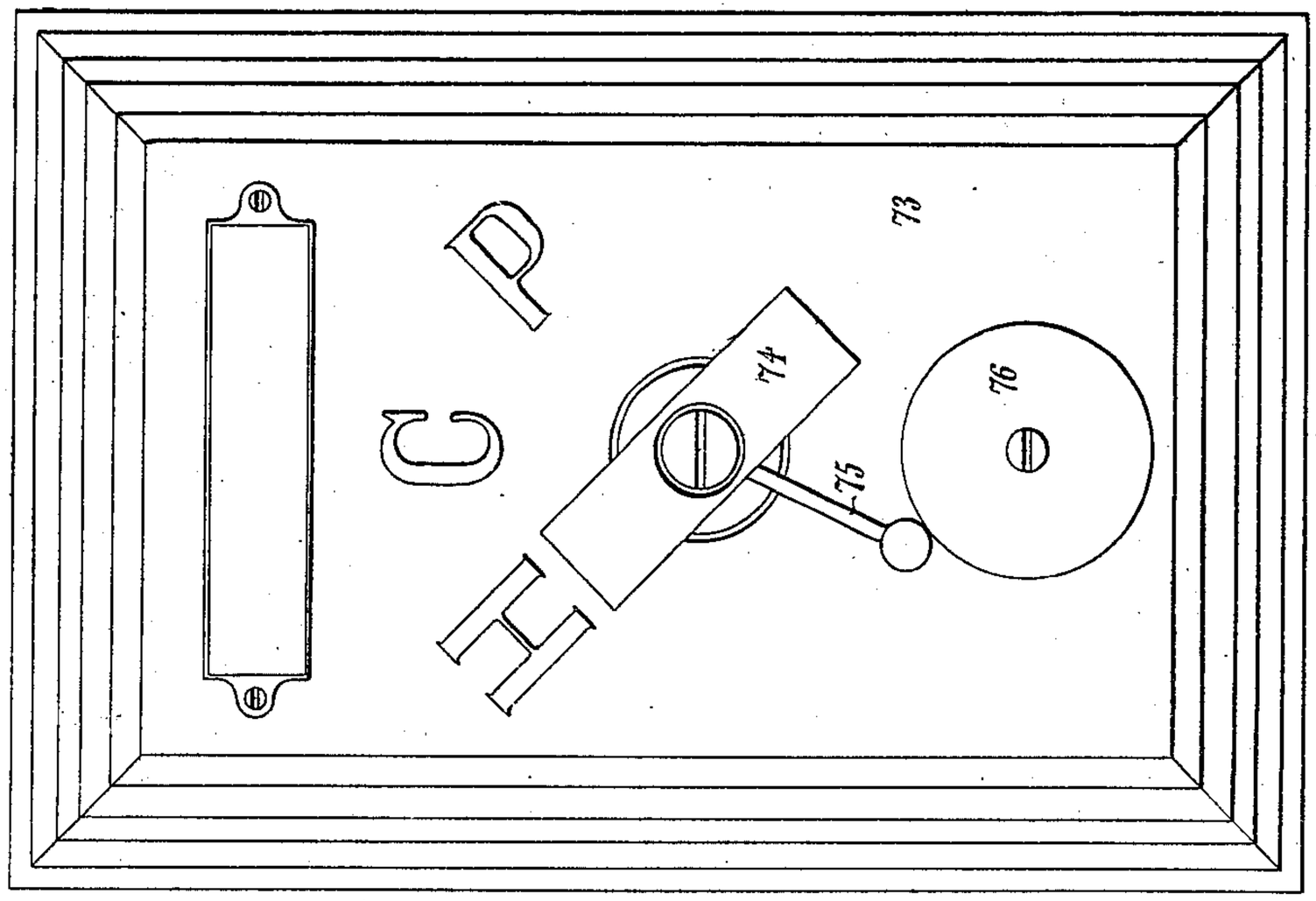


Fig: 1.



Witnesses;
Otto König
Emil Steinberg

Inventor;
Carl Heinrich Prött

No. 754,011. PATENTED MAR. 8, 1904.

C. H. PRÖTT.

COMMUTATOR FOR TELEPHONIC OR OTHER CIRCUITS.

APPLICATION FILED JUNE 14, 1902.

NO MODEL. 4 SHEETS—SHEET 2.

Fig: 5.

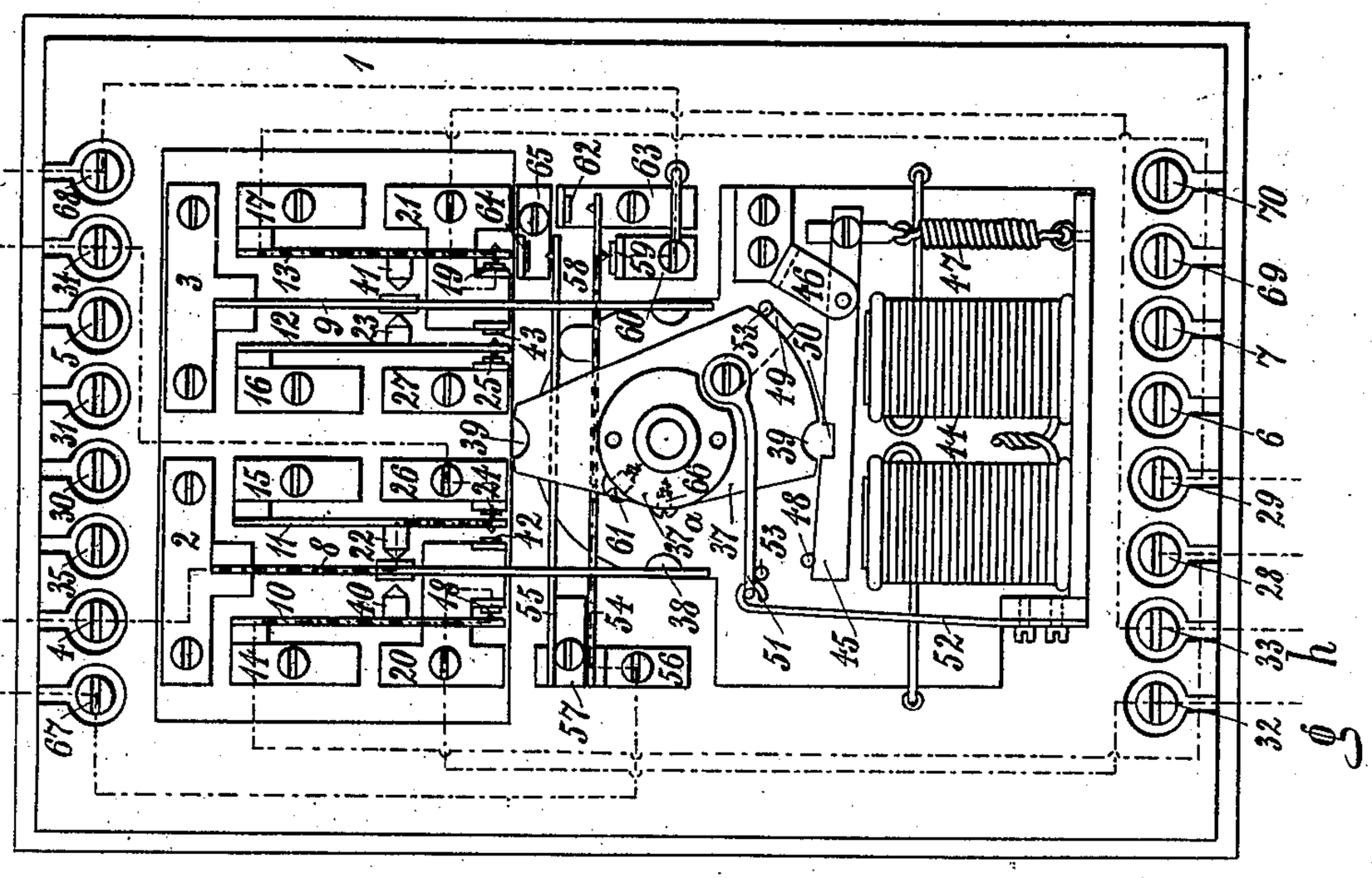
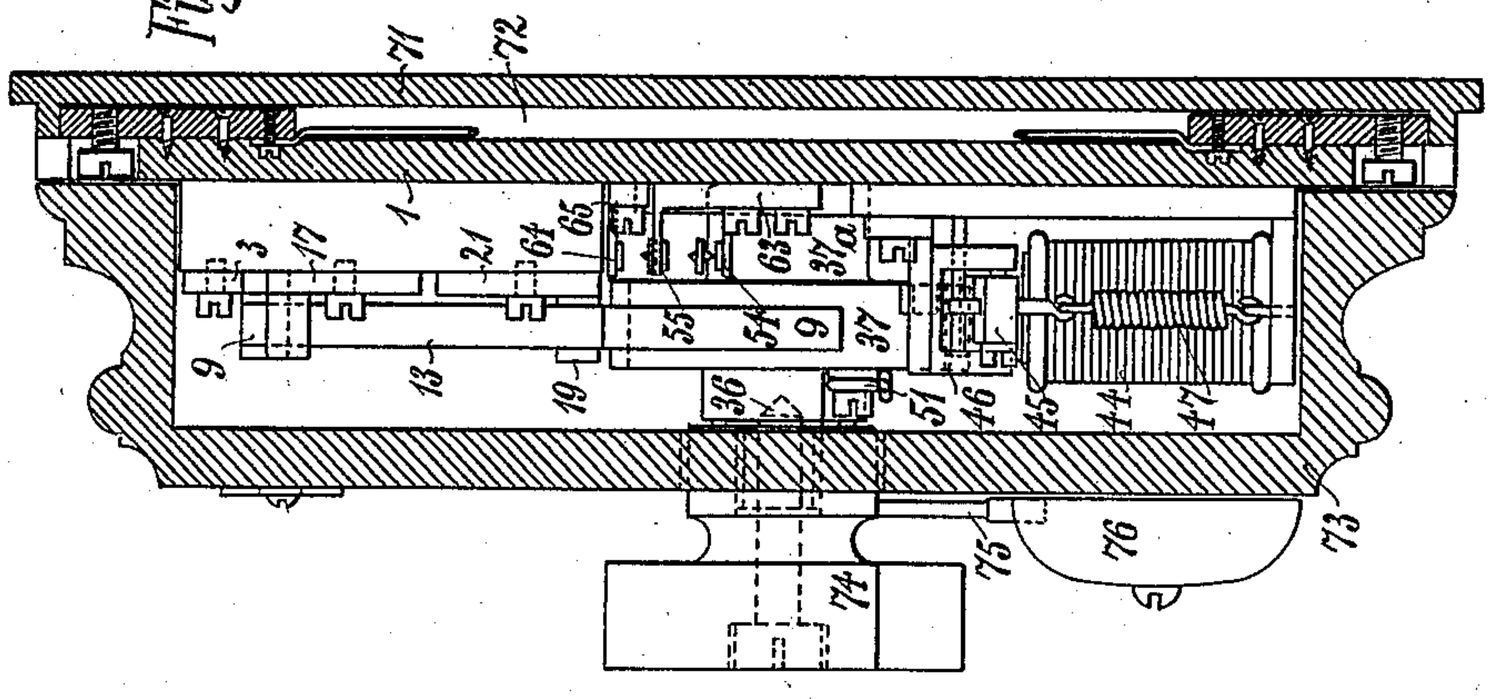


Fig: 3.



Witnesses;
Otto König
Emil Blomberg

Inventor;
Carl Heinrich Prött

No. 754,011. PATENTED MAR. 8, 1904.

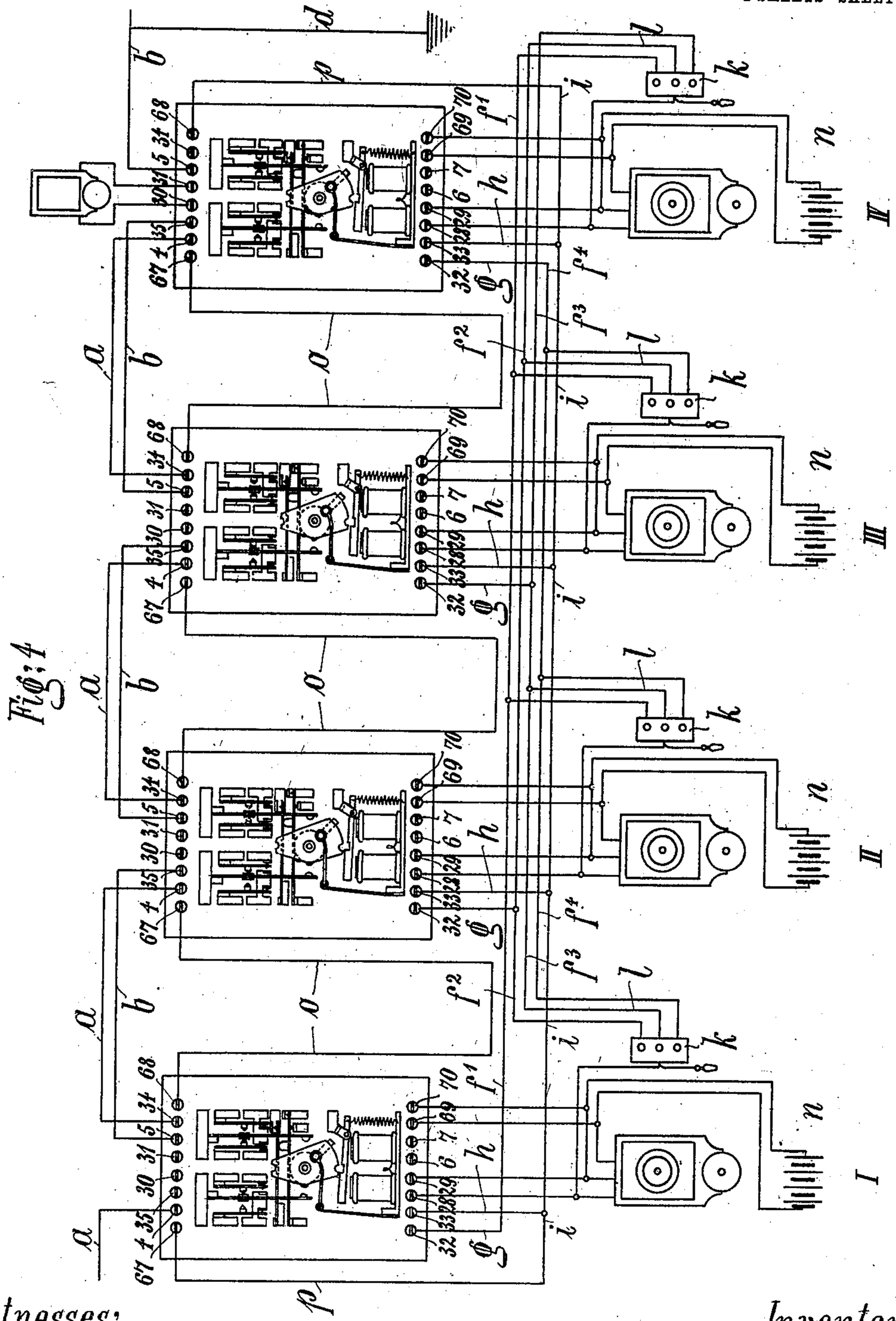
C. H. PRÖTT.

COMMUTATOR FOR TELEPHONIC OR OTHER CIRCUITS.

APPLICATION FILED JUNE 14, 1902.

NO. MODEL. 4 SHEETS—SHEET 3.

Fig. 4.



Witnesses;

Otto König

Emil Flanders

Inventor;

Carl Heinrich Prött

No. 754,011. PATENTED MAR. 8, 1904.

C. H. PRÖTT.

COMMUTATOR FOR TELEPHONIC OR OTHER CIRCUITS.

APPLICATION FILED JUNE 14, 1902.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 7.

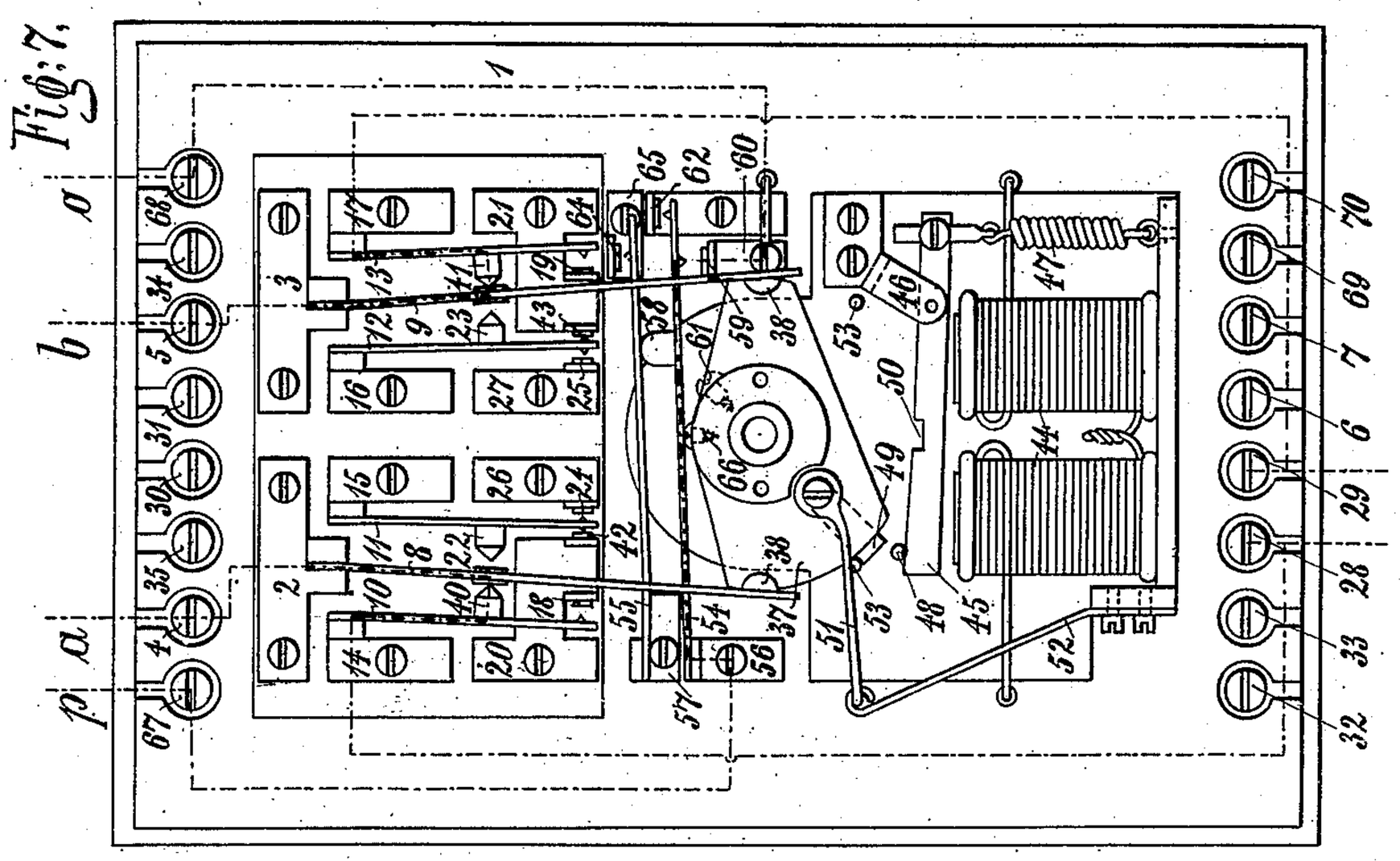
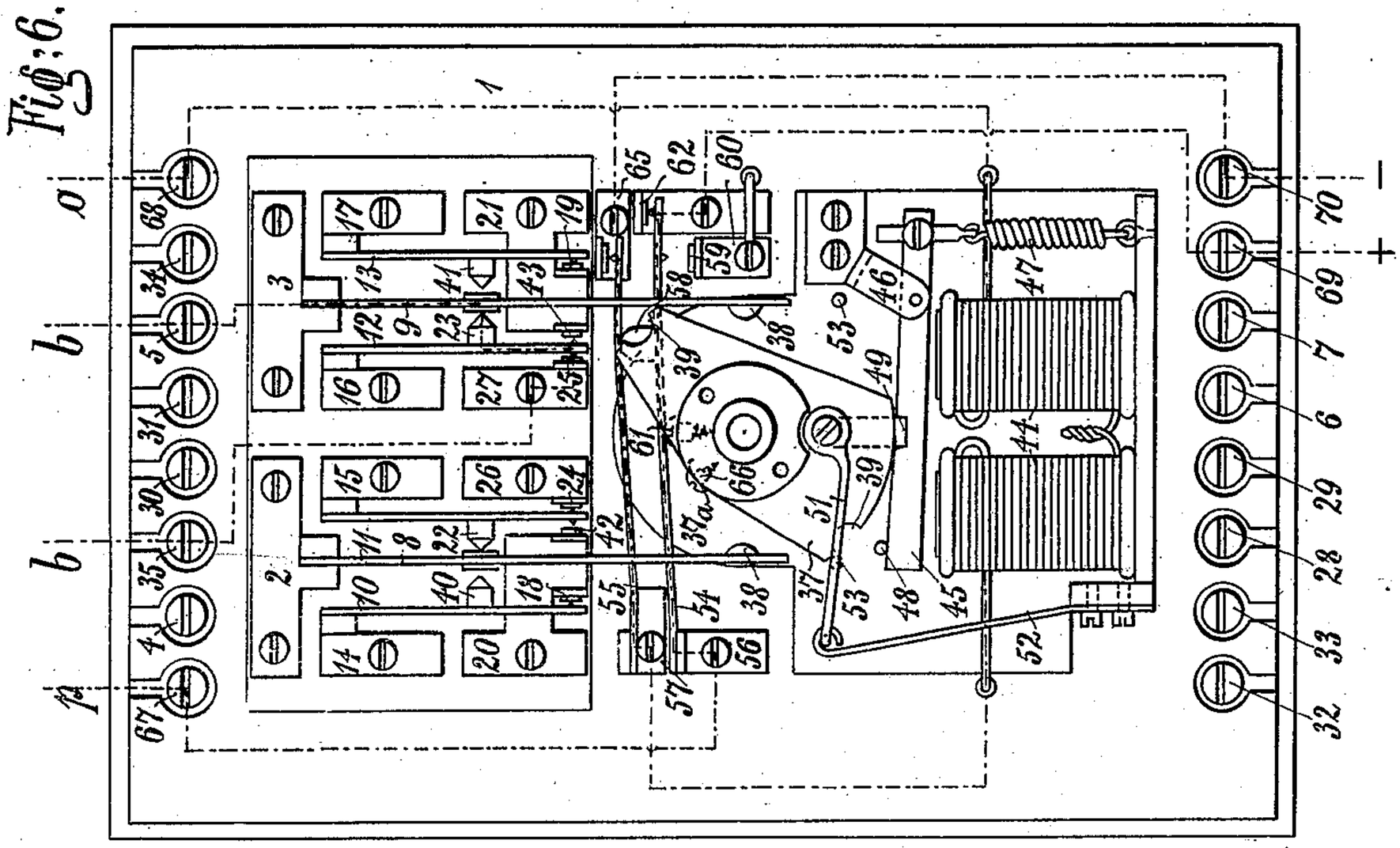


Fig. 6.



Witnesses;
Otto König
Emil Bonnberg.

Inventor;
Carl Heinrich Prött

No. 754,011. Patented March 8, 1904.

UNITED STATES PATENT OFFICE.

CARL HEINRICH PRÖTT, OF RHEYDT, GERMANY.

COMMUTATOR FOR TELEPHONIC OR OTHER CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 754,011, dated March 8, 1904.

Application filed June 14, 1902. Serial No. 111,632. (No model.)

To all whom it may concern:

Be it known that I, CARL HEINRICH PRÖTT, a citizen of the German Empire, residing at Rheydt, in the Province of Rhenish Prussia, Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Commutators for Telephonic or other Circuits; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide improved and satisfactory means for cutting out of circuit intermediate stations without interfering with the electric action at the station or stations where this is desired.

When used with telegraphic or telephonic systems, this invention prevents the message from being overheard or deciphered in the stations for which it is not intended. Its utility in electric-lighting systems, railway signaling systems, and elsewhere will be equally manifest.

In the accompanying drawings, Figure 1 represents a front view of a commutator embodying my invention intended for use with a telephonic system. Fig. 2 represents the same, the front cover being removed. Fig. 3 represents a vertical section on the line I I of Fig. 2. Fig. 4 is a diagram of a telephonic system provided with commutators embodying my invention. Figs. 5, 6, and 7 are views similar to Fig. 2, showing the commutator-cam in its three chief operative positions.

To an insulating base-plate 1 two metal plates are attached, one of these (marked 2) being electrically connected to the terminal or binding screw 4 of the main line *a*, while the other, 3, is similarly connected to a terminal 5 of a grounded wire *b*, these conductors being indicated by dotted lines in Figs. 2, 5, 6, and 7. Plate-springs 8 and 9 are attached at one end to plates 2 and 3, their construction and attachment being such as to put their free ends under stress, tending to move toward each other. Four similar though shorter springs 10, 11, 12, and 13 are arranged in pairs with the said springs 8 and 9, a shorter spring of each pair being on each side of each longer spring, the upper ends of springs 10, 11, 12, and 13 being fastened to fixed metal blocks or plates 14, 15, 16, and 17, respectively. The outer short springs 10 and 13 are provided with inwardly-facing contacts 40 and 41, the inner short springs 11 and 12 with outwardly-facing contacts 22 and 23, and the long springs 8 and 9 at their lower ends with inwardly-presented rounded bosses 38, arranged for contact with a commutator-cam hereinafter described. Fixed plates 20, 21, 26, and 27 are arranged in pairs on each side of each pair of short springs aforesaid, the two outer plates 20 and 21 being extended inwardly nearly to the inner short springs 10 and 12 and provided with contacts 42 43, presented toward these springs, respectively, while the inner plates 26 27 have similar contacts presented toward the said springs on the opposite sides thereof. The outer plates 20 and 21 are also provided with contacts 18 and 19, presented outwardly to the outer springs 10 and 13. In the normal position of the springs 8 and 9 the outer springs 10 and 13 are in touch with contacts 18 and 19 of plates 20 and 21, while the long springs 8 and 9 press the inner short springs 11 and 12 against the contacts 24 and 25 of the inner plates 26 and 27.

Plates 14 and 17 are wired, as indicated by dotted lines in Fig. 7, to binding posts or terminals 28 and 29 of the telephonic receiver-circuit. The plates 20 and 21 are similarly connected by wires (indicated by dotted lines in Fig. 2) to binding-posts 32 and 33 of house-lines f', f^2, f^3, and f^4 and grounded wire *i*, and the plates 26 and 27 are connected by wires (indicated by dotted lines in Fig. 6) to binding-posts 34 and 35 of main line 8 and grounded wire *b*.

The insulated commutator-cam 37 is mounted for partially rotating with a stud or shaft 36 and is of elongated shape. When in vertical position, it does not touch the springs 8 9; but when turned ninety degrees, as shown in Fig. 7, its operative ends will bear against the said springs and force them apart until the bosses 38 aforesaid spring into corresponding recesses 39 in the said cam, locking the said springs in position. The above-mentioned spreading apart of springs 8 and 9 causes them to press their contacts 40 and 41

against the springs 10 and 13, moving the latter away from the plates 20 and 21. The inner short springs 11 and 12 are simultaneously freed from contact with springs 8 and 9, and their resiliency causes them to bear against contacts 42 43 of plates 20 and 21.

An electromagnet 44, mounted on the base-plate aforesaid, has an armature 45, pivoted to a stud 46 and retracted by a spring 47, a stop 48 limiting its withdrawal. When the commutator-cam 37 has turned forty-five degrees, Fig. 6, a projection 49 of said cam falls into a recess 50 of the said armature, the latter being then withdrawn from the magnet and the magnet not energized, and the said cam is held in this position thereby. A spring 52, connected to an arm 51 of cam 37, restores the latter to its normal vertical position, Fig. 2, as soon as the magnet is energized by bringing its helices into circuit, and the armature consequently withdrawn from engagement with projection 49. This spring 51 is prevented from acting when the commutator-cam is turned far enough for the bosses 38 to enter the recesses 39, Fig. 7, as before described. Fixed stops 53, set in position to be struck by projection 49, limit the rotary movement of the said cam in either direction.

Above the hub 37[a] of the cam 37 and below the springs 8 and 9 are located two similar transverse springs 54 and 55, fixed at the left end to plates 56 and 57, their free ends tending to come together, but being held apart by an insulating-block 58. The lower spring 54 is thereby held normally against the said hub and the contact 59 of a fixed plate 60.

When the commutator-cam 37 is turned forty-five degrees, Fig. 6, a boss on hub 37[a], formed, preferably, by a screw-head 61, raises the springs 54 and 55, bringing the spring 54 into contact with the projection 62 of plate 63, connected by a wire (shown by a dotted line in Fig. 6) to a binding-post in electrical connection with the positive pole of the microphone-battery of the station, while the upper horizontal spring 55 presses against the contact 64 of another fixed plate, 65, similarly connected by a wire (indicated by dotted line) to binding-post 70, having an electrical connection with the negative pole of said microphone-battery.

The plate 56 is connected by wires (shown in dotted lines) to one end of the magnet-helix and also to binding-post 67, whence runs a wire *p* to the main wire, another wire, *o*, from said main wire being connected to binding-post 68, which again is connected by a wire (shown in dotted line) to the other end of the magnet-helix wire. Consequently when the two horizontal springs are lifted into the position shown by Fig. 6 a circuit is completed through the magnet 44 and also through the microphone-battery.

When the commutator-cam is turned ninety degrees into the position shown in Fig. 7, a second and lower boss 66 on the hub 37[a] comes against spring 54, lifting it and spring 55 into an intermediate position, in which contact with the parts 59, 62, and 64 is interrupted. The wires indicated by dotted lines in the respective figures are located in a space between the base-plate and a lower board 71 attached thereto, as shown in Fig. 3.

The commutator is provided with a cover 73, through which passes the stud or shaft 36, having a handle 74 for turning the commutator-cam 37, which moves with said stud, the position of the handle of course showing the position of the said cam. To make this plainer, suitable characters may be marked on the cover corresponding to these positions. A hammer 75, connected to handle 74, strikes a fixed bell 76 when the commutator-cam reaches its normal position.

In Fig. 4 the successive substations of a telephonic system having a central station (not shown) are indicated by I II III IV, each having a commutator and telephone. The main wire *a* is interrupted at each station, being thereby divided into sections which connect the successive commutators by being attached to binding-posts 4 and 34 of the base-plates. It ends at the binding-post 4 of the base-plate of the commutator of the last station IV. The ground-wire *b* begins at binding-post 5 of the first intermediate station, and its sections in like manner connect the binding-posts 5 35 of the successive commutator base-plates. Just beyond the commutator of station IV the said wire is grounded at *d*. This station IV is the main substation, which is first called from the central station and controls the calls to stations I, II, and III.

The main substation IV is provided with a call-bell *e*, connected electrically by short wires to a pair of binding-posts 30 and 31. For the several stations house-lines f', f^2, f^3, and f^4 are provided, each being connected by a branch wire *g* to the binding-post 32 of the commutator of its station. Binding-posts 33 in proximity to the binding-posts 32 of the several stations are connected by wires *h* to the ground-wire *i* or directly and independently to the ground. Plug-boards for the several stations are provided with wires *l*, arranged in sets of three for each board and connected to the said house-lines, as follows: the three wires *l* of station I to wires f^2, f^3, and f^4, the three wires *l* of station II to f', f^3, and f^4, the three wires *l* of station III to wires f', f^2, and f^4, and the three wires *l* of station IV to wires f', f^2, and f^3. From each plug-board *k* a wire runs to a short wire connecting the telephone-case *m* of that station with a binding-post 28 of its commutator base-blate, and from a proximate binding-post 29 of said base-plate another wire runs to the said telephone-case. Another wire extends from said case to microphone-battery *n* and another wire back therefrom to the wire leading to binding-post

29. From the two wires of the said battery (as last mentioned) short wires extend to proximate binding-screws 69 and 70 of the commutator base-plate. To avoid multiplicity and confusion of characters, the wires entering the telephone-case and the battery *n* have not been lettered. It has also been thought unnecessary to show the interior construction of the telephonic apparatus, as I claim no novelty therein, but may use any known construction. Of course there must be electrical connection through the inclosed parts of the instruments. A wire O connects the binding-post 68 of each commutator to the binding-post 67 of the next, and the binding-post 67 of station I and binding-post 68 of station IV are connected by wires *p* to grounded wire *i'* aforesaid or directly to ground. The various binding-posts are electrically connected by the conducting-plates and movable parts of the commutator already described, according to the positions of the commutator-cam, completing the circuits with and through the various external conductors above described. The immediate source of electrical current is the main wire, and it returns through the earth, as above indicated, though, of course, a return-wire may be substituted. This system will naturally be used with a central station, but does not absolutely require it, since the station IV may be used as an independent controlling-station receiving messages from any source.

If substation II, for example, desires to communicate with the central station, the commutator-cam of said substation is turned into the position shown in Fig. 7. The circuit will then be from the central station along the main wire, through the conducting parts 4, 2, 8, 22, 11, 24, 26, and 34, Fig. 5, of the intervening inactive stations I and in the active stations II, through the parts 4, 2, 8, 10, and 14 to the binding-post 28 of the said active station, thence through the transmitter to the binding-post 29 of said station II, thence through the conducting parts *b*, 17, 13, 41, 9, 3, and 5 and the parts 35, 27, 25, 12, 23, 9, 3, 5 of the commutator of the inactive station I, through the grounded wire *b* of said binding-post 5 to the earth, and so back to the central station. In calling the station II the central station first calls the main substation IV, causing the bell to ring, the signaling-circuit thus closed being merely from the central station through main wire *a* and intervening connections to binding-post 30, thence through the bell to binding-post 31, and thence through intervening connections to binding-post 5, wire *b*, and ground-wire *d*, returning through the earth to the central station. During this operation the commutator-cam of main substation IV and parts controlled thereby are in the normal position (shown in Fig. 2) and the parts 4, 2, 8, 22, 11, 15, 16, 12, 23, 9, 3, 5, as well as those above mentioned, are in the circuit; but it is not thought necessary to specify every detail of this signaling-circuit, which may obviously be varied, as well as the other circuits, in divers minor features without departing from the spirit of my invention.

The handle 74 of the commutator of the main substation IV is then turned to P, giving the commutator the position shown in Fig. 7, making the same circuit already first described for station II, (merely transposing the numbers of the stations,) and it then receives the message from the central station that the latter wishes to talk with station II. The plug-board *k* of the main substation is then manipulated to close the circuit through the upper wire *l* and the wire f^2 to the plug-board *k* of station II, thence through its telephone transmitter and receiver and intervening electrical connections before described to the grounded wire *i*, and so back to the central station, the part of the circuit prior to the first-named plug-board being from the central station and the main line *a*, with connections before stated, through the connecting devices within the commutator of station IV to binding-post 28 and the intervening wires and transmitting mechanism of station IV. The main substation IV then notifies the substation II that the central station wishes to talk with the latter. Station II then turns its handle to P, establishing the circuit first above described. Of course the operation and the circuits are the same when any other substation is put into telephoning-circuit with the central office, except that in stating the circuit the numbers of the stations should be correspondingly changed.

If substation I, for example, desires to talk with substation III, the former turns its handle or switch 74 to H, inserts the plug to close circuit through the middle wire *l* and the appropriate house-wire f^3, the parts taking the position shown in Figs. 2 and 5. The circuit then is as follows: From the source of electricity by the main wire and connections first above described to station I, thence through the transmitter of the same to the plug-board, the upper wire *l*, the house-wire f^3, the plug-board *k* of station III, and the wire *g* of station III, the parts 32 20 18 10 14 28 and the transmitter and receiver of said station III to the binding-post 29, then through parts 17, 13, 19, 21, 33, and *h* to the grounded wire *i*, and thence back through the earth to the source of electrical supply. The parts 33 21 19 13 17 29 of the apparatus at station I are included in this circuit. Of course the same circuit is formed with mere changes of numerals in description when any of the other substations undertakes a similar communication within the house or series.

When a substation—for example, I—turns its commutator-cam 37 into the position shown in Fig. 6, the springs 54 and 55, as above described, bring the electromagnet 44 into cir-

cuit. The latter is then through the commutator of said substation by parts 69, 63, 62, 54, 56, and 67 thereof to the wire O, thence through parts 68, 60, 59, 54, 56, and 67 of the commutator of the next station in the position of Fig. 5 and in the same manner through the other stations having their commutators in this latter position of rest, then by wires *p* and *i* to the binding-post 68 of main substation IV, thence back to the battery, the magnet 44, and the parts 57, 55, 64, 5, 65, and 70, Fig. 6. This permits the commutator-cam of station I to be turned into the position shown in Fig. 7 for closing the circuit with the central station. If an intermediate station has already put itself into circuit with the central station, its commutator-cam being in last-mentioned position breaks the circuit at 59, 62, and 64, and the magnet of station I will not be energized; but the projection 49 is locked in the recess 50 of the armature and the commutator-cam of station I is locked in the position shown in Fig. 6. When the conversation is finished, the commutator-cam of the substation I, or whichever station is conversing, is turned into to the position of rest, Fig. 2, and the circuit is again closed through the magnet of the main substation IV, withdrawing armature 45 from cam 37 of said station, which is returned to its position of rest, whereupon the hammer 75 strikes bell 76, signaling that the line to the central office is free. Each substation may be provided with a bell for the same purpose.

Binding-posts 6 and 7 of the various stations make it possible for the functions of station IV to be taken up by any other substation by connecting to said posts the telephone transmitter and receiver of such substituted station, the circuit then passing through parts 4 2 6 7 3 5 and the ground-wire *b* beside the main wire the central station, the source of electricity and intervening devices hereinbefore described.

The system and apparatus as a whole therefore consists of a series of telephonic or other electric stations, including a main substation which controls the communication of the central station with any of the other substations, each substation being provided with a commutator-cam and electrical contacts arranged so that the said cam is capable of three different axial positions, the circuit being changed accordingly by the turning of the cam, one position thereof leaving the parts normal and inactive, another position thereof providing for communication between the central station and any one of the substations, and a third position thereof providing for communication between two substations of the series, each commutator being, furthermore, locked when in the position for communication with the central station by an armature governed by a spring and a magnet, this locking continuing during conversation between any substation and the central station and closing the line to the latter against all other substations, but opening it automatically to any of them when the speaking-circuit is broken, the arrangement and combination of commutators and conductors being, furthermore, such that when a substation of the series is put in circuit with the central station by the proper adjustment of its commutator following the announcement of the main substation the other and inactive substations will be incapable of repeating, receiving, or being affected by the message, this inability on the part of the stations not connected for conversation also existing during conversation between any two substations of the series.

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

1. A series of telephone or other electric stations, including a main station which controls communication between a central or other additional station and any station in said series, each station in the said series being provided with a commutating device capable of taking any one of three circuit-controlling positions, in combination with contacts and conductors, one of the said positions leaving the apparatus normal and inactive, another position making an operative circuit between one of the said stations and the central station and the third position making an operative circuit between any two stations of the series, the conductors being arranged to leave inactive the stations of the series which are not in speaking or other active circuit substantially as set forth.

2. A series of telephonic or other electric stations, including a main station which controls communication between the central station and any station of said series, each station being provided with a commutating device adapted to be turned into position for closing circuit through the telephonic or other indicating devices of the said station and the central station in combination with said telephonic devices means for automatically locking the said commutating device in this position and thereby barring the central office-circuit to all the other stations of the series and means for releasing the said commutating device and opening the said circuit to any of the other stations when the first circuit above referred to is open.

3. In a commutator for electric currents in combination with an isolated ground-plate 1, a metal plate 2 connected to the admission-wire *a*, a similar metal plate 3 connected to the derivation-wire *b*, a spring 8 fixed to said metal plate 2, a spring 9 fixed to the metal plate 3, a commutator-cam 37 placed between the free ends of said springs 8, 9 said cam 37 being held rotatory upon a pin 36 on the ground plate 1, a handle 74 upon said pin outside of a cover 73, metal plates 14, 15 arranged respectively right and left of said spring 8 and

below said metal plate 2, similarly-arranged metal plates 16, 17 right and left of spring 9, said plates 14 and 17 being respectively connected to clamps 28, 29, holding the lines to and from the speaking and hearing apparatus *m*, while the plates 15 and 16 respectively are connected to clamps 30 and 31 respectively, leading to a call-bell *e*, springs 10 and 11 fixed respectively to said plates 14, 15 and springs 12, 13 fixed respectively to said plates 16, 17 said inner springs 11, 12 being pressed against contact-pieces 24, 25 respectively of plates 26, 27, while said outer springs 10, 13 by their own elasticity are pressed against the contact-pieces 18, 19 of plates 20 or 21 respectively, contact-pieces 40 and 41 on springs 10, 13 respectively against which contacts 40, 41 the springs 8, 9 respectively may be pressed, contact-pieces 42, 43 on plates 20, 21 respectively making contact with said springs 11, 12 respectively when the springs 8, 9 are pressed against the contacts 40, 41 of springs 10, 13 respectively, clamps 32, 33 on ground-plate 1 for connecting said plates 20 and 21 respectively to a speaking-line *g* and a house-line *h* respectively; plates 26, 27 and clamps 34, 35 respectively for connecting said plates 26, 27 respectively to the admission-line *a* and to the derivation-line *b* respectively, the whole as described and illustrated and for the purpose set forth.

4. In a commutator for electric lines with intermediate stations for currents of weak and strong intensity an isolated ground-plate 1 having fixed thereto metal plates 2, 3, clamps 4, 5, 6, 7, springs 8, 9 connected respectively to said plates 2, 3, metal plates 14, 15, 16, 17, springs 10, 11, 12, 13 connected to said plates 14, 15, 16, 17 respectively clamps 28, 29 and 30, 31, plates 20, 21, 26 and 27 and clamps 32, 33, 34, 35 respectively, for connecting said plates to a speaking-line *g*, a house-line *h*, an admission-line *a* and a derivation-line *b* respectively, a commutator-cam 37 on a pin 36 and a handle 74 fixed thereon in combination with metal plates 56, 57, 60, 63, 65 respectively, springs 54, 55 attached to said plates 56, 57 respectively, a distance-piece 58 held on spring 54 between said springs 54, 55, contact-pieces 59, 62, 64 on plates 60, 63 and 65 respectively, clamps 69, 70, 67, 68 for connecting said plates 63, 65, 56, 60 to the controlling-lines *p*, O respectively, the whole as described and illustrated and for the purpose set forth.

5. In a commutator for electric lines with intermediate stations for currents of weak and strong intensity an isolated ground-plate 1 having fixed thereto metal plates 2, 3, clamps 4, 5, 6, 7, springs 8, 9 connected respectively to said plates 2, 3, metal plates 14, 15, 16, 17, springs 10, 11, 12, 13 connected to said plates 14, 15, 16 and 17 respectively, clamps 28, 29, 30 and 31, plates 20, 21, 26, 27 and clamps 32, 33, 34, 35 respectively for connecting said plates to a speaking-line *g*, a house-line *h*, an admission-line *a* and a derivation-line *b* respectively, metal plates 56, 57, 60, 63, 65 respectively, springs 54, 55 fixed to said plates 56, 57 respectively, a distance-piece 58 between said springs, contact-pieces 59, 62, 64 on plates 60, 63 and 65 respectively, clamps 69, 70, 67 and 68 for connecting said plates 56, 60, 63 and 65 respectively to controlling-lines *o* and *p* respectively, a commutator-cam 37 on a pin 36, a handle 74 on said pin, a hub 37^a on the cam 37, supporting said springs 54, 55, projections 61 on hub 37^a, lifting the spring 54 out of contact with the plate 60, a projection 66 raising both springs so much, that spring 55 comes in contact with contact-piece 64 of plate 65 in combination with an electromagnet 44, a stay 45 held on a bracket 46, a spring 47 tending to pull the stay away from the magnet, a pin 48 limiting the path of the stay, a recess 50 on the upper side of the same, a projection 49 on the lower side of the commutator-cam limiting the turning of the commutator-cam, when the stay is not attracted by the magnet 44, a spring 52 connected to the commutator-cam and a rod 51 having the tendency to press the same toward the right side, the whole as described and illustrated and for the purpose set forth.

6. In a commutator for electric lines with intermediate stations for currents of weak and strong intensity an isolated ground-plate 1, metal plates 2, 3 fixed thereon, springs 8, 9 attached to said plates respectively, knobs 38 at the end of said springs in combination with a commutator-cam 37 on a pin 36 carrying a handle 74, said cam having recesses 39 at diametrically opposite sides for holding the springs spread asunder by the knobs 38 falling into said recesses when the cam is turned, a spring 52 connected to said cam by a rod 51 and held fast at one end to the ground-plate 1, said spring tending to press the commutator-cam into its position of rest, a hammer 75 fixed to the handle 74 of the commutator-cam 37, a bell 76 fixed on the cover 73 of the commutator-case so, that the bell is made to sound when the commutator-cam is brought in its normal position of rest, thereby indicating that the line is free; the whole as described and illustrated and for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

CARL HEINRICH PRÖTT.

Witnesses:
OTTO KÖNIG,
EMIL BLOMBERG.