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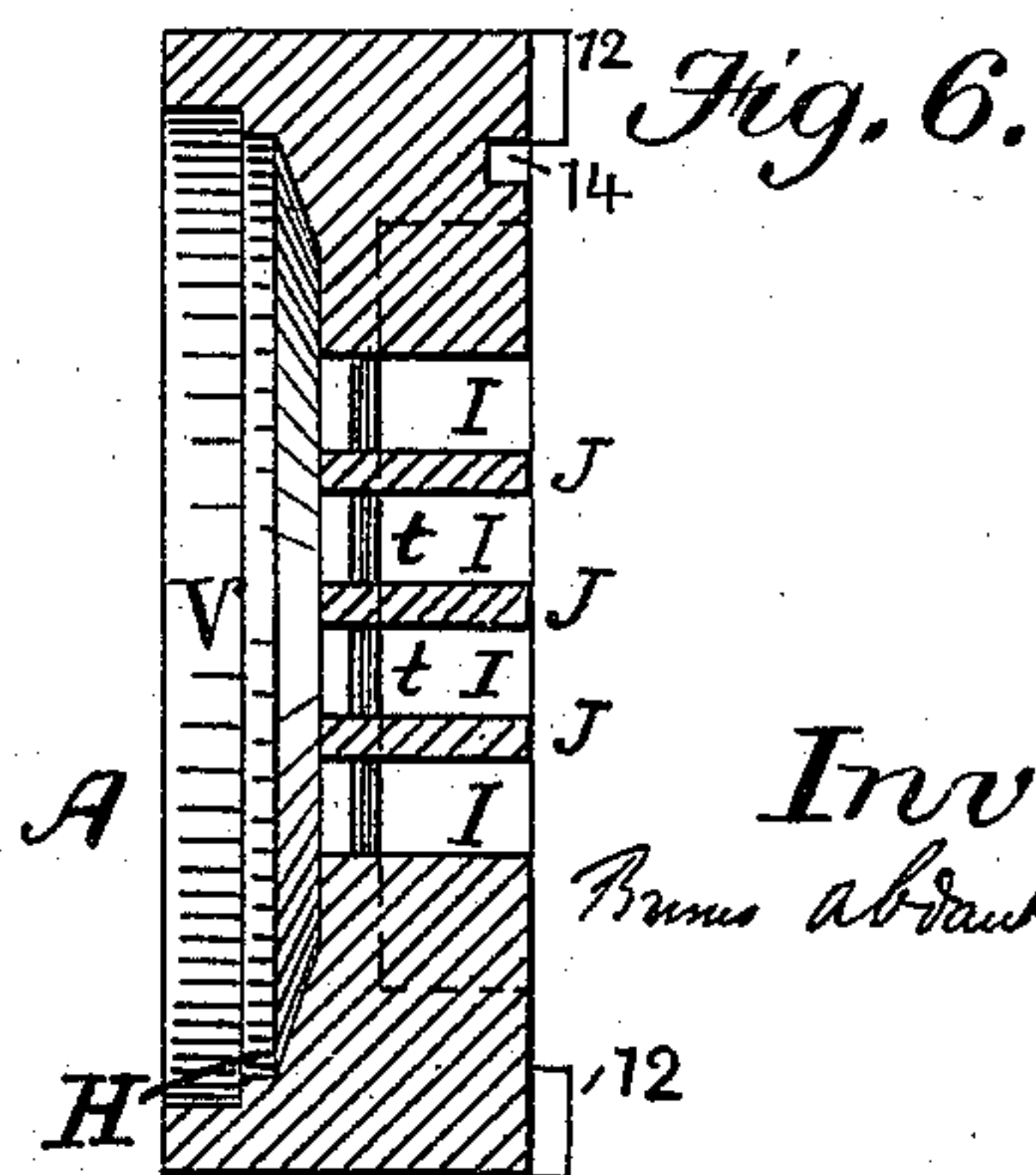
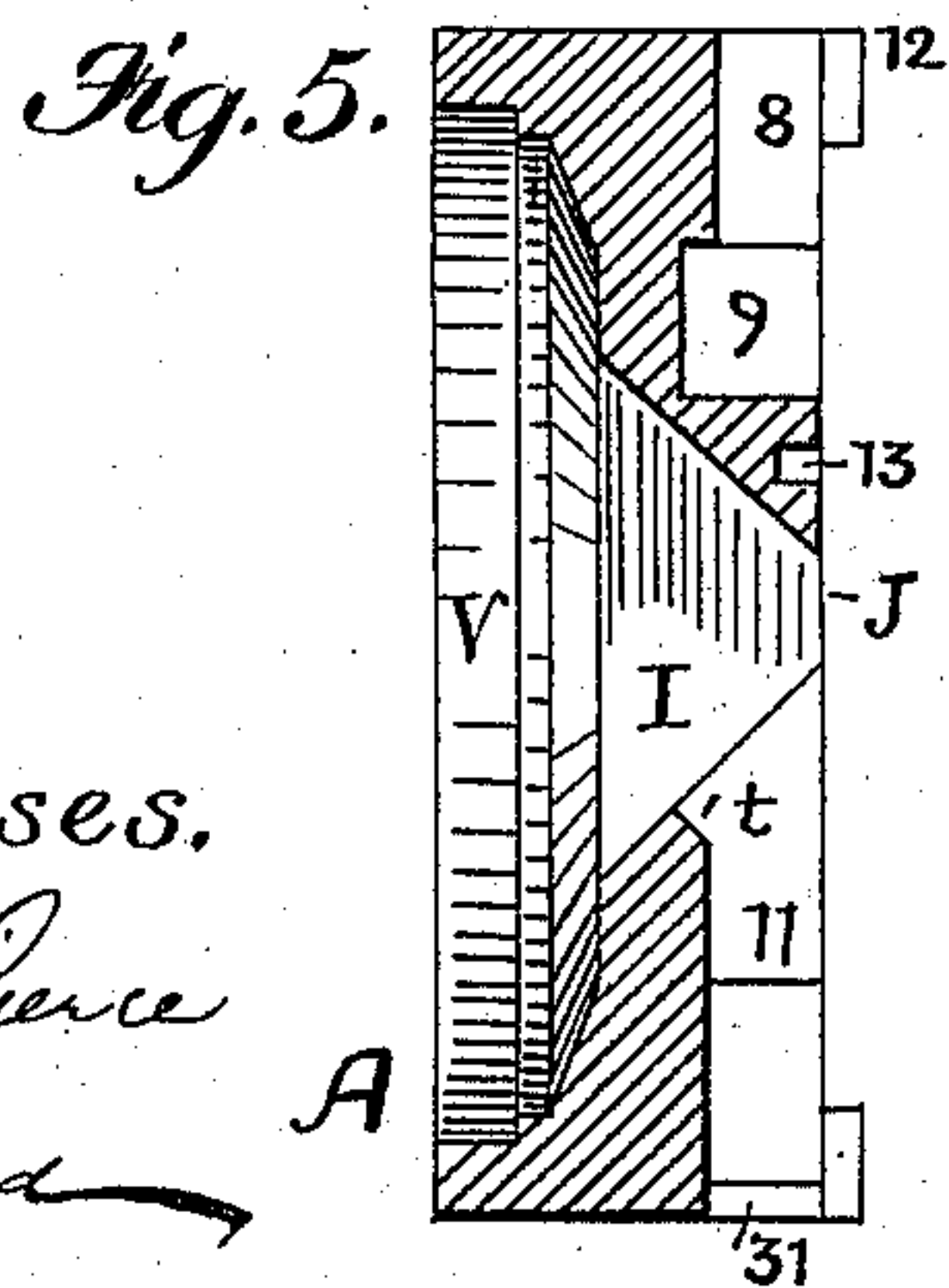
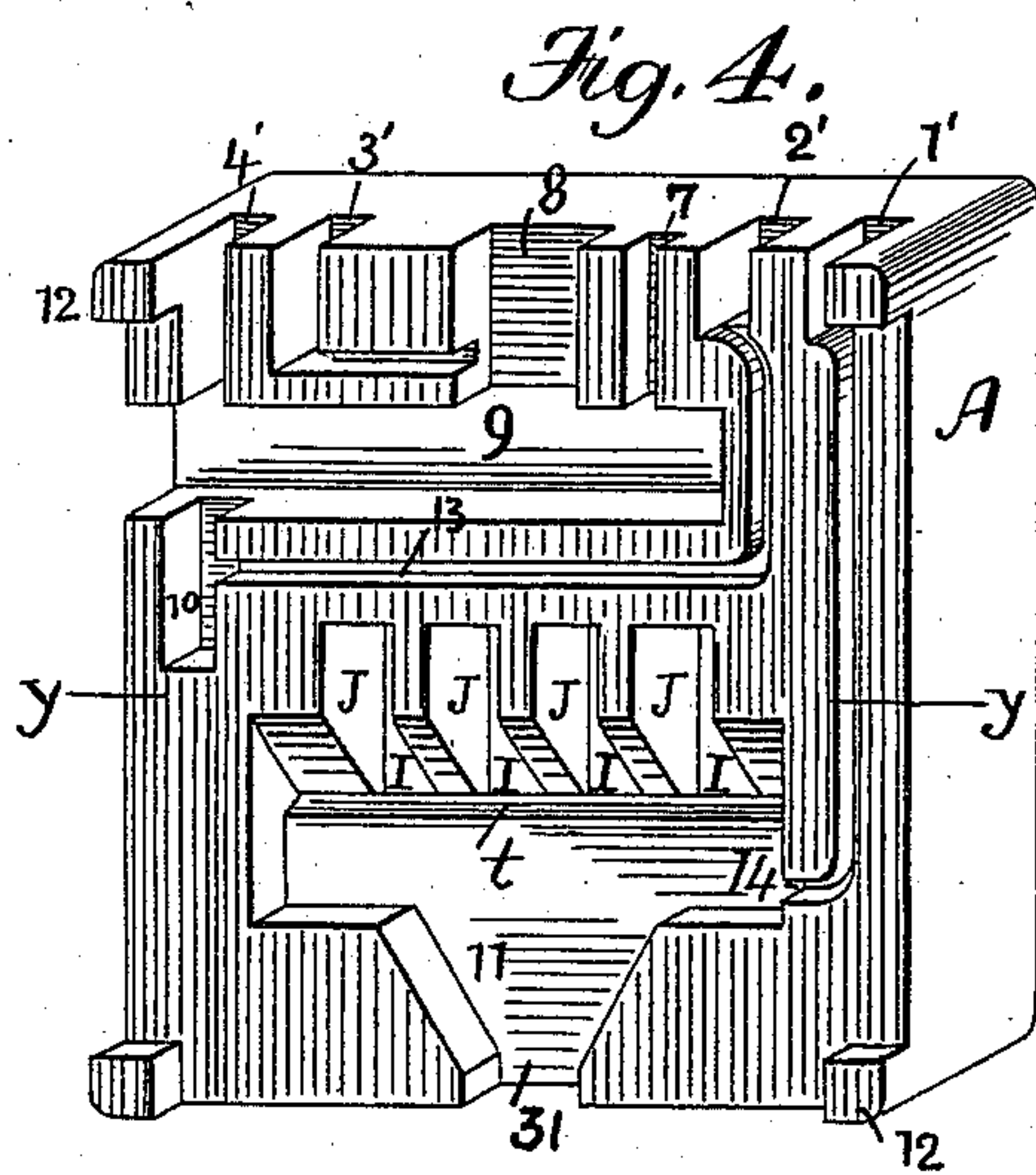
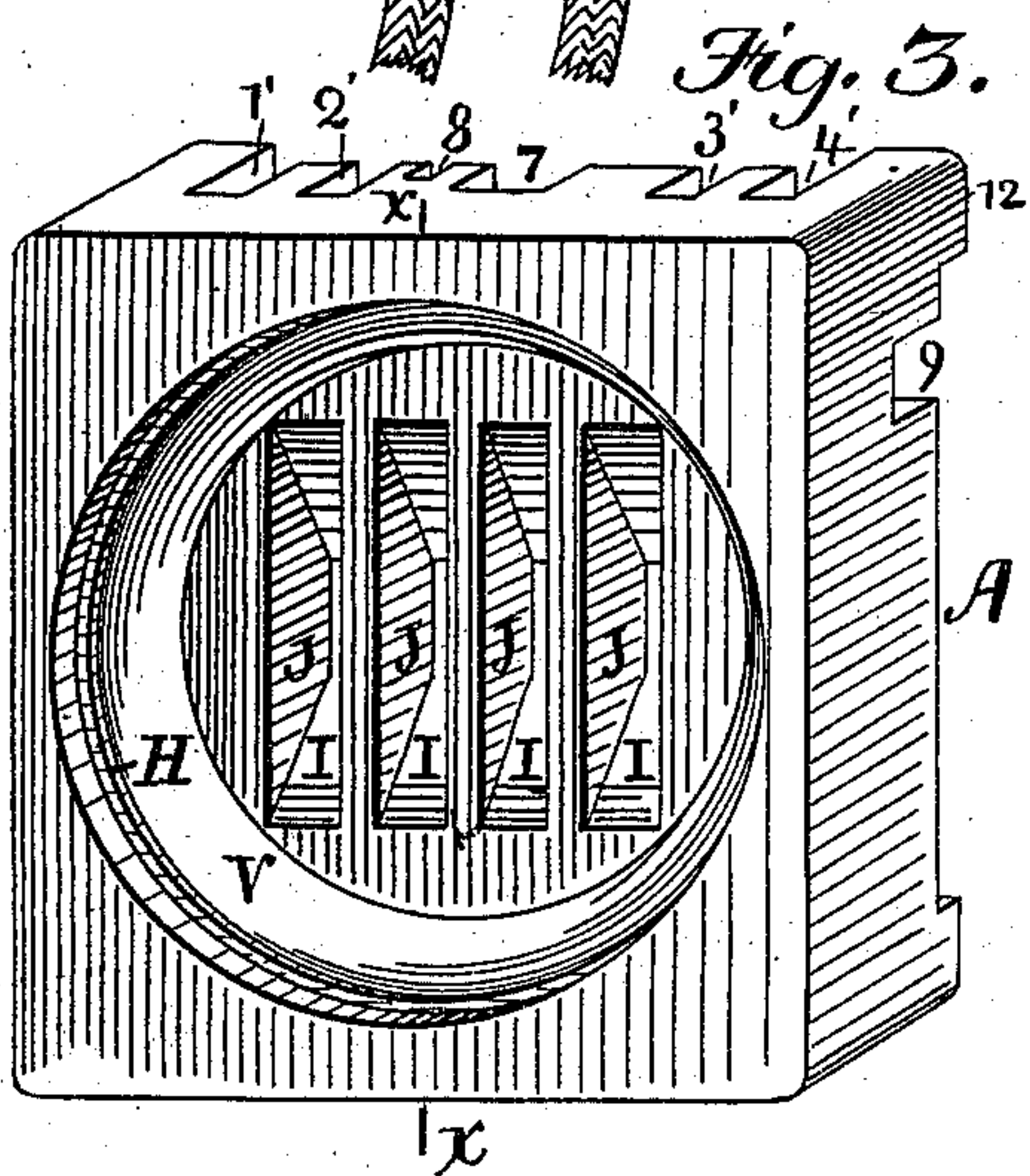
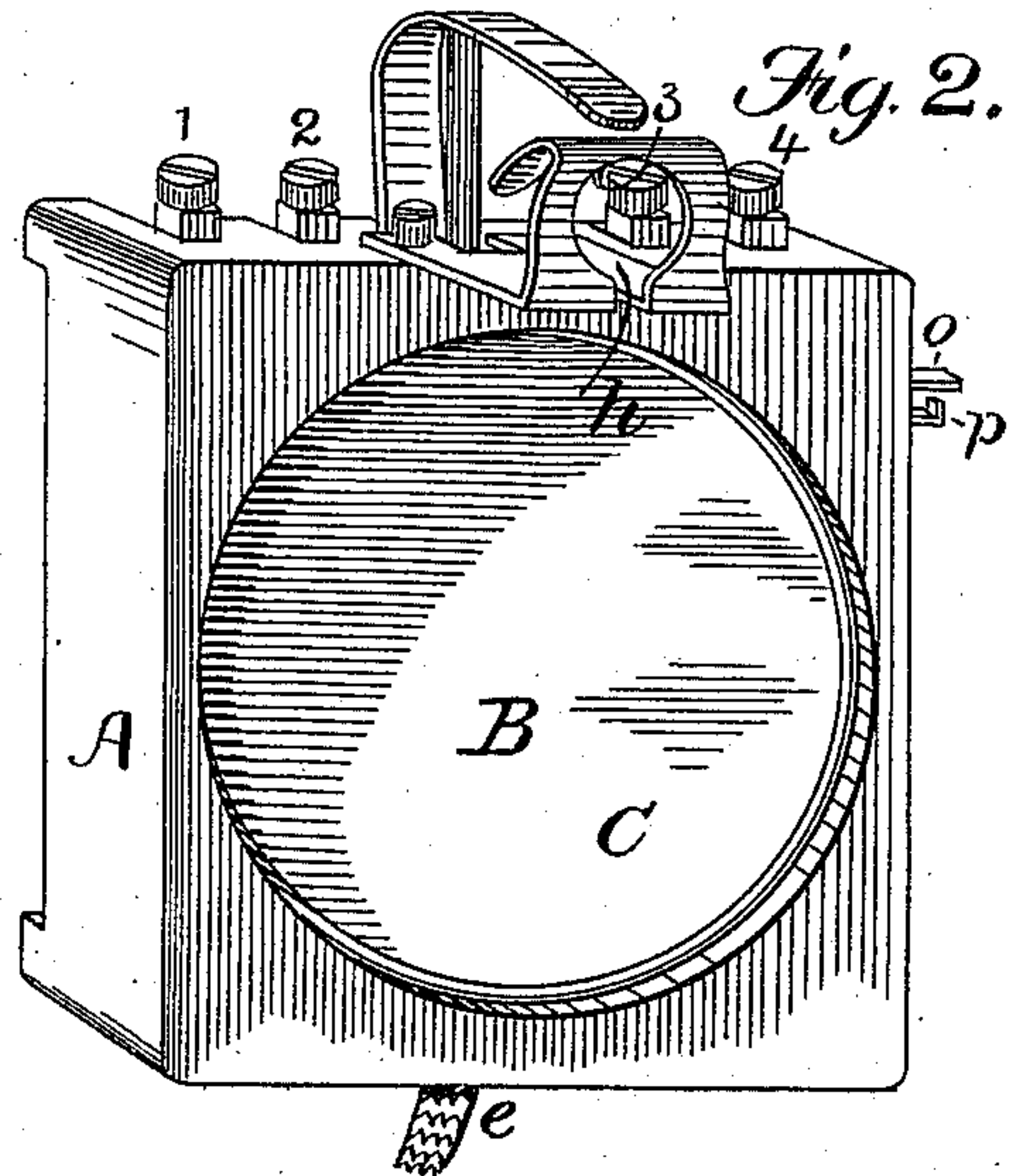
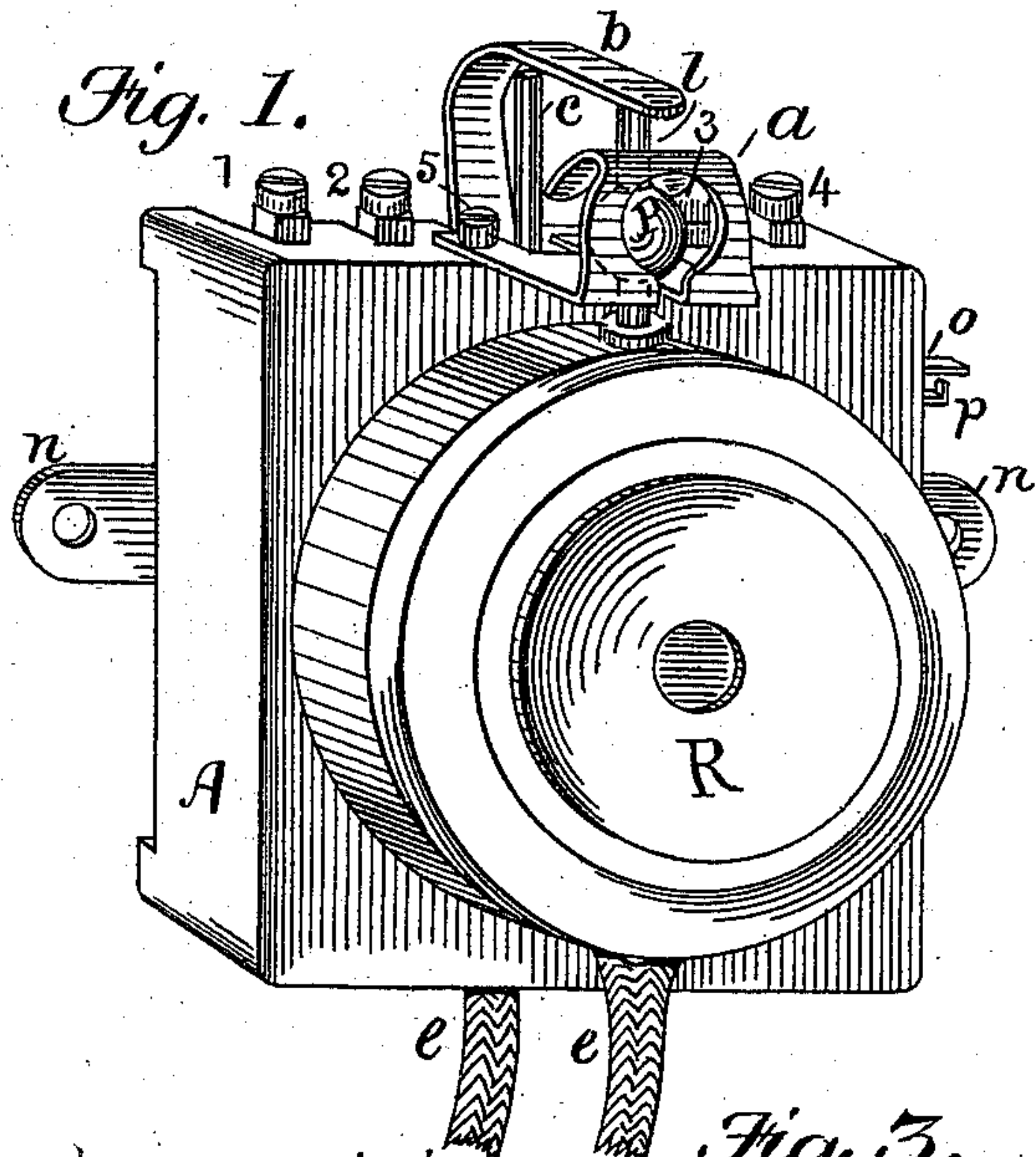
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B. ABDANK-ABAKANOWICZ.

TELEPHONE STATION APPARATUS.

No. 412,580.

Patented Oct. 8, 1889.



Witnesses.
Geo. M. Pierce
Thos. D. Lockwood

Inventor.
Boris Abdank-Abakanowicz

(No Model.)

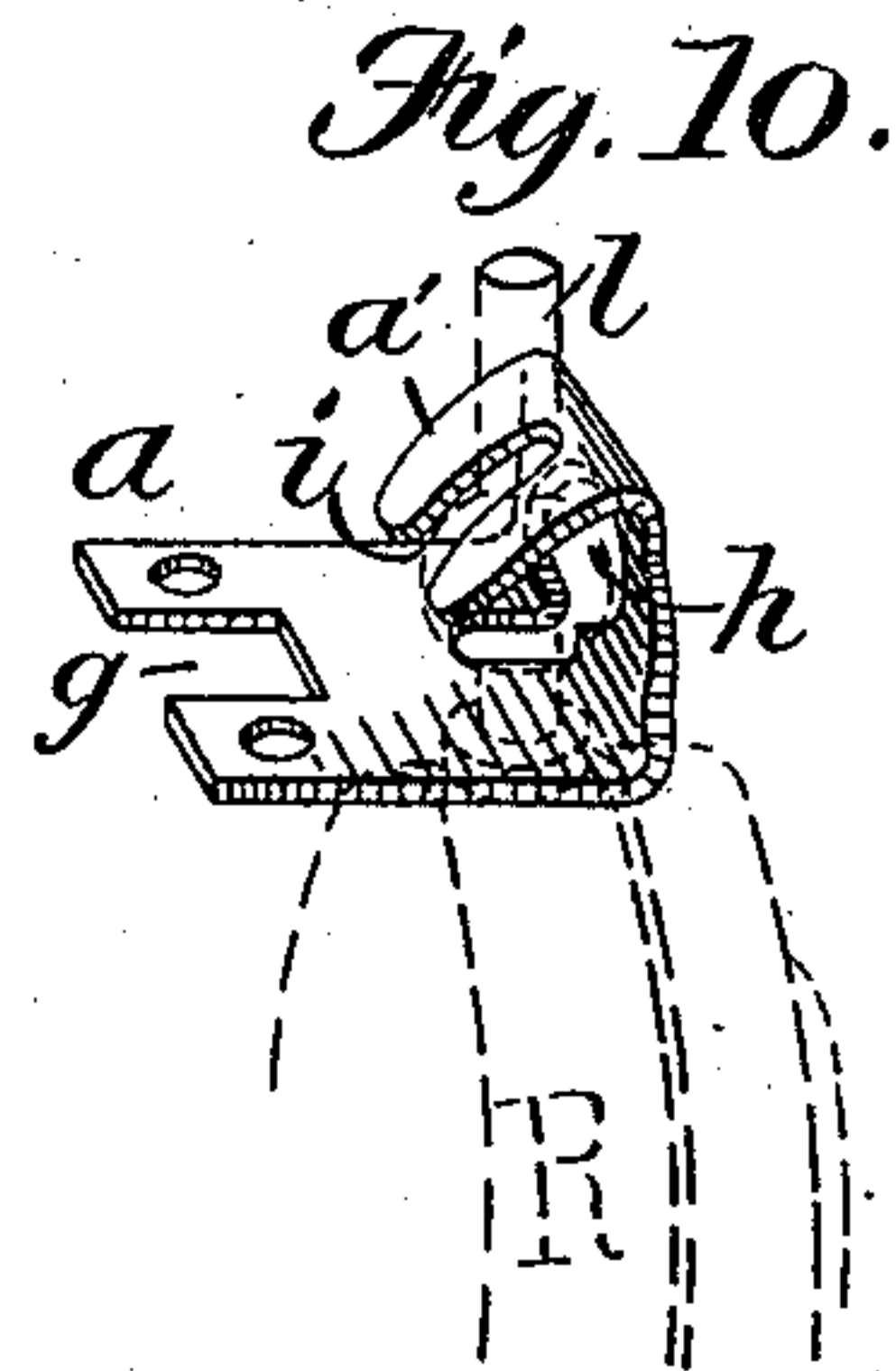
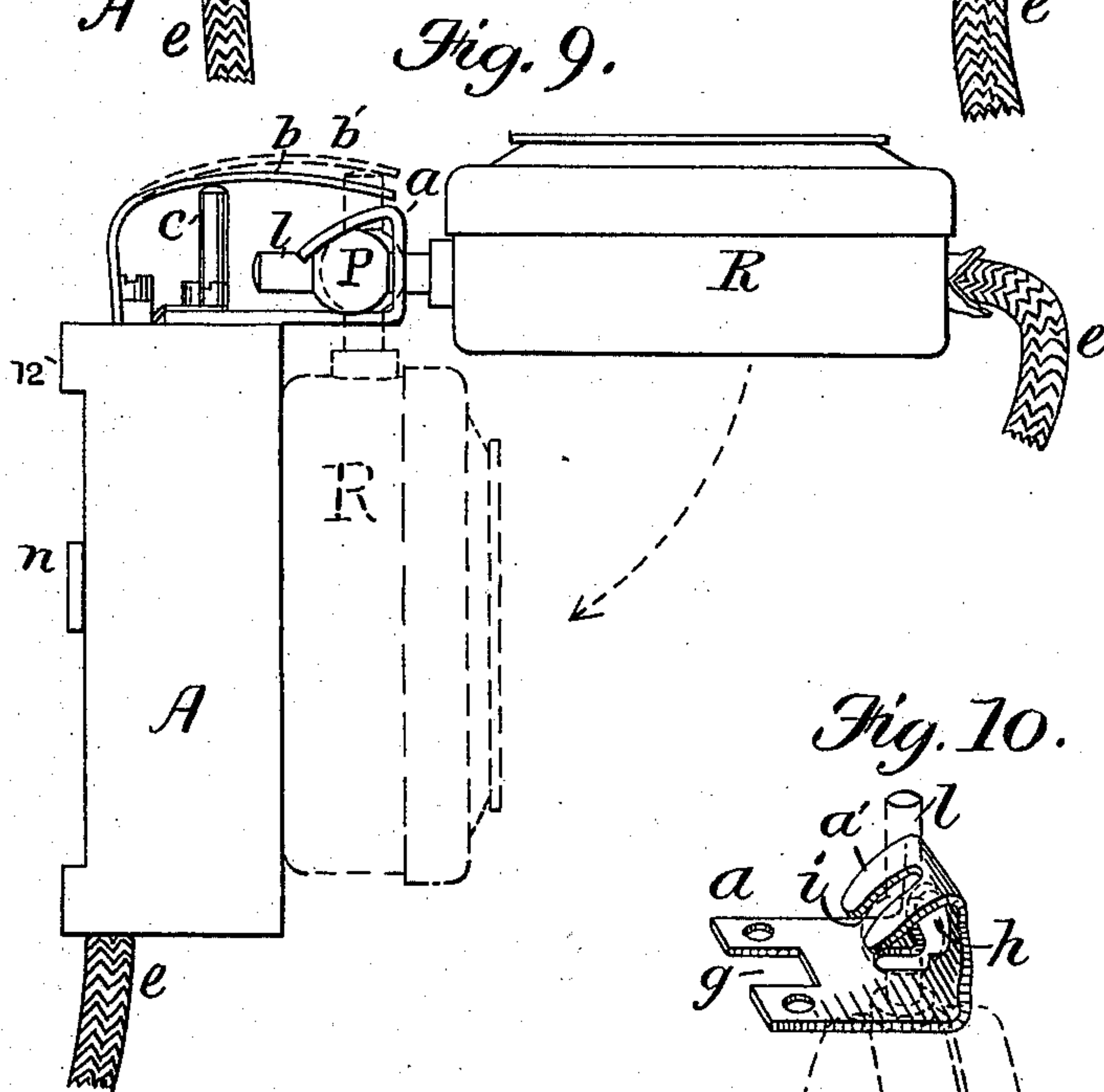
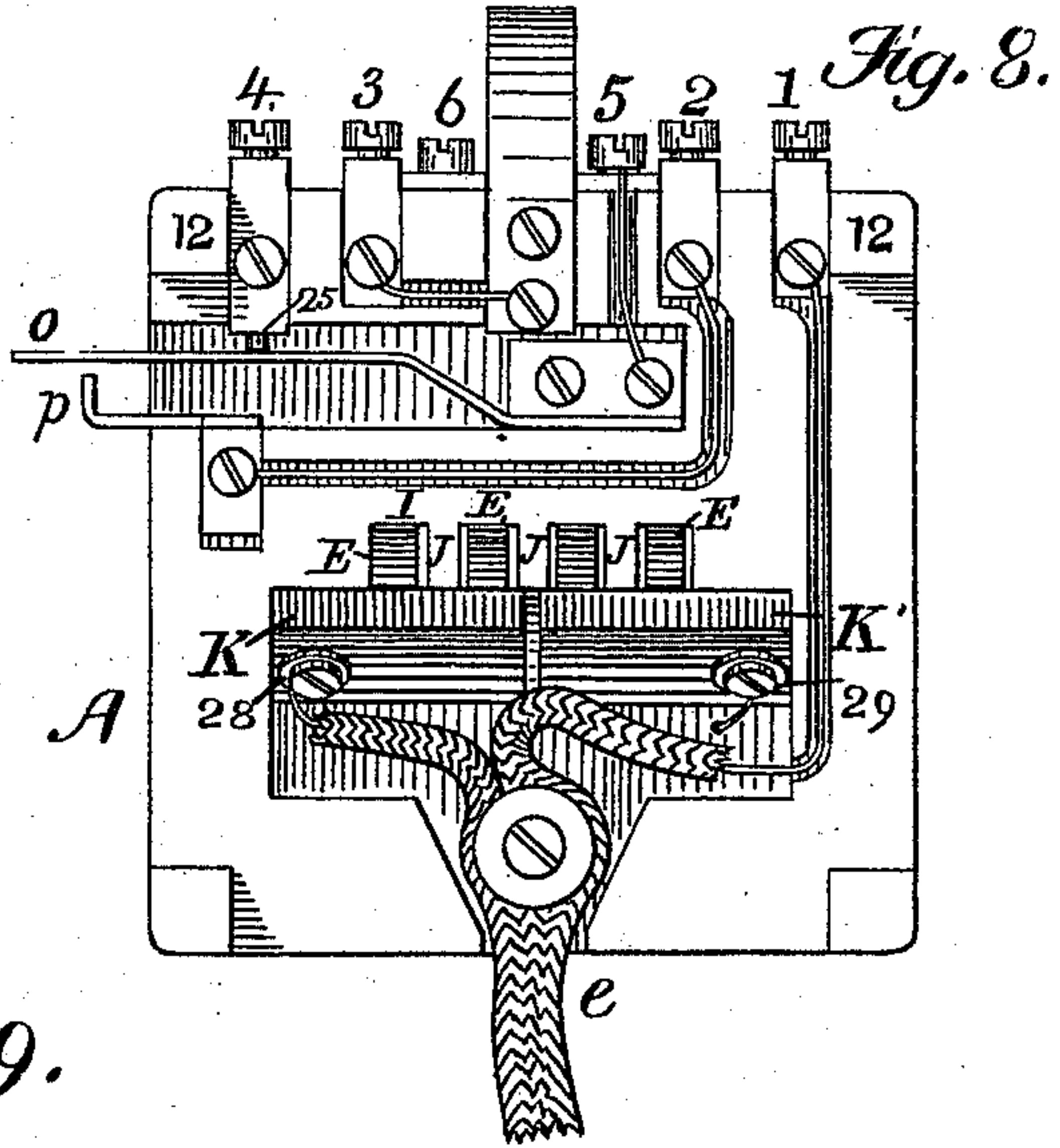
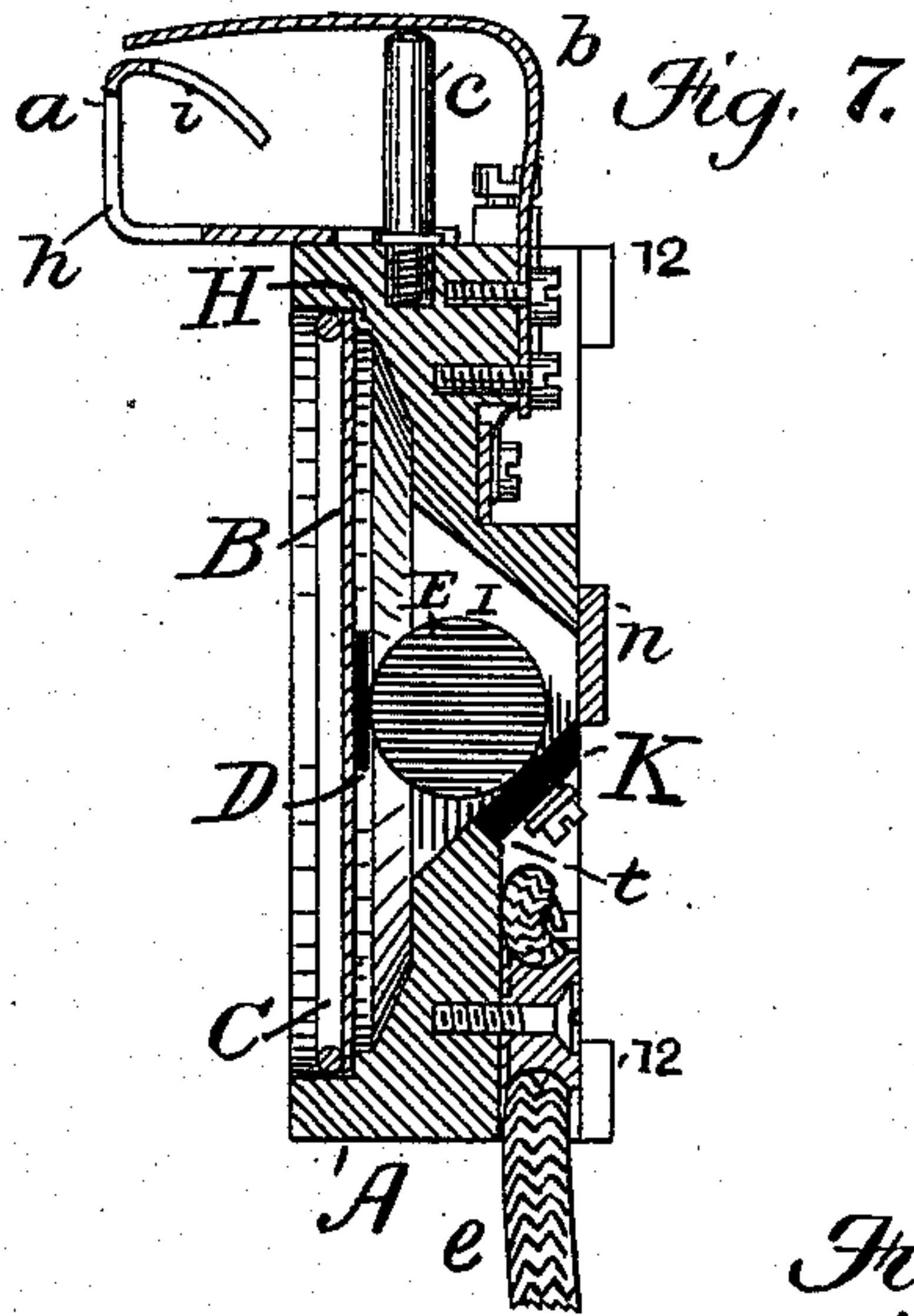
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B. ABDANK-ABAKANOWICZ.

TELEPHONE STATION APPARATUS.

No. 412,580.

Patented Oct. 8, 1889.



Witnesses.

Frederick Pierce
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Inventor.

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(No Model.)

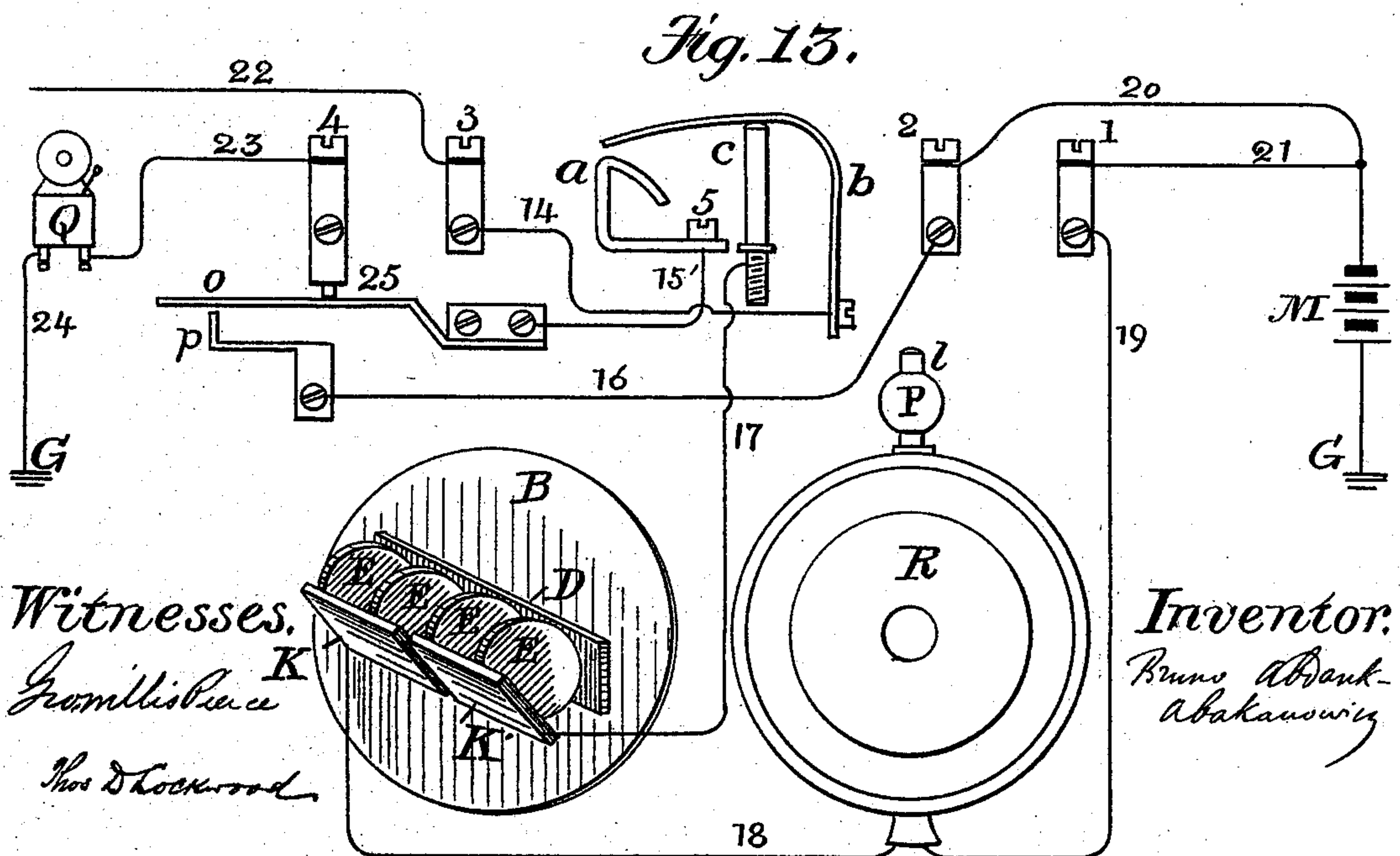
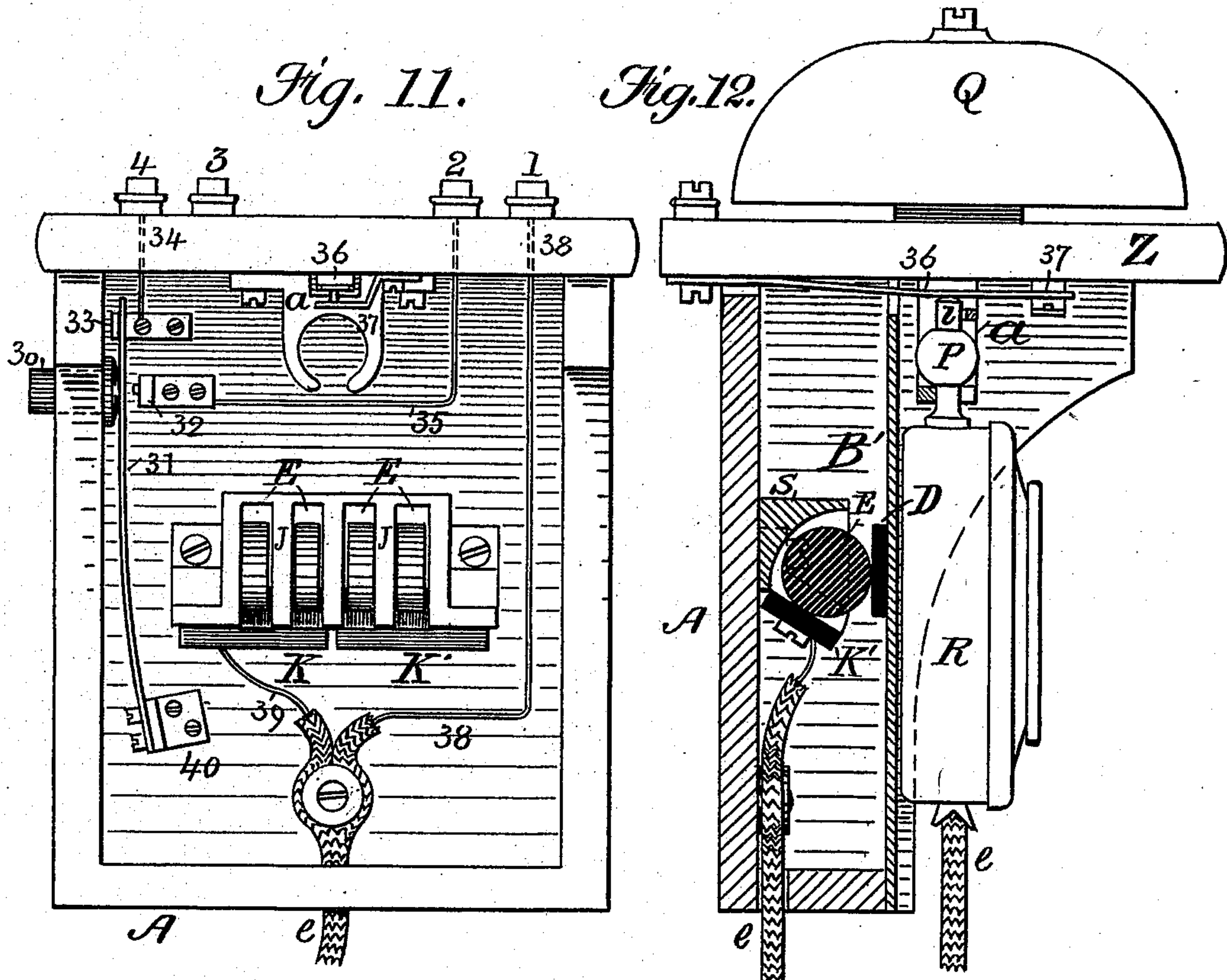
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B. ABDANK-ABAKANOWICZ.

TELEPHONE STATION APPARATUS.

No. 412,580.

Patented Oct. 8, 1889.



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(No Model.)

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B. ABDANK-ABAKANOWICZ.

TELEPHONE STATION APPARATUS.

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Fig. 14.

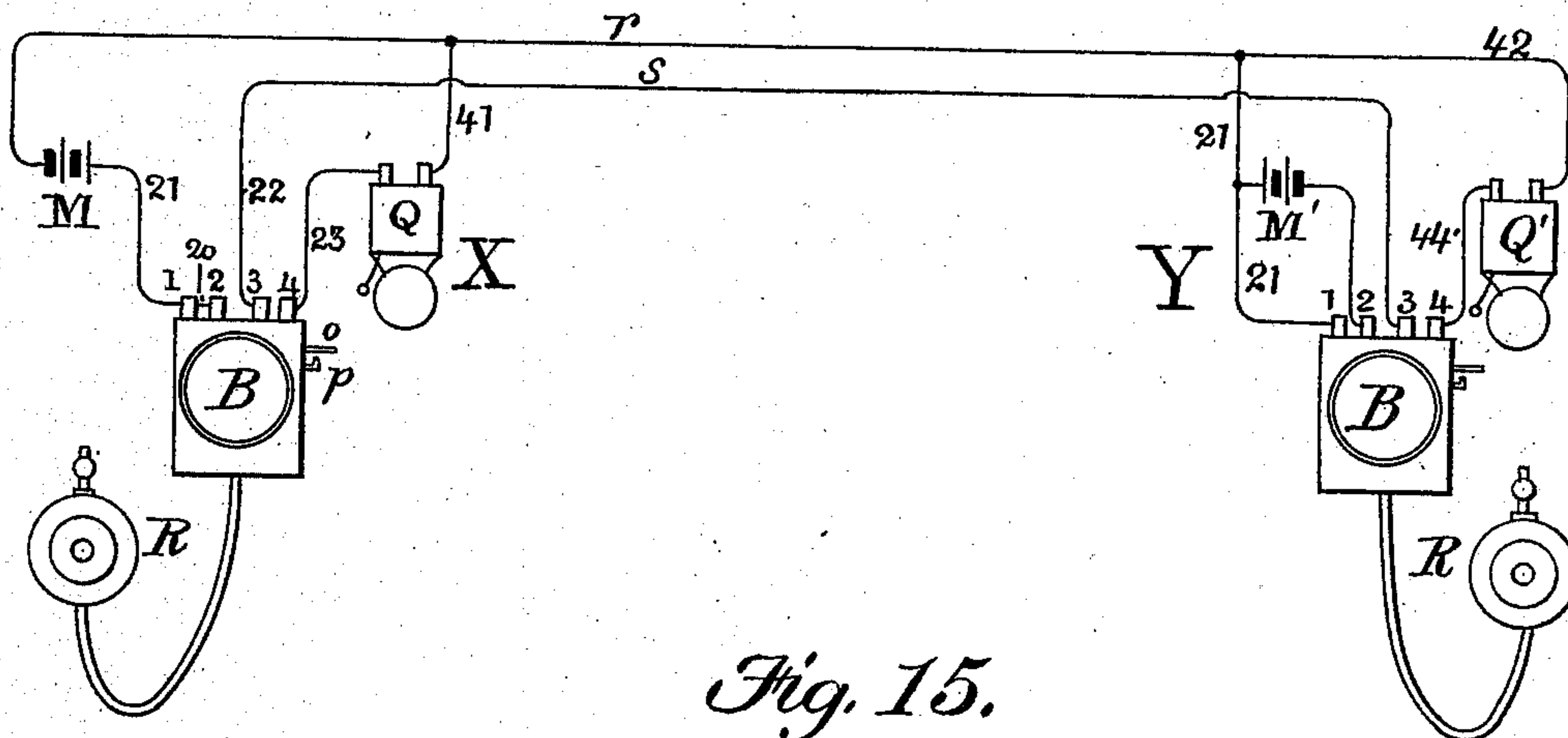
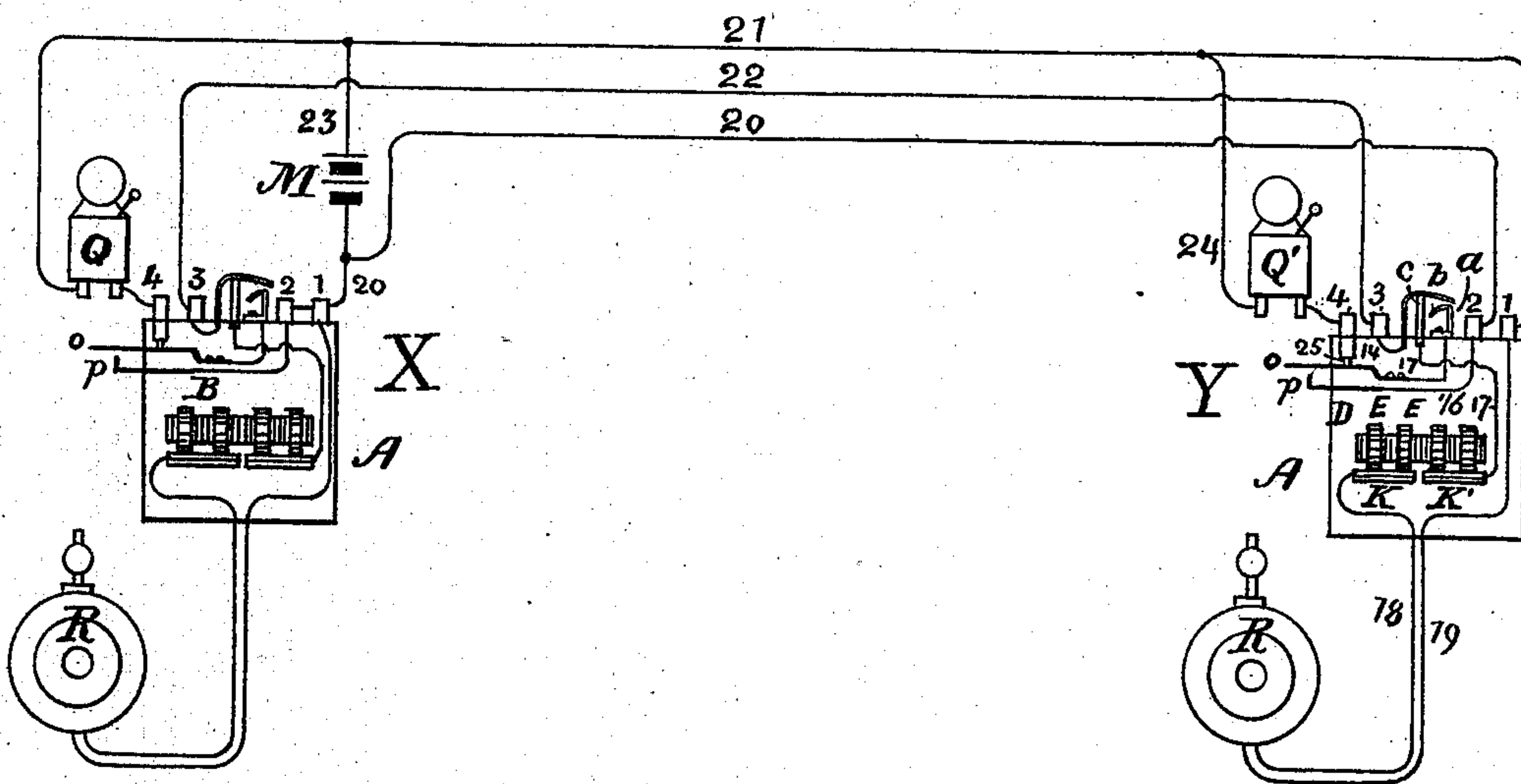


Fig. 15.



Witnesses.

Samuel Pierce

John Lockwood

Inventor.

Bruno Abdank-Abakanowicz

UNITED STATES PATENT OFFICE.

BRUNO ABDANK-ABAKANOWICZ, OF PARIS, FRANCE, ASSIGNOR TO THE
AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

TELEPHONE-STATION APPARATUS.

SPECIFICATION forming part of Letters Patent No. 412,580, dated October 8, 1889.

Application filed February 20, 1889. Serial No. 300,543. (No model.) Patented in France February 28, 1888, No. 189,018, and in Austria-Hungary April 16, 1888, No. 6,623.

To all whom it may concern:

Be it known that I, BRUNO ABDANK-ABAKANOWICZ, residing at Paris, in the Republic of France, have invented certain Improvements in Telephone-Station Apparatus, (for which I have obtained Letters Patent in France, No. 189,018, dated February 28, 1888, and in Austria-Hungary, No. 6,623, dated April 16, 1888,) of which the following is a specification.

This invention relates to combination telephone sets in which the various appliances are organized in a small compass, so as to make a compact, neat, uncomplicated, and efficient telephonic outfit suitable for home use. The various instrumentalities which are practically required even in the simplest efficient installations are, in brief, a telephonic transmitter and receiver at each station for the transmission and reproduction of speech, a call-bell for the reception of call-signals, a call-sending appliance for the transmission of call-signals, and a commutating switch or circuit-changer, whereby the line-circuit is transferable from the call-signal appliances to the telephones, and vice versa. This latter device is usually dependent, at least in part, upon the telephone-receiver, and it is usual to so combine the switch with the said receiver that the latter, when hung in its position of rest, is caused to exert a force against the pressure of a spring and thereupon to actuate the switch in one direction, while the said spring acts, when the receiver is removed, to move the switch in the opposite direction.

In a separate application for a patent, filed of even date herewith and having the serial number 300,542, I have described and claimed the microphonic transmitter, which forms one feature or element of the invention described and claimed herein. The said transmitter comprises a series of carbon disks standing on edge between an inclined plane of conducting material and a conducting-plate, preferably of carbon, carried by a vibratory diaphragm, the said disks having necessarily a tendency to roll down the said inclined plane, but being prevented from carrying the said tendency into effect by their contact with

the diaphragm-plate, which holds them in place. The current passes through the said disks and their respective front and rear contacts, and its strength is varied by variations in the resistance at said points of contact when the diaphragm is varied by the voice of an operator.

In the organization of appliances which forms the subject of my present invention all of the elements which I have stated as being requisite or convenient in speech-transmission are, with the exception of the call-bell, comprised. That instrument, however, can be, and preferably is, affixed to any part of the wall, or, may, if preferred, be mounted out of sight.

In the complex instrument which I am about to describe a mold, frame, or base of non-conducting material is first provided, being recessed in front for the reception of the transmitting-telephone diaphragm and microphonic contacts, and being suitably cut or pressed into channels on its rear side for the reception of the various connecting-wires, springs, and screws, and for the attachment of a call-key. The microphone is of the character indicated, and the diaphragm thereof is secured in its recess by a circular metal spring. The receiving-telephone does not essentially differ with respect to its working parts from the ordinary magneto-telephone, being, as usual, provided with a magnet, electro-magnetic coil, and a diaphragm mounted in inductive proximity to the coil-surrounded magnet-pole, the whole being enclosed in a suitable case and provided with a screw-cap perforated to serve as an ear-piece. It is, however, externally shaped like a watch, which it also resembles in size. It is provided with a suspending-stem in the form and position of a watch-stem, and this stem is adapted to enter a perforated metal plate fastened to the upper edge of the transmitter-case. When the stem is so entered and the receiver pressed downwardly so that it hangs vertically in front of the transmitter-diaphragm, concealing the same, it is in the place provided for its reception when not in use, and it cannot be removed therefrom ex-

cept by first raising it to a position at right angles with the transmitter, when it may be withdrawn for use, the circuit of the receiver-helix being connected by a flexible conducting-cord with terminals behind and attached to the transmitter-frame. When hung in its resting position, the watch-stem of the receiver raises a flat spring connected with the incoming main-circuit wire from a mixed metal post, which is united by a wire with the telephone branch circuit and establishes a metallic connection from the said spring through the metal of the said suspending-stem to the perforated holding-plate of the receiver, this being connected by another wire through a call-key to the call-bell. The presence or absence of the receiving-telephone in its place of rest thus determines the direction of the main circuit through the apparatus. Since to the weight of the telephone is superadded a leverage of considerable power, it will be seen that I am enabled to use a powerful counter-spring, and the chances of getting out of order are thus materially diminished. A call-key and its battery-contact project from a slot or orifice in the side of the frame, the former being normally in the bell-circuit, as already indicated, and the latter being connected directly with a screw-terminal leading to a voltaic battery.

The several circuit arrangements will be fully described herein.

Heretofore, as I am well aware, organizations similar in some respects to the present have been devised; but they have been defective in that some have been altogether devoid of the microphonic transmitter, while others, endeavoring to supply this want, have introduced transmitters in which the contacts are distributed over the entire surface of the diaphragm, and thus produce inharmonious and non-concurrent vibrations, interfering with perfect articulation.

My instrument embodies a radical improvement in the switching and transmitting apparatus and a more compact organization than any arrangement which has heretofore been proposed, and consists, further, in the employment of a common non-conducting matrix or base-plate, which is recessed and channeled for the reception of the transmitter elements and electrical connections.

In the drawings which form a part of this specification, Figure 1 is a perspective view of the entire station apparatus ready to be screwed up on a wall or partition. Fig. 2 is a similar perspective view but with the receiver removed. Figs. 3 and 4 are respectively front and rear perspective views of the mold or frame within which the working parts are mounted. Fig. 5 is a vertical section on the line xx , and Fig. 6 a horizontal section on the line yy , of said mold. Fig. 7 is a vertical section of the transmitting and switching apparatus. Fig. 8 is a rear view of the apparatus, showing the call-key and some of the electrical connections. Fig. 9 is

a line drawing of a side elevation of the entire station apparatus, showing the switch and indicating its operation by means of the receiving-telephone. Fig. 10 is a detail of the circuit-changing switch. Figs. 11 and 12 are respectively rear, face, and sectional side views of a modified mechanical arrangement in which the bell-call is attached directly to and forms a homogeneous part of the telephone outfit. Fig. 13 is a diagram of the electrical connections of a telephone-station constructed in accordance with my invention; and Figs. 14 and 15 are diagrams of two station telephone-circuits, showing two ways of connecting the instruments.

In the principal and ordinary form of the apparatus, A is a mold, base, or frame for the operating parts, and is formed of non-conducting substance. It may be made of hard rubber, vulcanized fiber, bonsilate, papier-maché, or similar material, and its various apertures, recesses, or channels may either be excavated or may be pressed therein while the material is in a plastic condition, according to the material used. No specific dimensions need be adopted; but I have found the size of two and three-quarters inches square by seven-eighths of an inch thick to be convenient. This frame, divested of its attachment, is shown in Figs. 3, 4, 5, and 6. A recess V on the front side, furnished with a shoulder H, forms the diaphragm-seat and vocalizing-chamber of the transmitting element, the diaphragm B resting on the said shoulder, and being there confined by an expansible ring-shaped spring C. At the upper edge vertical channels 1', 2', 3', and 4' are cut for the insertion of screw-terminals 1, 2, 3, and 4, these being secured by machine-screws, (see Fig. 8,) which also serve for the attachment of the internal connection-wires. A central vertical channel 8 is provided for the line-switch spring, and a smaller channel 7 for a wire leading to the call-key. These channels all thread the rear side of the casing, which also is threaded with horizontal channels 9, 10, and 13 for the call-key and its attachments, a vertical channel 14 for the wire leading from screw-terminal 1, and a cavity 11, in which may be mounted the inclined fixed element of the transmitter-contacts, which are mounted on the abutment t , and the cord-connections of the receiving-telephone, the said cord finding egress through an orifice 31. The base may be furnished at the corners of its rear side with feet 12, whereby it may be supported with its working parts at a suitable distance from the wall on which the apparatus is placed.

In addition to the various front and rear side recesses and channels recited, the base is centrally divided into narrow cells I, separated from one another by the partitions J, these being integral with the substance of the frame, the said cells being adapted for the reception of the movable contact-pieces of the transmitter. The construction of transmitter

which I prefer in this system is that described in the separate case to which I have referred, and is shown with the greatest clearness in Figs. 7, 8, 11, 12, and 13. The diaphragm B, which may be made of any suitable material, may form or may carry equatorially a suitable conducting-piece D, preferably of carbon. A complementary fixed conducting-piece, also preferably of carbon, and centrally divided so as to form two pieces K and K', placed end to end, (but which may be in one piece, if desired,) is mounted in the form of an inclined plane and supported by its lower edge on the abutment *t*. Disks or short cylindrical sections, E of carbon, are placed in the cells I, which are sufficiently wide to support them loosely, and, as shown, make contact in the rear with the inclined contact-pieces K and in front with the diaphragm contact-piece D. The microphonic contact thus has a gravity adjustment, the carbon disks being prevented from yielding to their tendency to roll down the inclined plane by their contact with the diaphragm-plate, and both series of contacts are in the telephone-circuit. By employing a number of such disks I am enabled to effect a considerable variation in the telephonic current, and by placing them and also the diaphragm-plate in the equatorial position which I have shown I am enabled to use a multiplicity of contacts without distributing them over the entire diaphragm-surface.

I employ a receiving-telephone R of ordinary construction, resembling a watch in form and size, this having a projecting metal suspending-stem *l*, with a spherical enlargement P placed about midway of its length. The receiver is connected with the microphone-circuit by its double conductor-cord *e*, uniting at one end, of course, with the terminals of the telephone-helix (not shown) and at the other by means of its bifurcated ends (see Fig. 8) with the appropriate telephone-circuit connections within the recess 11 of the frame, the said cord passing thereinto through the orifice 31. The receiving-telephone, when not in use, is intended to be suspended, as shown in Fig. 1, in front of the transmitter-diaphragm, thus keeping it out of the way and adding to the sightliness of the appliance. To this end it has the stem *l*, and for the reception of the said stem a metal plate perforated and slotted at *h* and *i* is affixed by screws 5 and 6 to the upper edge of the frame-piece and overhangs the front face thereof. The perforation is circular at its outer end, and at this part is sufficiently wide to allow the spherically-enlarged part P of the receiver-stem to be easily passed through it; but it begins to narrow at about the middle of its length, and at its inner end is much narrower than the diameter of the said enlargement. The plate is bent into a right angle across the center of the perforation, so that the circular and large part thereof is in the vertical plane, while the narrow and slotted part is in a horizontal plane, its end being

slightly in front of the front of the frame-piece. The extreme end of the plate *a* is curved backwardly, as at *a'*, the curved portion being likewise slotted at *i*. This plate is secured to the frame by suitable screws, its fixed end being likewise slotted at *g*, for a purpose which hereinafter will appear. It will now be readily understood that the plate *a* is made to serve as a telephone-rest by the construction I have described. In the act of placing the receiver therein the stem of the said receiver, as in Fig. 9, is horizontally passed through the circular part of the perforation *h*, the enlargement P passing there-through. The instrument is then caused to assume a vertical position, and the said enlargement, being unable to pass through the slot, rests thereon, and the receiver is thereupon suspended, as shown in dotted lines, the extreme end of the stem passing through the slot *i* and maintaining a vertical position therein. As is well known in telephony, it is convenient to provide a circuit-changer whereby the main circuit can be transferred from the signal-bell branch to the telephone branch, and reversely, and also to open and close the battery-circuit if a battery be employed. These functions are performed by the act of removal and replacement of the receiver in the holder which I have described and by the use of the said holder in association with the receiver and other attachments now to be specified. A metal post *c* is mounted upon and secured to the upper edge of the frame-piece, and is insulated from the plate *a* by being mounted within the slot *g* of the horizontal part of the said plate. This post *c* forms one terminal of the telephone-branch circuit, and it extends to a greater distance vertically from the edge of the frame-piece than the highest point of the curved plate *a*. A curved metal spring *b* of considerable stiffness is secured at one end by screws in the vertical channel 8, and from thence rises vertically, and at a suitable height is bent forward and overhangs the post *c* and the plate *a*, making a strong contact with the end of the former unless positively elevated and disengaged therefrom. The said spring, as will hereinafter be seen, forms the terminal of the main circuit. It should also be stated that the plate *a* forms the terminal of the call-bell branch. Now, when the receiver is in use and the spring *b* presses upon the top of the post *c*, the main line is thereby connected with the telephone branch and the circuit of a battery closed through the microphone; but the signal branch is open, because the spring *b* is prevented by the height of said post from reaching the plate *a*; but when the use of the telephone has ceased the receiver-stem *l* is passed through the hole *h* in the plate *a*, and then the receiver is pushed down into the position shown in dotted lines in the figures. It is thus caused to act as a lever, the enlargement P, resting on the horizontal part of the plate, being the ful-

crum thereof, and the end of its stem, rising through the slot *i*, strikes the end of the spring *b*, making contact therewith and breaking its former contact with the post *c*. The new position is indicated by the dotted lines in Fig. 9. The main line is thus disconnected from the telephone-circuit and connected through the substance of the metal stem of the receiver with the plate *a*, forming the signal-branch terminal. It is not, however, absolutely necessary, except for symmetry of appearance, that the receiver when hung in place shall be forced down in front of the transmitter, since its weight alone will operate the circuit-changer. Interposed in this branch is a call-key *o*, provided with a front contact or anvil *p* and a back or resting contact 25. These are placed in the channels 9, 10, 13, and 4' at the rear side of the instrument.

The electrical connections are clearly indicated by the diagram Fig. 13. Screw-terminal 3 is usually connected with the main line 22, leading to the distant station. By wire 14 it is united within the instrument to the spring *b*, which, as explained, becomes the terminal of said main line. The main line is in the diagram shown as being connected with the telephone branch, which is traced as follows: from its terminal post *c* by wire 17 to inclined plate *K'* of the microphone, through two of the carbon disks *E* to diaphragm-plate *D*, through the remaining disks to the other inclined plate *K* by wire 18 to receiver, then by wire 19 to screw-terminal 1, and by wire 21 to the battery and ground at *G*. The call-bell branch is in the diagram discontinuous, (the receiver *R* being off its holder, as hereinbefore explained,) but is traced as follows: from plate *a* by screw 5, wire 15, call-key *o*, back-contact 25 thereof, screw-terminal 4, wire 23, bell *Q*, and wire 24 to ground. A branch wire 16 runs from terminal 2 to the key-anvil *p*. Since the terminals 1 and 2 are both connected, although by different wires 20 and 21, with the battery *M*, it is clear that the same purpose would be achieved by connecting the battery-wire with but one of them, and then by uniting the two terminals; but I prefer the two terminals connected as shown for convenience. So, also, though I show a separate ground for the telephone and battery and bell branches, it is obvious that in practice one would serve for both, or that as an alternative the ground-connection might be dispensed with altogether and a return-wire substituted therefor. The bell *Q* may be mounted close to the other parts of the apparatus, or may be at any desired distance. It is immaterial.

Figs. 11 and 12 are modifications, in which, while the electrical connections remain the same, the bell is affixed to a bracket *Z*, placed over the casing. In this instance the spring-tongue 36 and bracket-contact 37 take the place of the spring *b* and post *c* of the first set, the plate *a* being only slightly changed

in form. The telephones remain without change; but the casing is made hollow instead of being channeled and recessed. The non-conducting partitions *J* and the disk-containing cells between them are mounted in a frame secured between the diaphragm and the back of the box, to which it is fastened by screws. The telephone-cord *e* passes up into the box, and the key is represented by the spring-tongue 31, its battery-contact by the point 32, and its resting-contact by the bracket 33. It is operated by the button 30.

Figs. 14 and 15 show modes of connecting my compound station apparatus in a telephone-circuit.

X and *Y* are respectively telephone-stations.

In Fig. 14 a mode of connection is shown in which but two wires *r* and *s* are required, but requiring, however, a battery at each station. At both stations are like instrumentalities, and the connections are as indicated. At station *X* binding-screws 1 and 2 are united by wire 20 and connect by wire 21 with the battery *M*. The other pole of said battery is connected with line *r*, leading to station *Y*, where it diverges, the principal branch being through wire 42 to bell *Q'*, and thence by wire 44 to binding-screw 4. The other branch leads by wire 21 to binding-screw 1. There is also a wire leading from binding-screw 2 through battery *M'* to the said branch wire 21. At station *X*, again, a branch 41 leads through call-bell *Q* and wire 23 to binding-screw 4 of the instrument there. The main-line wire *s* extends from the binding-screw 3 at one station to the same screw at the other. The station-instruments are symbolically shown; but they are in every respect arranged as in the former descriptions and as in Fig. 15, and it will readily be understood by those skilled in the art by reference to the other drawings that each station uses its own battery in sending call-signals, but that the battery at station *X* only is used in talking.

The mode shown in Fig. 15 has but a single battery, but requires three lines. At station *X* binding-screws 1 and 2 are united, and together connect with one pole of battery *M*. From the same pole of the battery is led the main line 20, leading to the binding-screw 2 at station *Y*. From binding-screw 3 at station *X* the main wire 22 runs to the terminal of the same number at station *Y*. From binding-screw 4 at station *X* a wire leads to one terminal of the call-bell *Q*, and thence by main wire 21 to terminal 1 at station *Y*. At station *X* a branch 23 leaves this wire 21 and connects with the remaining pole of the battery, and at station *Y* a branch 24 leads through the call-bell *Q'* to terminal 4.

It is scarcely necessary to describe the operation of these instruments. At each station a pressure of the key while the receiving-telephones are in place connects the main line leading to the bell at the distant station with the battery, closing the circuit and ringing the

said bell. Both receivers are then taken from their holders, and the battery-current is thereby directed through the microphones, the bells being disconnected from and the telephones connected with the main circuit. Conversation can then be carried on in a manner well understood.

Having now fully described my invention, I claim—

1. The combination, in a telephone-station apparatus, of a microphonic transmitter in which the variable-resistance contacts are formed by the interposition of a number of carbon disks placed on edge between an inclined rear surface of carbon and a plate of carbon carried upon the diaphragm, a non-conducting case for the working parts of the said transmitter, comprising non-conducting partitions integral with or centrally mounted within the said case and interposed between the several adjacent carbon disks, a perforated bifurcated plate serving as a telephone-holder mounted centrally on the upper edge of the non-conducting case, a portable telephone-receiver having a watch-stem suspending-rod adapted to engage with the said perforated plate, whereby the said telephone may be hung upon its holder in front of the transmitter, a circuit-changing switch also mounted upon the upper edge of the said non-conducting case, actuated automatically in one direction by a spring when the receiver is removed and actuated in the other direction by the operation of the suspending-stem of the said receiver when replaced, the said stem acting as a lever in opposition to the said spring, as and for the purposes specified.

2. The combination, in a telephone-station outfit, of a microphone-transmitter consisting of a vibratory diaphragm carrying or forming a conducting-plate, an inclined plane of conducting material in the rear thereof, and a series of carbon disk-formed movable contact-pieces making variable-resistance contact with the diaphragm and rear plates, a mold, frame, or base of non-conducting material recessed in front to serve as the diaphragm-seat and vocalizing-chamber, provided centrally with partitions for interposition between the several carbon disks and channeled on the rear side for the reception of a calling-key and electrical connections, a calling-key with normal and battery contacts mounted in one of the said lateral channels on the rear side of said frame and projecting therefrom, a circuit-changing switch comprising a line-spring, a telephone-contact, and an alarm-branch contact, serving also as a telephone-holder, secured to the upper edge of the non-conducting frame, and a portable telephone-receiver in circuit with the said microphone-transmitter provided with a watch-stem suspending-rod adapted to be engaged by the telephone-holder when placed therein and thereupon to disengage the line-spring from the telephone-contact and to transfer the circuit thereof through its own

substance to the signal-branch contact, the telephone-receiver being hung in front of the transmitter-diaphragm, substantially as described.

3. As a new article of manufacture, the homogeneous case, frame, or base for a compound telephonic apparatus described herein, consisting of a block of hard rubber, vulcanized fiber, or like non-conducting material partitioned centrally for the reception and mutual insulation of the several movable microphonic contact-pieces, and provided with a shouldered recess at its front side, serving as the diaphragm-seat and vocalizing-chamber, and with suitable channels and recesses cut or pressed into its substance at its rear side for the reception and protection of the calling-key and electrical connections and terminals, substantially as described.

4. In a compound telephone-station outfit, the combination of a main electric circuit, a call-signal branch circuit therefor normally completing the same and including a slotted plate forming a holder for the receiving-telephone when not in use, a spring calling-key, the back or resting contact thereof, and a call-bell magnet, a normally open or discontinuous telephone branch including a multiple-contact microphone, a receiving-telephone, and a transmitter-battery, the said battery being also connected with the front contact of the calling-key, a circuit-changing switch for transferring the main line from either branch to the other as required and for closing the circuit of the battery through the transmitter, operated automatically in one direction and actuated by the suspending-stem of the telephone-receiver used as a lever in the other, and comprising a contact-spring constituting the automatically-actuating main-line terminal, an insulated contact-post forming the terminal of the telephone branch normally out of contact with the said main-line spring, but connecting therewith when the receiver is removed for use, thereby closing the said branch to line, and the slotted receiver-holding plate forming the terminal of the call-signal branch circuit and normally connected with the said main-line spring through the substance of the suspending-stem of the receiver, the said stem being interposed between the said plate and the line-spring, uniting them electrically and raising the latter from the telephone-branch terminal post when the receiver is hung upon its holder, substantially as described.

5. The combination, in a telephone-station apparatus and in a concrete organization of the several instrumentalities thereof, of a non-conducting matrix forming a frame or base for the entire instrument, a multiple-contact microphonic transmitter mounted in the front and center of said matrix, a calling-key with front and back contacts, together with electrical connections recessed in channels cut in the back of said matrix, a circuit-changing switch constituting a rest or holder for

the receiving-telephone mounted on the upper edge of the said matrix and projecting over the front side thereof, and a watch-formed telephone-receiver having a metal
5 suspending-stem and adapted to be hung thereby, when not in use, in the said telephone-holder and in front of the transmitter, the said stem being adapted to actuate the said switch in one direction and forming when in
10 place a portion of one of the circuits controlled thereby.

6. The combination, in a telephone-station apparatus, with a receiving-telephone having a metal suspending-stem formed, as shown
15 and described therein, with an enlargement at its central part, of a circuit-changing switch controlling the circuits of said apparatus, and consisting of the angle-plate *a*, perforated and slotted to receive and lock the telephone sus-
20 pending-stem and to serve as a rest or holder therefor and forming the terminal of a given branch circuit, the insulated post or fixed con-

tact *c*, forming the terminal of a second branch circuit, and the spring *b*, fixed at one end, having its free end in line with and over-
25 hanging the said fixed post and the slot of the angle-plate, the said spring being the terminal of a main circuit and being adapted to press, when the telephone is not suspended in place, upon the said insulated post and to be
30 elevated and disconnected therefrom by the telephone suspending-stem acting as a lever and to connect through the substance thereof with the slotted plate when the telephone is
35 suspended from the said plate, substantially as and for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 16th day of February, 1889.

BRUNO ABDANK-ABAKANOWICZ.

Witnesses:

THOS. D. LOCKWOOD,
GEO. WILLIS PIERCE.