

No. 835,074.

PATENTED NOV. 6, 1906.

J. K. LUX.

CONTROLLING MEANS FOR ELECTRIC CIRCUITS.

APPLICATION FILED OCT. 11, 1904.

2 SHEETS--SHEET 1.

Fig. 1.

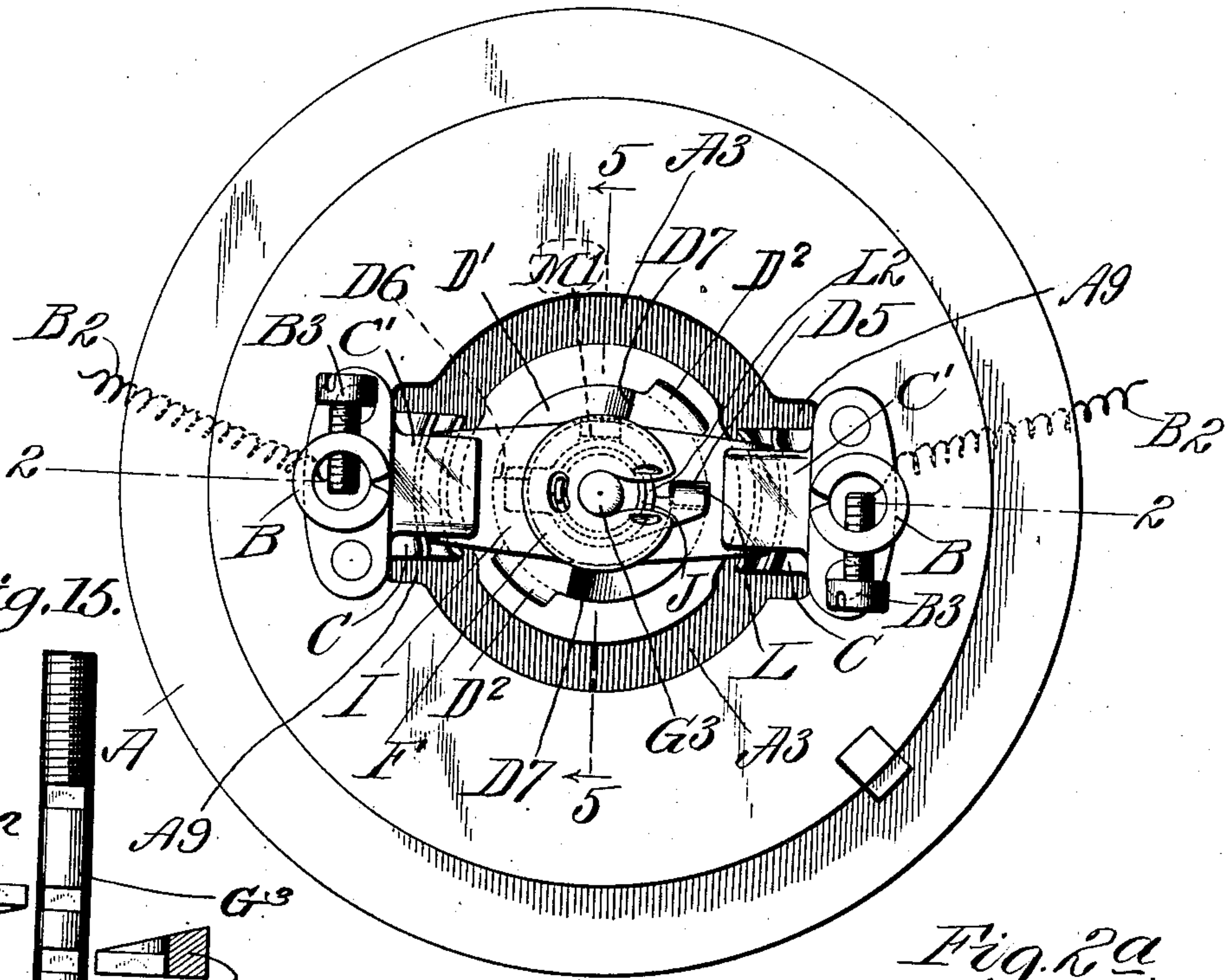


Fig. 15.

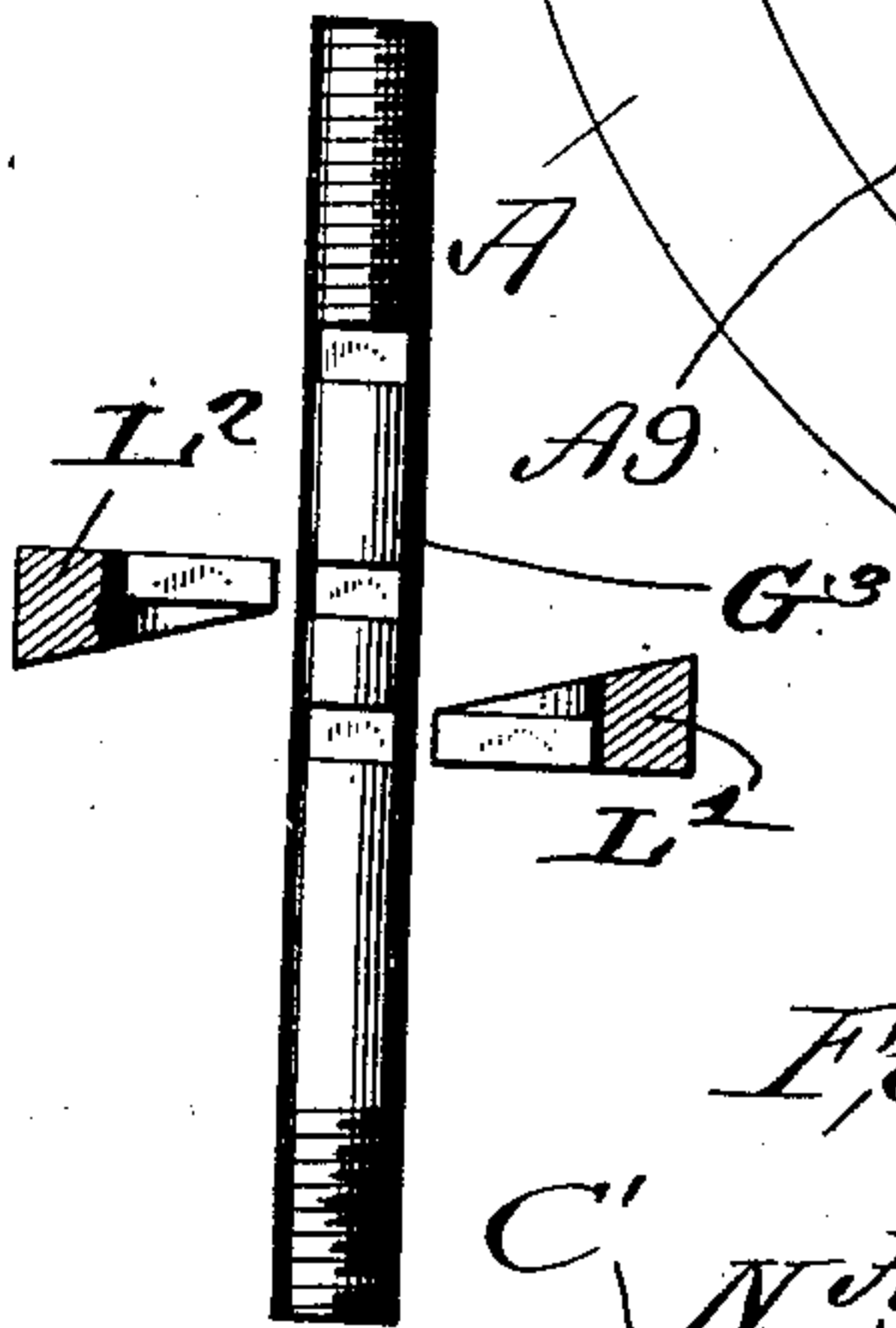


Fig. 2a.

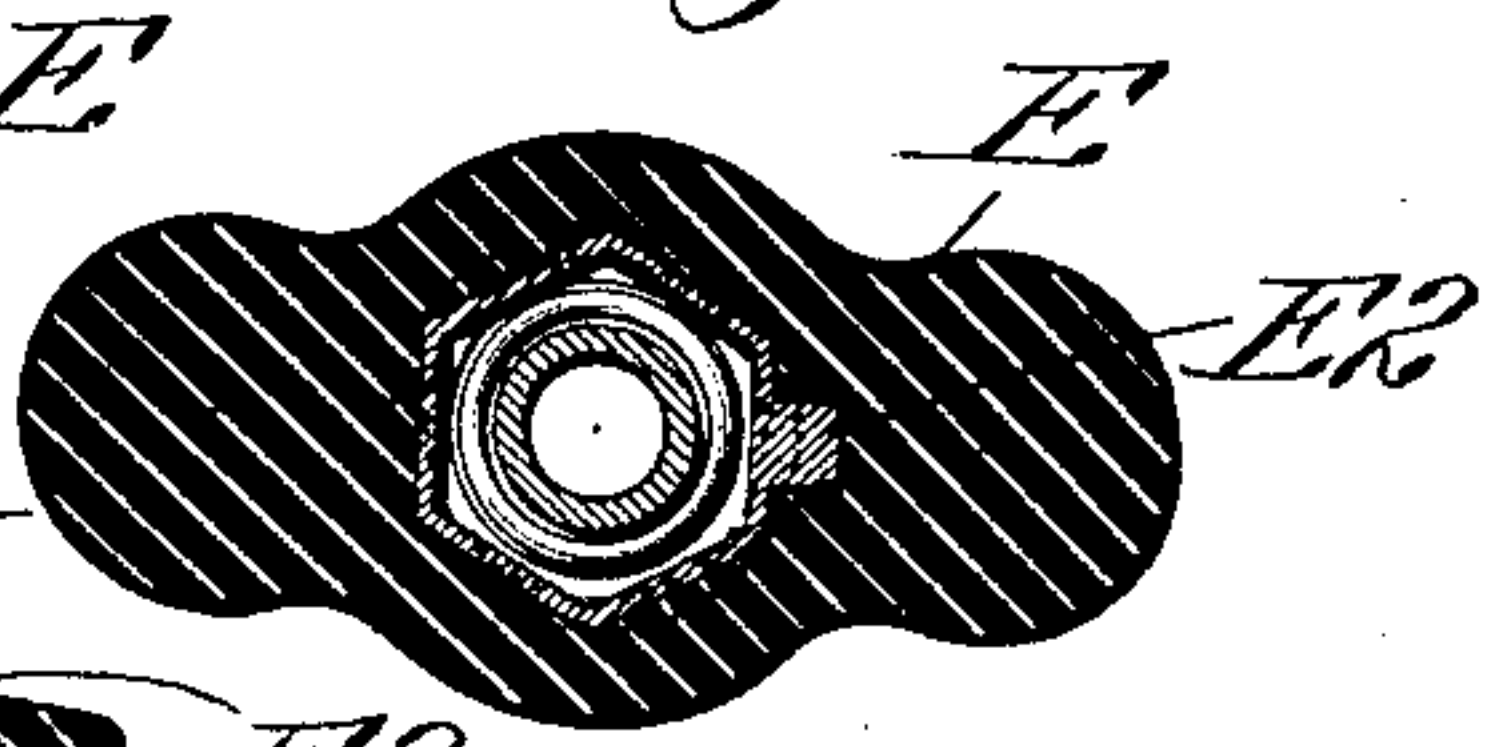
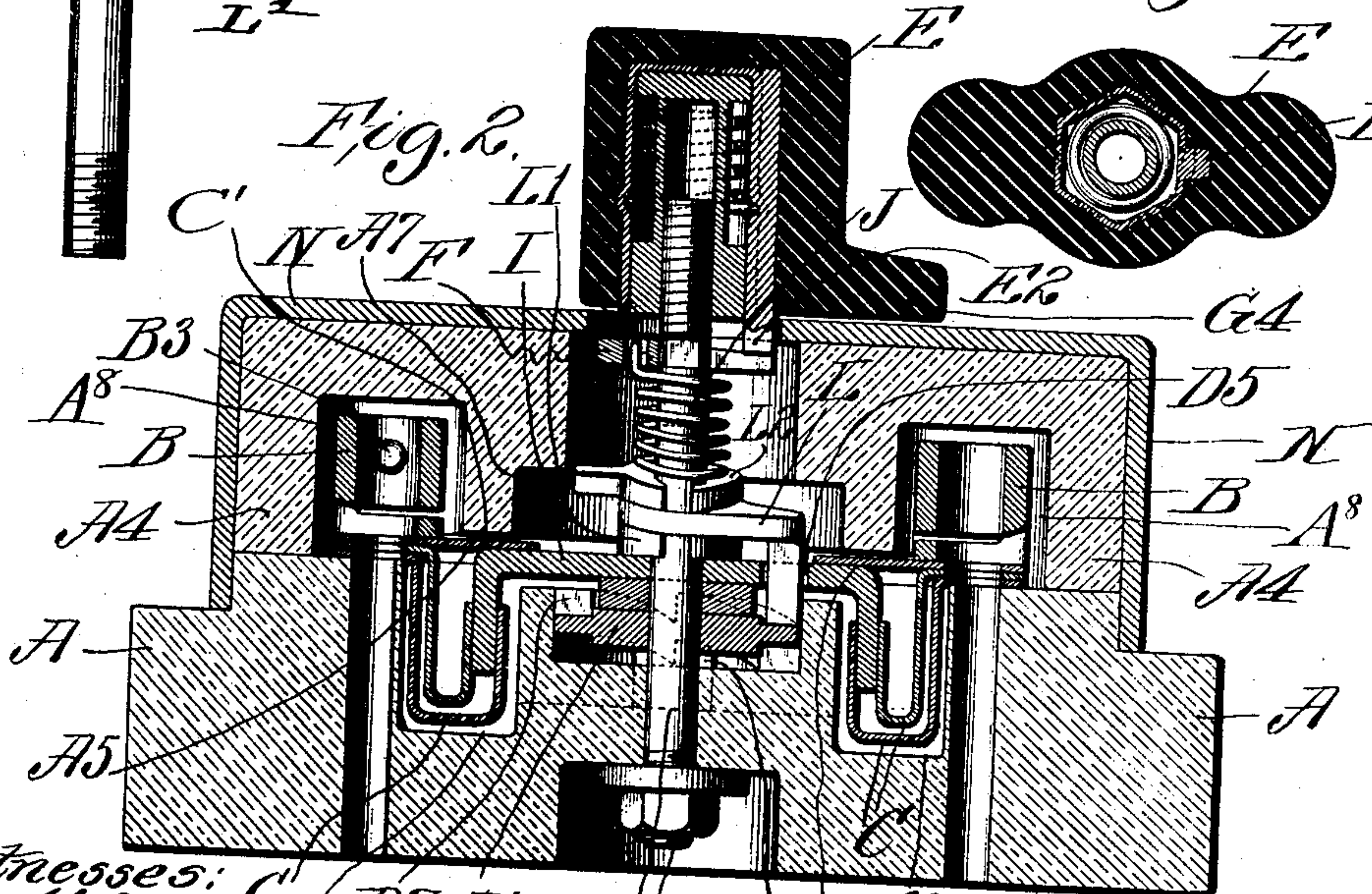


Fig. 2.



Witnesses:

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2 SHEETS—SHEET 2.

Fig. 3.

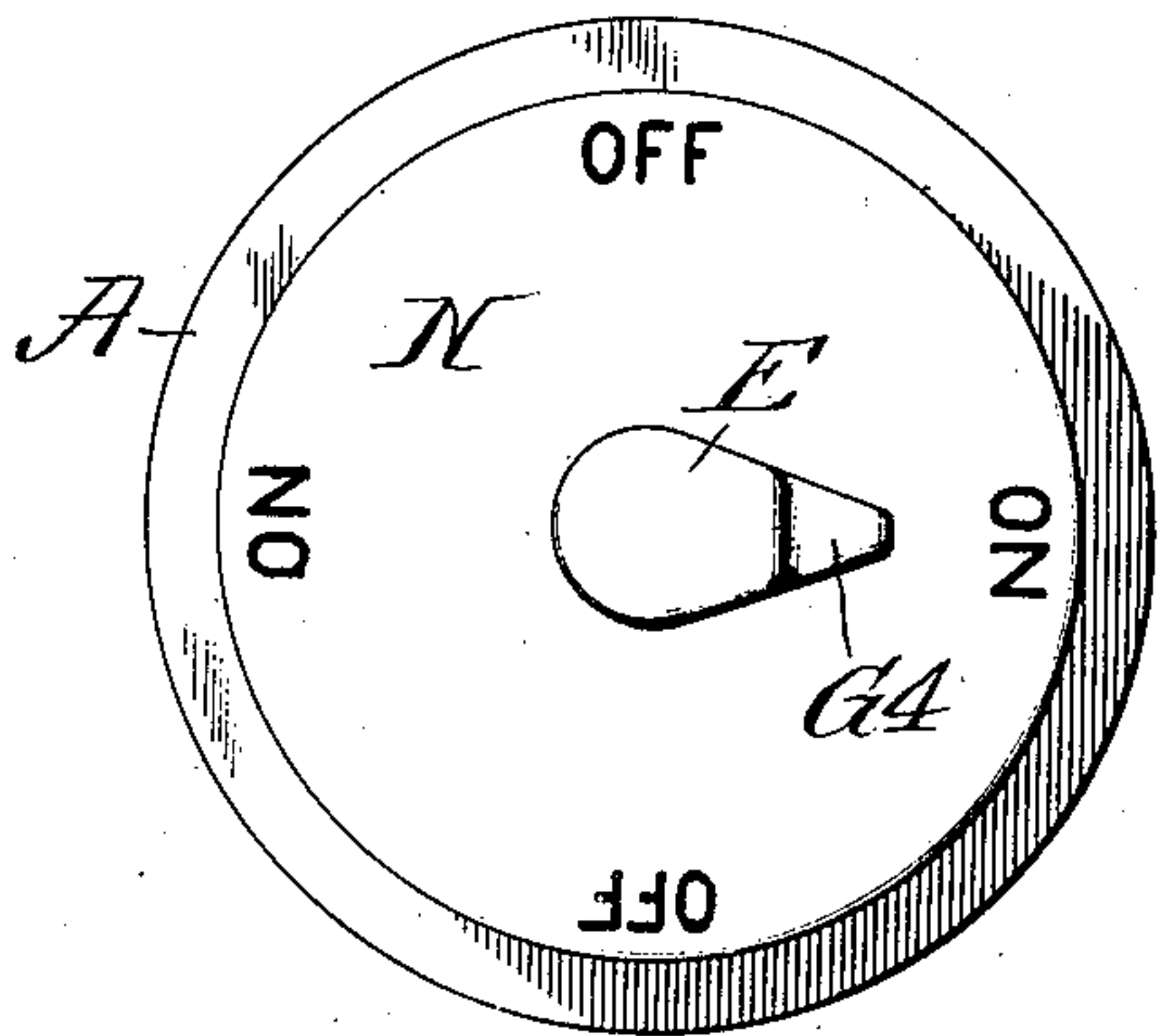


Fig. 4.

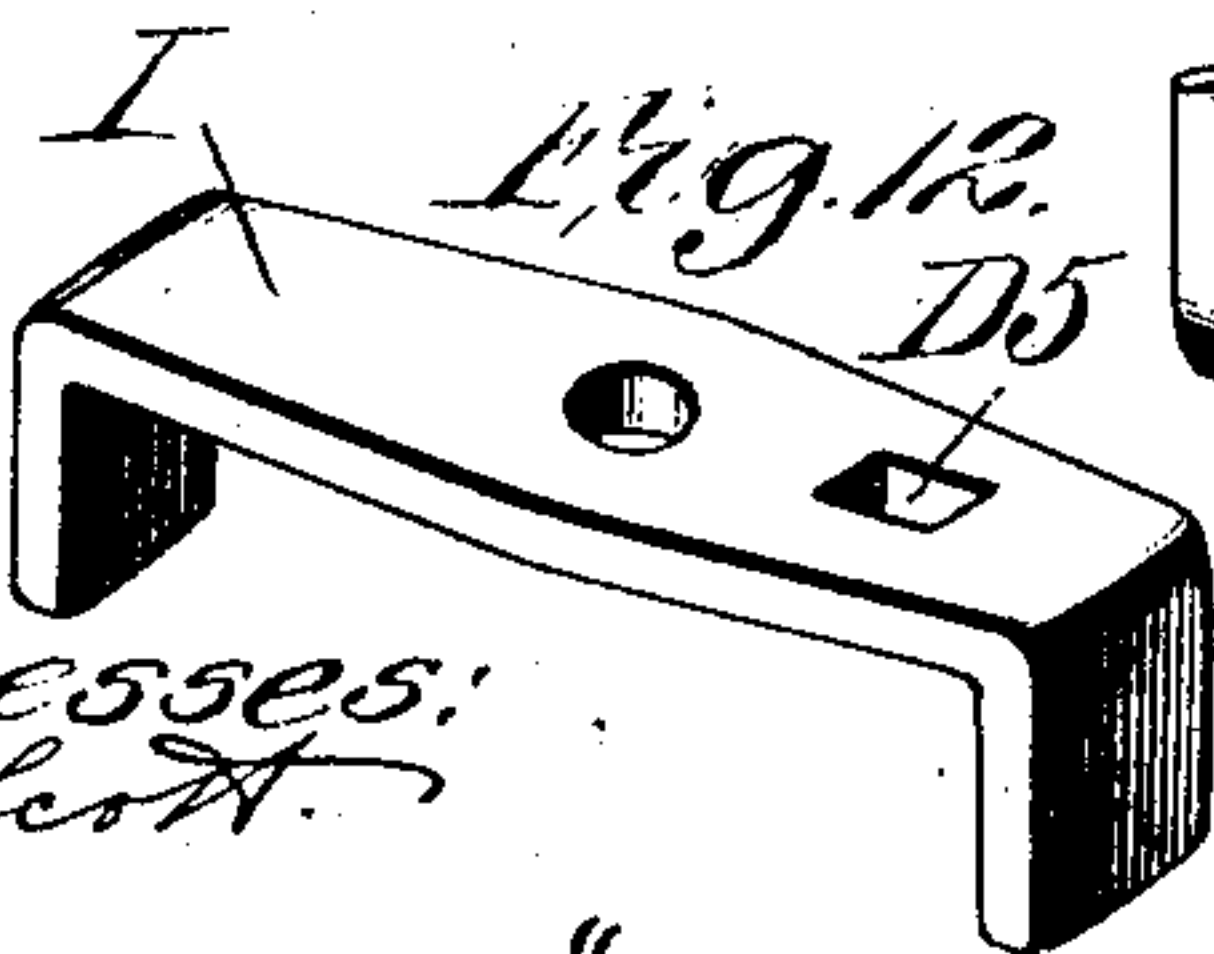
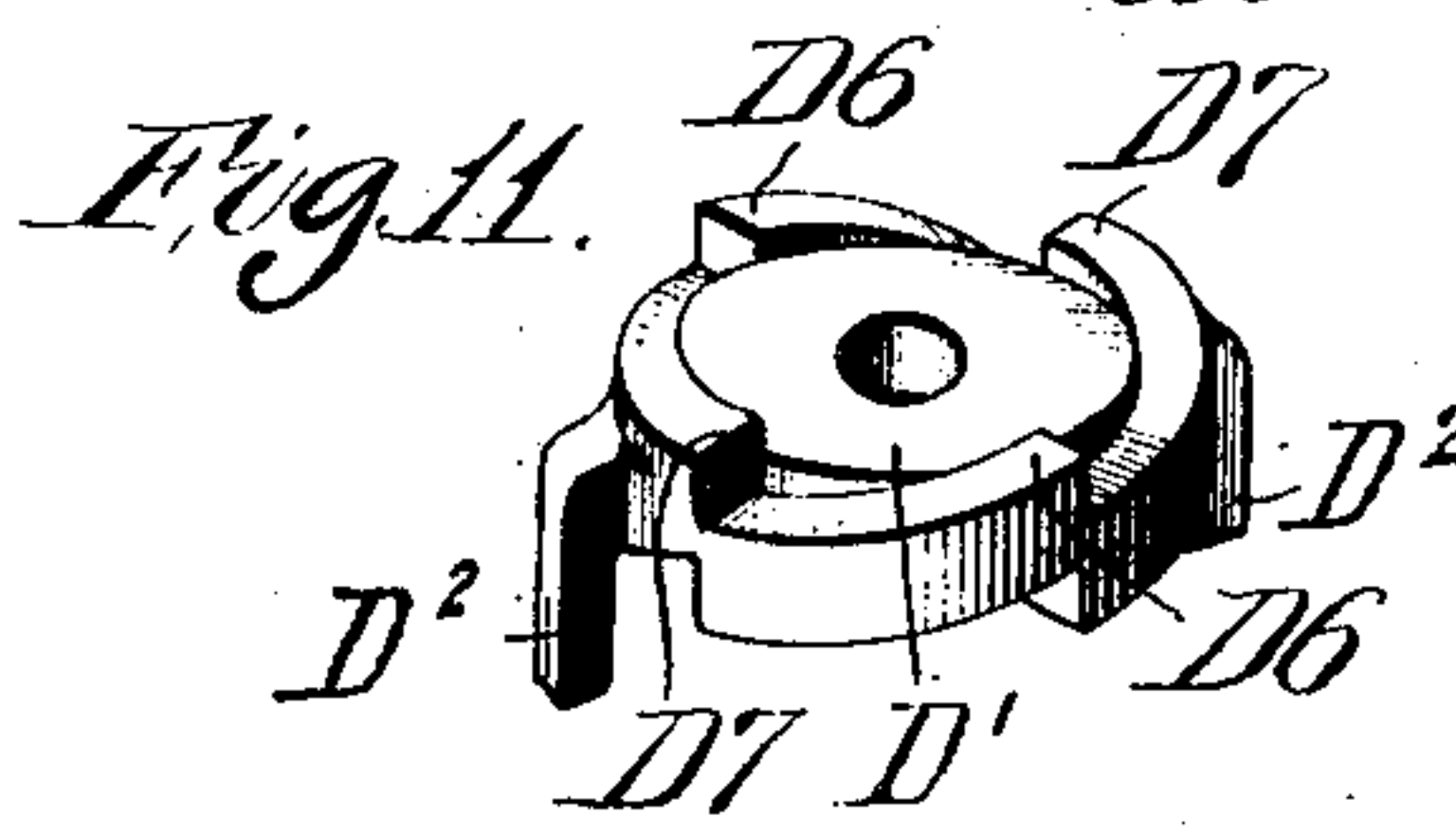
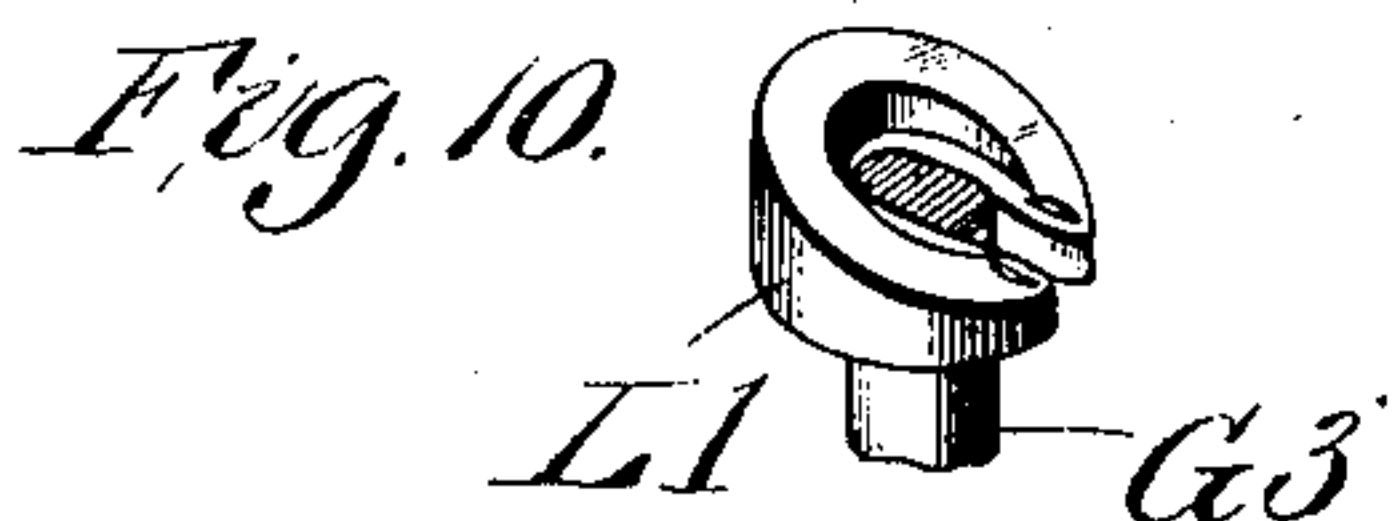
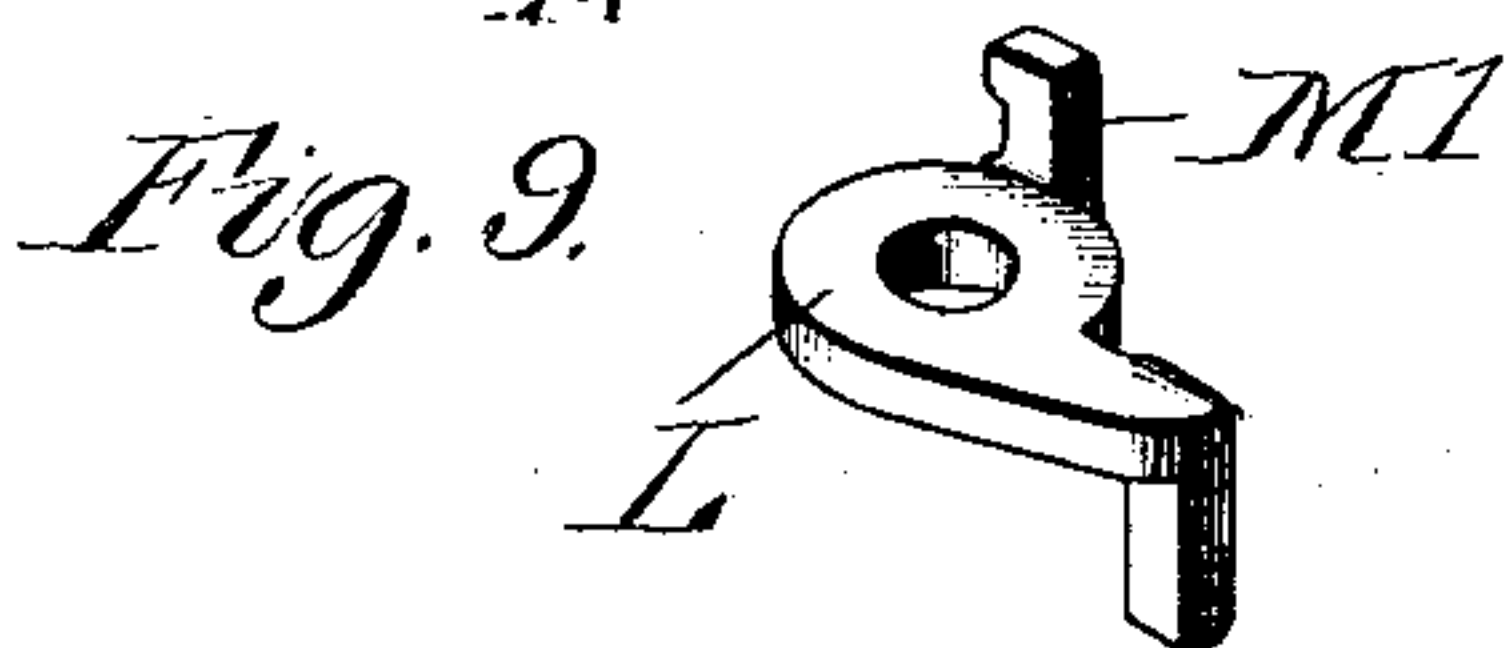
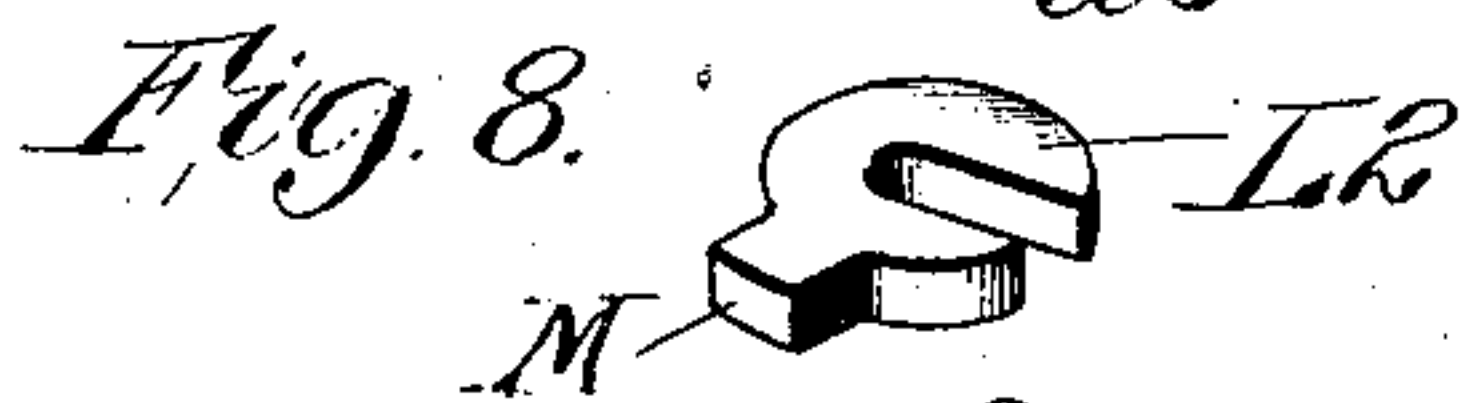
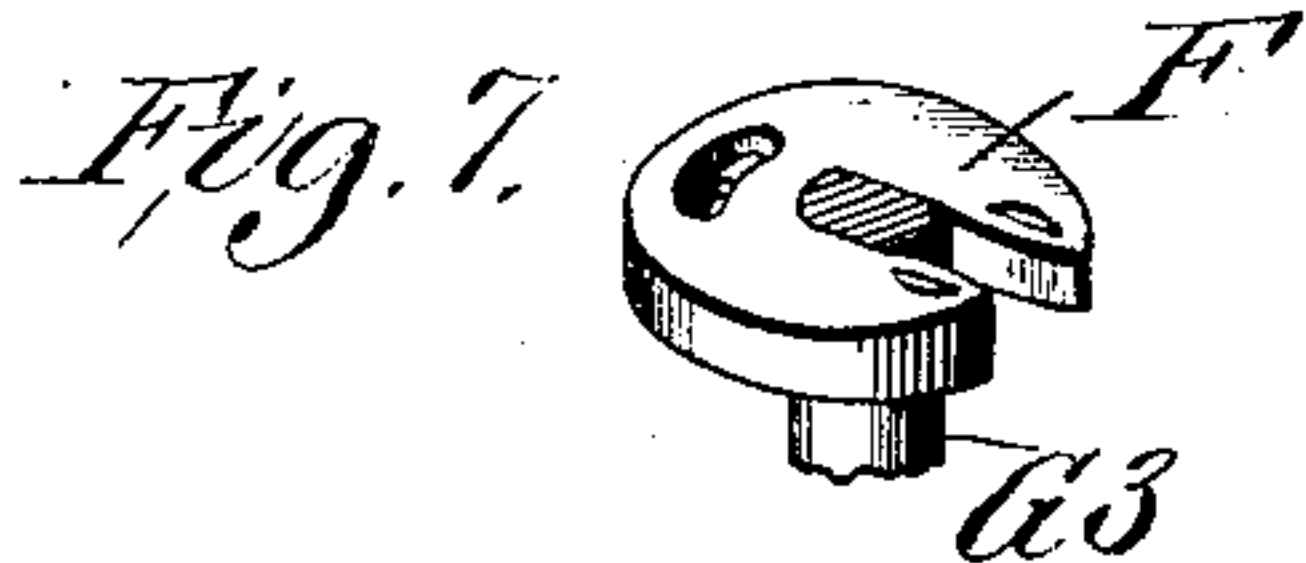
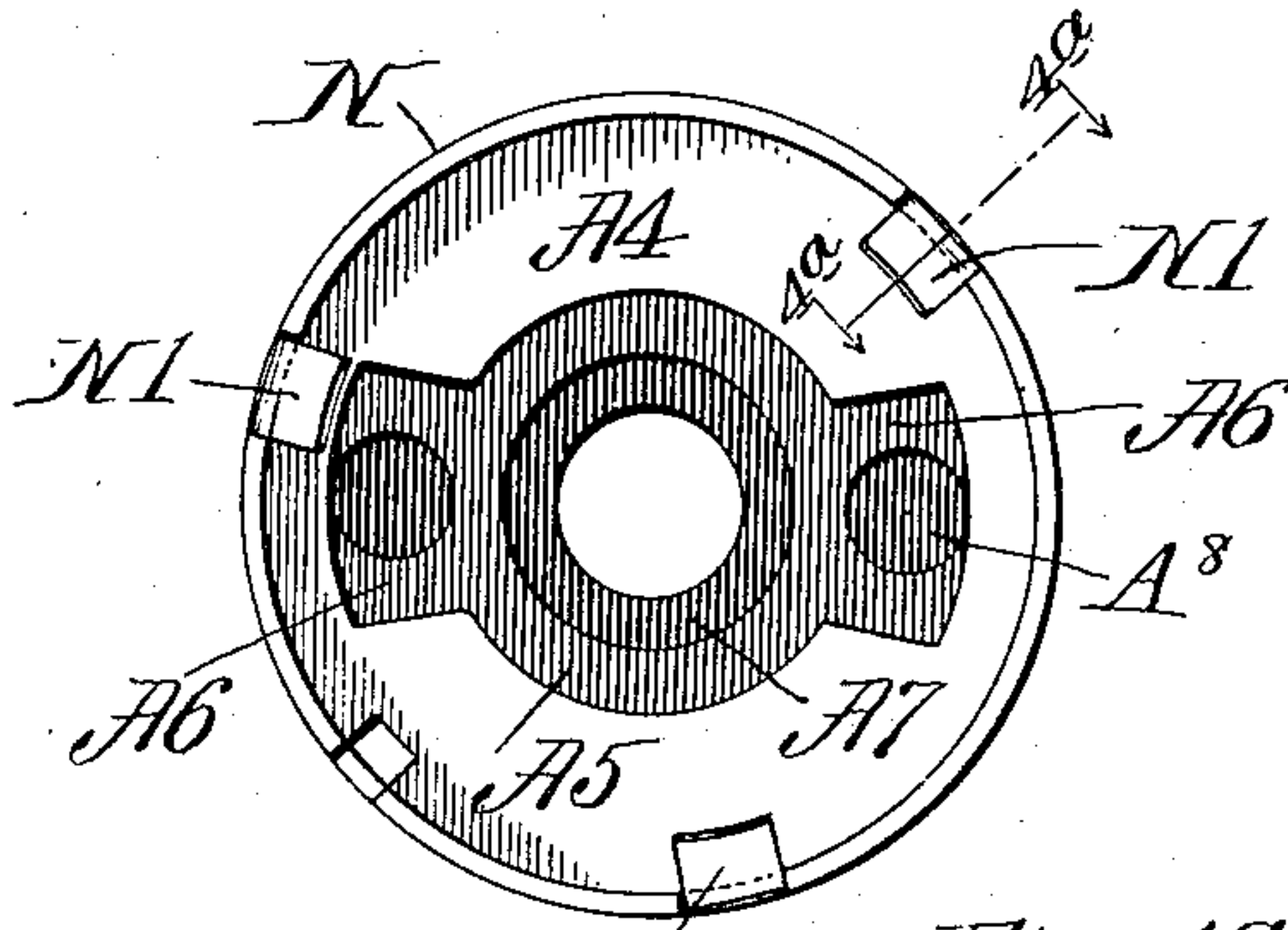


Fig. 13.



Fig. 14.

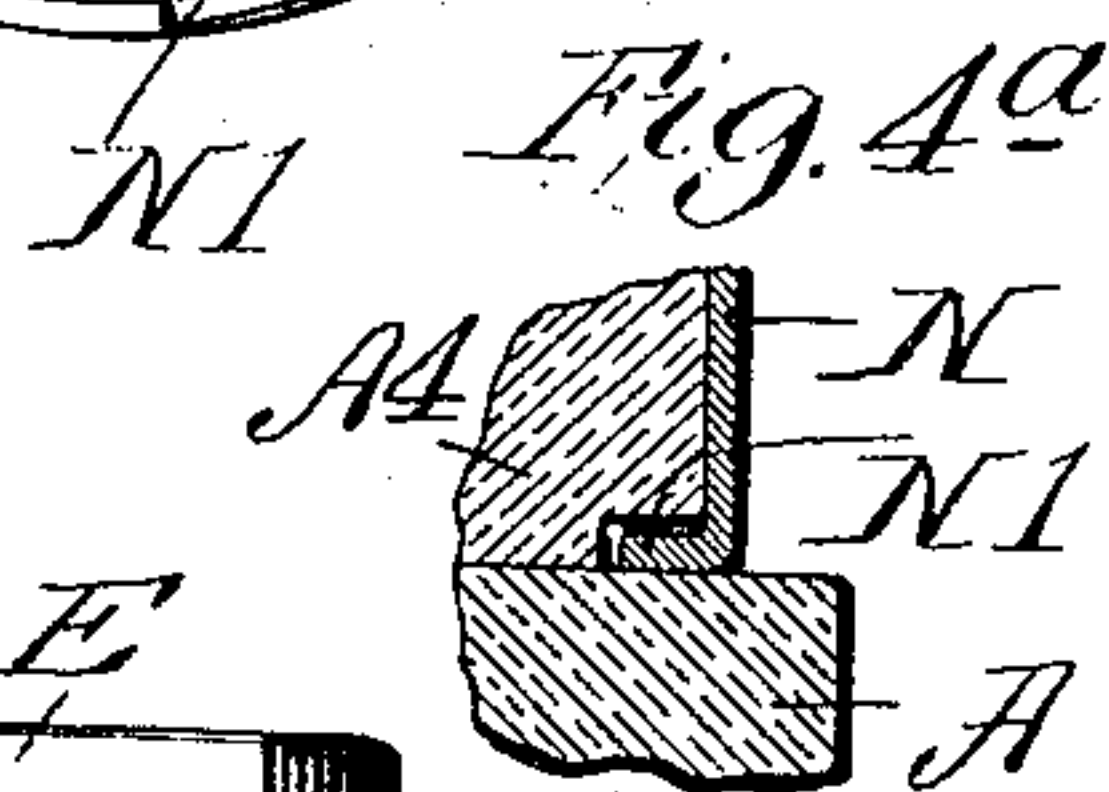
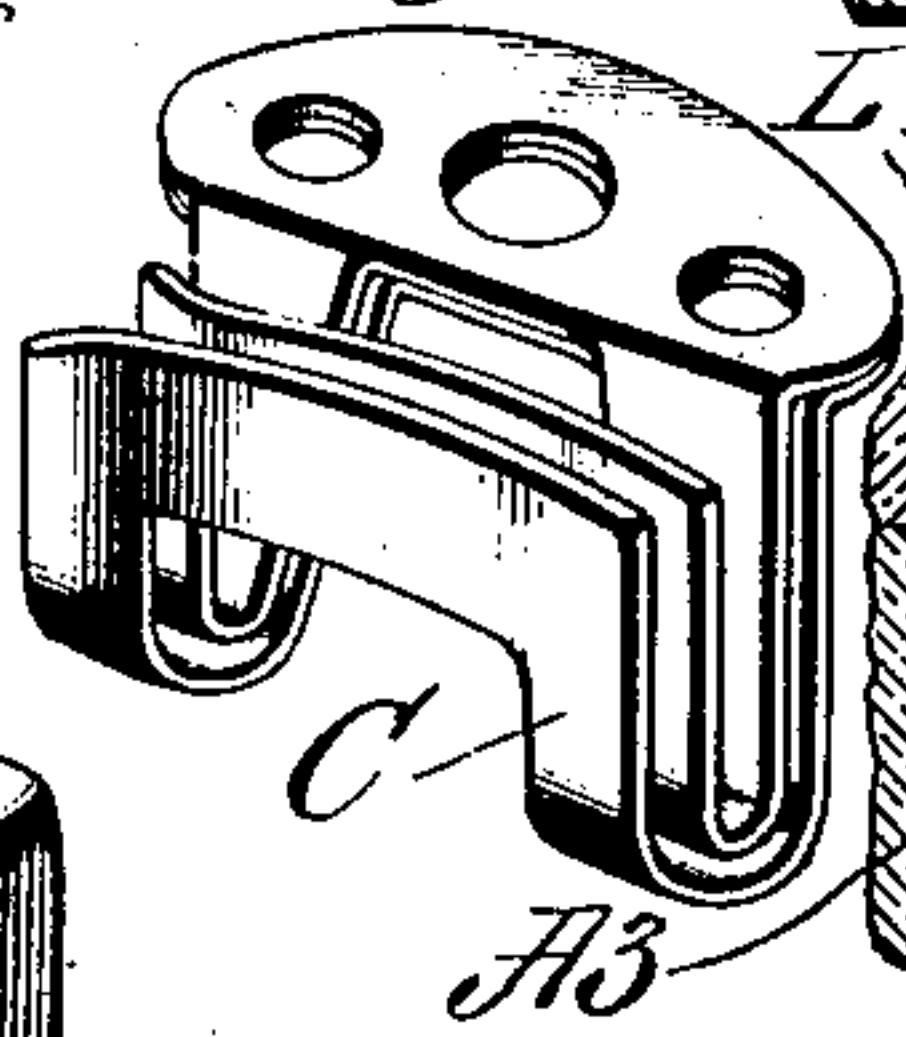


Fig. 5.

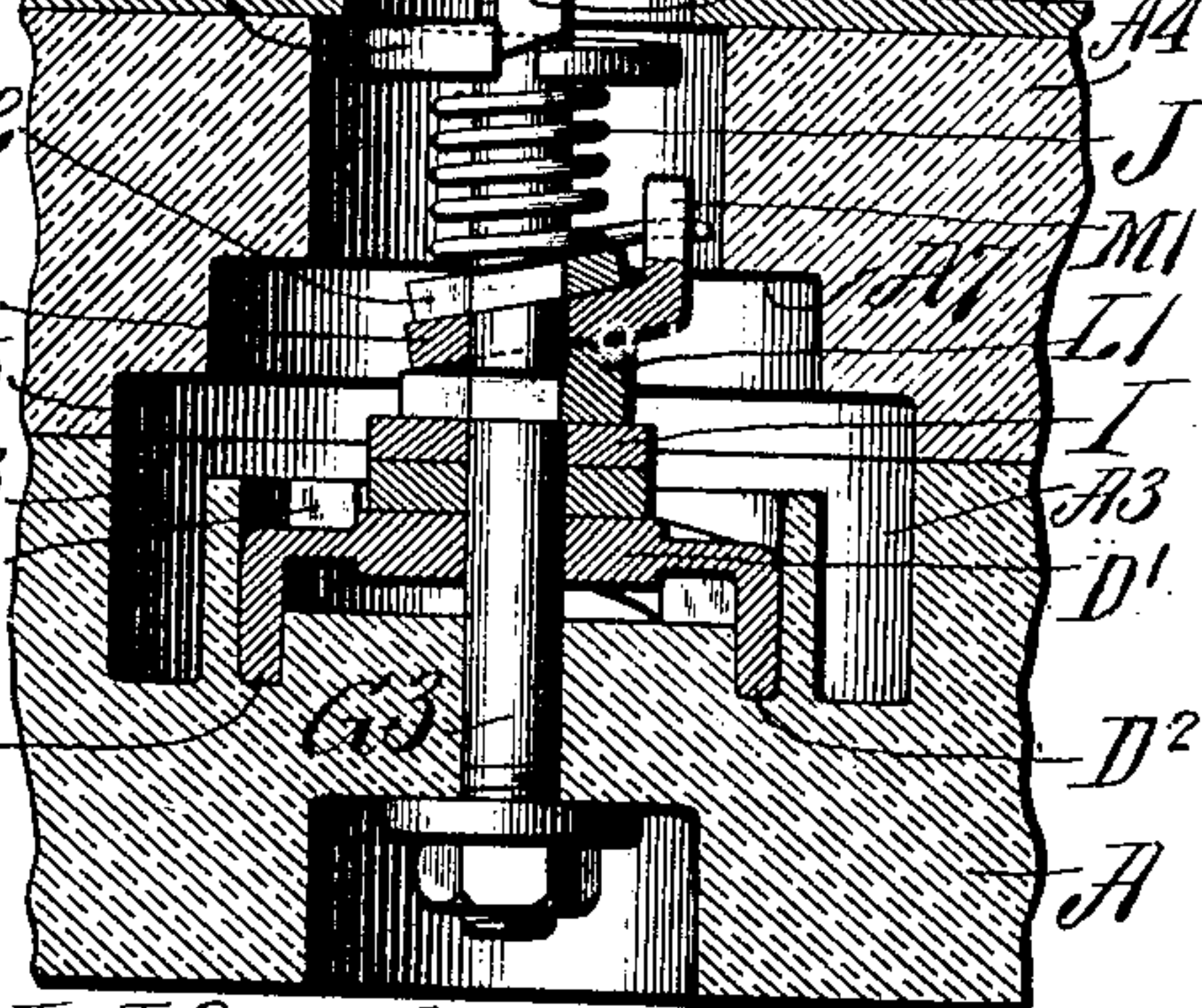
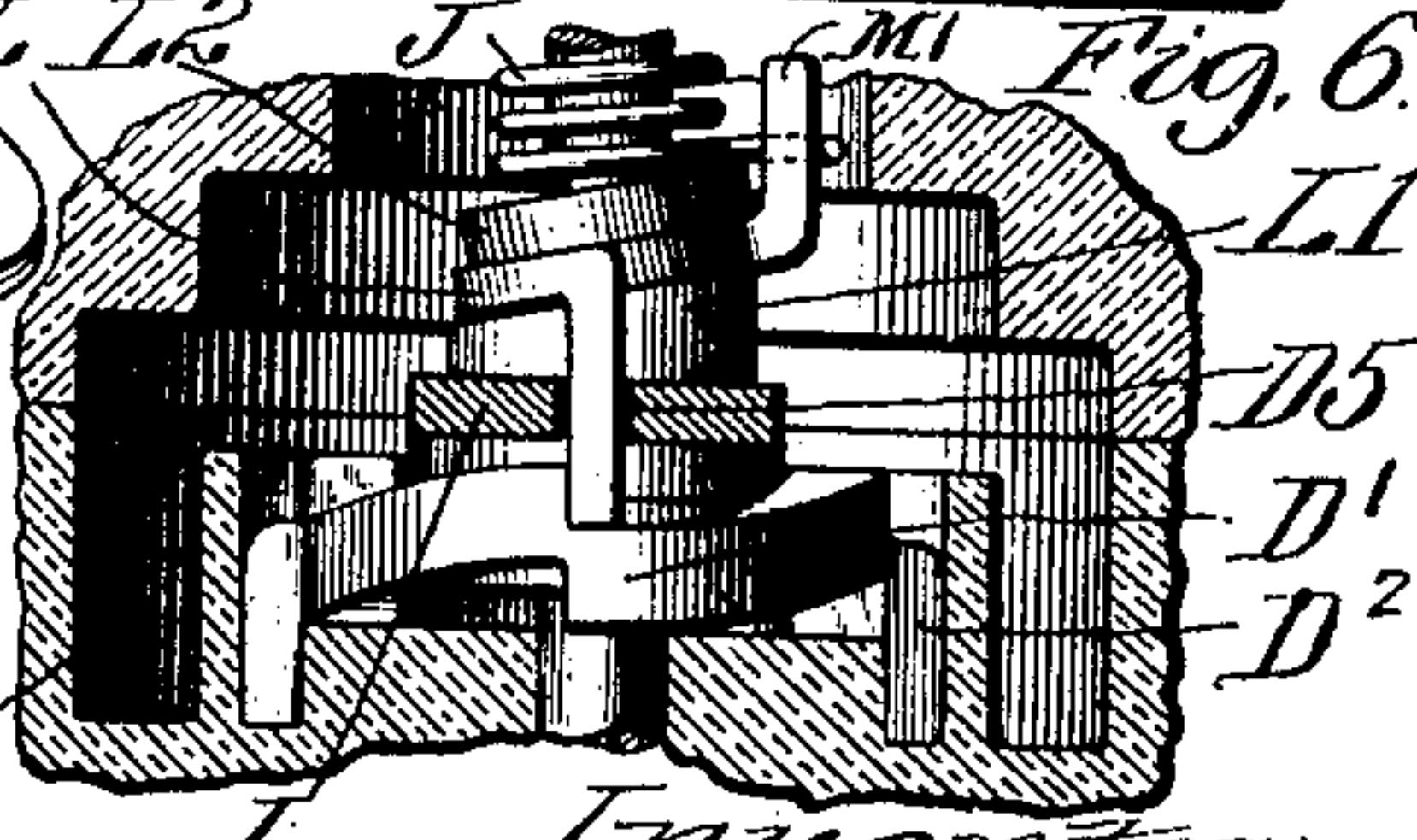


Fig. 6.



Witnesses:

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UNITED STATES PATENT OFFICE.

JULIUS K. LUX, OF ST. LOUIS, MISSOURI.

CONTROLLING MEANS FOR ELECTRIC CIRCUITS.

No. 835,074.

Specification of Letters Patent.

Patented Nov. 6, 1906.

Application filed October 11, 1904. Serial No. 228,090.

To all whom it may concern:

Be it known that I, JULIUS K. LUX, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Controlling Means for Electric Circuits, of which the following is a specification.

The principles of my invention are embodied in the form of a single-pole snap-switch.

My improved construction comprises means for locating the fixed contacts in recesses below the major upper surface while disposing the binding-posts therefor above the said upper surface of the base, means on the base for restricting arcing when a circuit is being opened, means superimposed over the base for restricting arcing when a circuit is being opened, a novel detaining means and method of construction of the parts related thereto that cheapens production, means for positioning the operating-handle or an indicator, or both of these, so that they or either of them will indicate the position of the mechanism with substantial uniformity and interchangeably and without minutely exact fitting.

Other features of invention reside in the construction, arrangement, and combination of the several parts, as hereinafter described.

In the accompanying drawings, Figure 1 is a plan view with upper porcelain A⁴ and cover N removed. Fig. 2 is a perpendicular sectional view on line 2 2 of Fig. 1, showing the handle E, the indicating means G⁴, and the means for positioning the two latter parts with relation to the mechanism. Fig. 2^a is a horizontal sectional view of an operating-handle fitted with my improved positioning means. Fig. 3 is a plan view, on a reduced scale, of the device. Fig. 4 is an inverted plan view of the porcelain top A⁴ and the cover N, showing means for fastening those parts together. Fig. 4^a is a detail section view on the line 4^a 4^a of Fig. 4. Fig. 5 is a perpendicular sectional view taken transversely to that of Fig. 2 or about on the line 5 5 of Fig. 1. Fig. 6 is a detail view companionable with Fig. 5, showing the elements in elevation. Fig. 7 is a perspective view of the collar F. Fig. 8 is a perspective view in detail of a part of the operating mechanism. Fig. 9 is a perspective view of the movable detaining means. Fig. 10 is a perspective view of the cam for operating the

movable detaining means, showing the spindle broken away and showing the means for fastening the cam to the spindle. Fig. 11 is a perspective view of the bearing-piece for the moving parts and of the fixed detaining means. Fig. 12 is a perspective view of the movable contact. Fig. 13 is a perspective view of the spindle, and Fig. 14 is a perspective view of the fixed contact. Fig. 15 is a view of a modified form of spindle with both slots for the cam parts at right angles to the spindle and showing a modified upper cam-piece. The said parts are partly broken away to economize space.

Referring to the drawings in detail, A indicates the base, made of porcelain or other suitable material.

D' indicates a bearing-piece for moving parts of the mechanism. The said bearing-piece is formed with downwardly-projecting portions, D² D², which are inserted in recesses in the base, serving to hold the part D' in a fixed position.

D⁶ D⁶ and D⁷ D⁷ indicate detents formed as ratchet-teeth on the edge of the bearing-piece D'. The said detents cooperate with the moving parts of the device, so as to detain the said moving parts during the initial movement of the hereinafter-described energizing means and until a predetermined amount of energy is stored in the hereinafter-described yielding actuating means or spring. The said detents also act as stops to limit the successive movements of the device.

I indicates the movable contact, which is revolvably mounted. It has ends bent downwardly in position to come into rubbing or sliding engagement with the hereinafter-described fixed contacts. The said movable contact has a perforation D⁵, through which a portion of the hereinafter-described cooperative detaining means or latch L projects so as to engage the fixed detaining means. The said movable contact is perforated at the center. It has a bearing on the spindle G³, on the part D⁵, and on the hereinafter-described cam-collar L'.

L indicates a cooperative detaining means or detent. It is formed as a swinging or rocking cam-operated latch. The free end of L is bent downwardly at about a right angle. It projects through the aperture D⁵ in the movable contact I and successively engages the fixed detaining means D⁶ and D⁷.

M indicates means for positively moving

the spring-actuated parts of the device irrespective of the power of the hereinafter-described yielding actuating means J. The part M is integral with L^2 .

5 L' indicates a cam-faced piece struck up from sheet metal, so as to have a lower face perpendicular to its axis to bear on the movable contact, and an upper face inclined relatively to the lower one to engage the part L.
10 A slotted and a central portion of the part L' is parallel to the lower face thereof, so as to fit into a slot in the spindle G^3 , which latter slot is preferably perpendicular to the axis of the spindle.

15 L^2 indicates a piece stamped out of sheet metal, so as to have its upper and lower surfaces parallel and with a slot extending to the central portion thereof, so as to fit into another slot in the spindle G^3 , which latter
20 slot is inclined relatively to the lower surface of L' and parallel with the upper surface thereof. The upper surface of L' forms a cam for moving the part L, and it rocks or tilts the latter part to and from the fixed detaining means $D^6 D^7$. The part L^2 holds the part
25 L in contact with the cam-face on L' . Means other than L^2 may be used to hold L and L' in engagement, or the parts L' and L^2 may be made integral—that is, joined together as at the part M and so as to form a
30 U-shaped piece with circular flat sides. The part L^2 may be like the part L' and inverted, so that both slots in the spindle for the cam movement may be perpendicular to the axis,
35 as shown at L^5 of Fig. 15. The spindle G^3 is slotted, preferably, on two opposite sides, so that the bases of the slots are parallel.

The circular parts F, L' , and L^2 have slots to fit the bottoms of those in the spindle,
40 allowing the said parts to be slipped onto the spindle, so that they are concentric therewith and fit the same. Extending the said cam-surface around and to opposite sides of the spindle reduces cramping and binding to the
45 minimum and makes the device in every way more satisfactory. To prevent the working loose and withdrawal of the said circular parts from the spindle, a portion of each of the parts F, L' , and L^2 is displaced or set
50 over, as with a chisel or punch, into the slot formed in those parts and against the spindle, thus locking or riveting the circular parts as against withdrawal from the spindle, as shown in Figs. 1 and 10. This construction
55 and fastening does not multiply the pieces. It is compact, cheap, simple, and effective.

The herein-described construction of the movable detaining means and the cam for operating it produces a movement which is
60 wholly self-contained and not dependent upon any fitting to or precise adjustment with the contacts. It affords a movement adapted to either single or double pole switches and to any usual form of fixed
65 contacts. In the last-named form of device

a second movable contact may be mounted with and insulated from the one here shown by any of the means usual in the art.

J indicates the yielding actuating means or spring. It has one end connected with the mechanism at L, and preferably by engaging
70 that portion of L which is indicated at M' . The spring is wound around the spindle, and the remaining end is connected therewith at the collar F.

F indicates a collar slotted and fixed to the upper portion of the spindle. One side of the collar is slightly thicker than the other,
75 and it is also slightly bent up, so as to form a catch or tooth to engage another part, hereinafter described.

B B indicate terminals which comprise receptacles for receiving the wires $B^2 B^2$, which latter are secured in position by means of the binding-screws $B^3 B^3$.

C C indicate fixed contacts which are preferably yielding. They have a fastening portion parallel with the top of the base. The free ends are bent abruptly downward to
80 about a right angle, then curved toward the center of the device and bent upwardly, so as to have contacting surfaces about perpendicular to the base, and those surfaces are curved so as to be concentric with L. The central part of the bent portion is preferably
85 cut away, so as to make the whole more elastic. Two of these pieces or springs are used for each contact, one folded over or outside of the other and arranged to receive the movable contact between their free ends,
90 forming a knife-contact.

Important features of improvement reside in the novel arrangement of the terminals and contact-brushes. The latter are disposed below the major upper surface of the
95 base and below the receptacle or binding-post. By this means they are further removed from the moving parts of the device, so as to reduce liability of burning the latter. The contact-surfaces of the brushes may be
100 located nearer the center line of the receptacle or binding-post and radially farther from the center line of the movable contacts with a given size of base than would be the case were the brushes arranged between the
105 binding-post and the center of the device.

$C' C'$ indicate horizontal contact-brushes which are arranged to coact with the horizontal part of the movable contact L.

The base A is recessed or cut away from
120 the upper side, so as to allow the insertion and necessary elastic movement of the fixed contacts, and narrow circular slots in the base (indicated by $A^3 A^3$) connect the said recesses so that the movable contact on leaving
125 the fixed contacts travels the narrow slots, the curvature and narrow confines of which latter form a barrier and restrict arcing when a circuit is broken. A circular groove about
130 a raised central portion of the base, in com-

bination with a movable contact, having sus-
 tained frictional engagement at the bottom
 or side of such groove and with a perpen-
 dicular snap movement of the movable con-
 tact, so as to give a perpendicular spark-gap,
 have been usual in the art; but I believe I
 am the first to provide means for curving the
 spark-gap about a (convex) raised central
 portion of the base in combination with a
 movable contact the free end of which is
 during the major part of each revolution free
 from engagement or contact with fixed parts
 of the device and with a snap rotary move-
 ment which provides a curved spark-gap
 about the said convex central portion of the
 base, which latter acts as a barrier between
 the fixed and movable contacts when the de-
 vice is opened. It also forms a barrier be-
 tween the fixed contacts. The said barrier
 toward or about the center of the support,
 the narrow confines of the curved spark-gap,
 and the snap rotary movement of the mov-
 able contact around the barrier and through
 the narrow spark-gap enables the breaking
 of circuits of greater voltage and amperes
 than has been usual with devices of this class.

The binding-posts are fastened to the base
 by means of screws which are inserted from
 underneath, as is usual. The contact-
 brushes are clamped in place by the binding-
 posts and the fastenings thereof.

A⁴ indicates a piece made of porcelain or
 other suitable material. It forms a cover
 for the device and comprises the surfaces or
 parts A⁵, A⁶, A⁷, and A⁸. It has been usual,
 first, to form shell-like covers (for switches)
 of insulating material and also to provide
 shell-like metallic covers lined with insula-
 tion, the latter part snugly fitted to the metal
 cover; second, it has been usual to dispose
 some of the conductive parts of switches at
 upper and some at lower surfaces of insulat-
 ing material, so that the said conductive
 parts, and particularly the lower ones, are
 difficult of inspection, adjustment, and re-
 pair, and to have access to the parts it is
 usually necessary to remove the conductors,
 the fixed, or the movable contacts. My new
 arrangement differs from the first as above in
 the same sense that a molded imprint or cast
 differs from a box or ordinary container. It
 differs from the second as above in that the
 conductors and all conductive parts of the de-
 vice remain stationary, and upon the re-
 moval of the cover they are all accessible.
 I believe that I am the first to adapt a re-
 movable cover as herein described to a snap-
 switch so that insulation fits snugly about
 the irregular conductive parts of the device
 and so as to shut in or encompass or envelop
 those irregular parts separately and with
 substantial uniformity and so as to impose
 removable barriers of insulation between the
 several parts of the device. In other words,
 the part A⁴ embeds the said irregular and

conductive parts of the device in insulating
 material. The part A⁴ acts as a cover or
 shield against external interference and also
 as a barrier between the several parts within,
 so as to separate and separately inclose those
 parts with insulating material. By fixing
 the barriers to the cover instead of to the base
 the barriers are more universally applied, and
 the mechanism is at the same time wholly
 accessible upon the removal of the cover.
 The surface of porcelain indicated by A⁵ is
 superimposed over the horizontal fixed con-
 tacts C' C', and the portions A⁵ A⁷ are
 superimposed over the horizontal portion of
 the movable contact and in proximity to the
 base A. A horizontal groove is thus
 formed between the porcelain piece A⁴ and
 the base A. This horizontal groove is trav-
 eversed by the movable contact, and the said
 groove serves to restrict arcing at all times,
 and especially when a circuit is about to be
 broken.

A⁵ is superimposed over the grooves A³,
 the fixed contacts in the recesses A⁶, and
 the horizontal and perpendicular extremities
 of the movable contact. The surface or part
 A⁷ is superimposed over the horizontal middle
 portion of the movable contact. The recesses
 A⁸ inclose the receptacles B. The part A⁴
 as above is preferably secured to the herein-
 after-described cover N by means of the ears
 N', which are bent out of N so as to hold
 those parts together. The part A⁴ projects
 from the cover N toward (or to) the base A.
 The horizontal part of the movable contact
 is between the upper face of the porcelain
 base A and the lower face of the portions A⁵
 and A⁷. The part A⁴ covers the terminals B
 and the fixed contacts C, so as to further in-
 close parts where sparking is liable to occur,
 and it is superimposed over the curved slots
 A³, so as to further restrict or hinder arcing
 when a circuit is being opened. The part A⁴
 may be used as a cover to the exclusion of the
 part N, in which case the markings shown on
 the latter part will be inscribed on the part
 A⁴. A portion of the groove A³, the barrier
 A⁵, or one recess A⁸ will act much the same
 as the preferred form shown, but not so well.
 The perpendicular extremities of the mov-
 able contact may be omitted, and the usual
 form of horizontal movable and of their co-
 operative fixed contacts may be used.

N is a metal casing or cover inclosing the
 part A⁴ and the operating mechanism.

E is an operating-handle for the device. It
 is preferably screwed on the spindle G³, the
 threaded portion serving as a journal for the
 handle; but it may be connected in any
 manner which will allow the handle to nor-
 mally rotate in one direction without oper-
 ating the said movable contact.

G⁴ represents means for positively indicat-
 ing the positions of the mechanism or mov-
 able contacts. It is arranged outside of the

cover or casing and taken in combination with a handle having a free or loose backward movement improves the indication. The indicator G^4 is preferably secured to or integral with the operating-handle E. Such integral arrangement calls for a loose or free backward movement of those parts. Means arranged outside of a removable cover to indicate the position of the movable contact have usually been fixed to the spindle so as to have substantially no loose or free backward movement. If such indicating means be affixed to switches of this type, a backward movement of the spindle could be given which would cause the cooperative contacts to engage backwardly and to burn out or to otherwise disarrange or injure the parts. To avoid this, the handles on switches of this type have been made with screw-threaded connections for the handles, so as to screw solidly up to a shoulder or end. The backward movement unscrews the handle without turning the spindle.

Handles and indicators definitely positioned relatively to the movable contact have been usual in the art; but all handles or external indicators having the said heretofore usual means for definitely positioning those parts relatively to the operating mechanism, as herein set forth, influence or operate the spindle in both directions. My improved positioning means for the handle and indicator causes the latter parts to move in unison with the mechanism in but one direction, while at the same time the said means definitely positions the said handle and indicator and operatively connects them with the device. The said positioning means extends the advantages of a positive indication outside of the cover to a class of switches in which it is essential that the spindle be influenced or rotated in one direction only.

When the handle is screwed up to a shoulder, it does not make a suitable indicating means adapted to the conditions and requirements of manufacture and use that obtain in the art. A minute excess or deficiency of material at the screw-shoulder will cause the handle to give a faulty indication, one-eighth of a turn on the screw-thread sufficing to indicate midway between successive positions of the device and one-fourth turn on the screw-thread indicating open when, in fact, it is closed. Wear and stress of the threaded parts will in a short time cause faulty indications to be given, (by the handle,) and if the wrong handle—that is, a handle other than the one especially fitted to a particular switch—be used inaccurate and even reverse indications will be made.

Any irregularly-formed handle with screw-thread, such as have been usual in the art, would indicate satisfactorily, but for faults or difficulties, such as herein set forth, and even if it were commercially practicable to fit

screw-threaded handles to each device, so as to indicate accurately, some of the handles would be transposed or exchanged from one switch to another, so that enough would be inaccurate to confuse all and to make them unsatisfactory and undependable. This particularly follows where they are installed in numbers or "gangs"—that is to say (first) that the minute exactness required, (second) the changes due to stress and wear of the threaded parts, and (third) the non-interchangeableness of the handles, as above referred to, is each alone prohibitive to manufacture or use in the present state of the art, and they have necessitated other well-known indicating means being used, which latter add to the cost and do not give such unmistakable or conspicuous indications as does my improved arrangement. My arrangement adapts either the handle E or the indicator G^4 or both of these to give uniform indications.

It has been usual in the art to screw the handle home on the spindle so that those parts are screwed home or jammed solidly together, so as to be comparable with a friction-drive. In my improved construction said parts are not jammed or screwed solidly together, but have grooved or notched and toothed or angular forms or have recessed and projecting portions and preferably a spring influencing the engagement therebetween, so as to be comparable with a ratchet-drive. My improved connection normally is substantially free from upward jamming or stress on the threaded portion of the spindle.

One of the objects of my invention is to provide a positioning stop or surface for the indicator or for the handle or for both of these, which stop is independent of the usual jammed shoulder or seat of the screw-threaded portions. I provide a positioning-surface for the indicator, which positioning-surface is at a substantial angle and preferably perpendicular to the plane of rotating movement of the removable (screw-threaded) portions. The herein-described positioning-surfaces position the indicating means without the screw-threaded parts being jammed solidly together, while leaving the handle free to turn in one direction without influencing the movable contact. When the handle is screwed down on the spindle, the preferably perpendicular cooperative stopping or driving or positioning surfaces or means come into engagement substantially without jamming or pressing upwardly against the pitch of the screw-thread—that is, without being screwed home as has been usual—and to screw the handle farther down, as may be desirable in order to bind the cover, it is necessary to pull the handle upwardly (compressing the spring in the handle) until the cooperative stopping-surfaces are separated, when the

handle may be screwed farther down until the said stopping or driving surfaces engage again, but to a greater extent than before. The first as well as the succeeding engagements of the cooperative driving or positioning means being prearranged, invariably indicate the positions of the contacts with precision.

I form a stop or catch or carrier, which is affixed to the movable parts of the switch, without recourse or reference to any screw-shoulder, so as to provide means for turning the switch mechanism in a forward but not a backward direction. It is, in effect, a ratchet-tooth having a perpendicular front and inclined rearward surface, as shown at E^2 , fixed to the indicating-handle, and in its preferred form it is movable on a coarse screw-thread on the spindle G^3 , so as to engage a cooperative part on the switch mechanism, the latter being in this case a ratchet-tooth formed by the slot in the collar F . The collar F is bent up so as to be highest at the point of its cooperative engagement with the ratchet-tooth E^2 on the indicating-handle. Thus as the handle is screwed down the ratchet-tooth thereon clears the said raised portion of the collar F for a given number of turns and then engages therewith, so as to carry the spindle, but leaving it free to be turned backwardly on the screw-thread without influencing the switch mechanism. It may, however, be arranged to turn backwardly without unscrewing. This connection is complete and operative without the sliding and spring movement which is given to the said ratchet-tooth E^2 , as hereinafter described.

Some of the objects attained are that the removable indicating means may be applied interchangeably so as to normally determine and assure certain invariable positions of the said indicating means or of the operating-handle or both of these relatively to the movable contact, the said handle being normally rotatable in one direction without operating the movable contact, and the handle, the indicator, and the cover are made easily removable from the said support to give complete access to the terminals and to the mechanism. The usual indicating-dial rotating inside the cover is dispensed with, thereby reducing the cost. The impact on the detaining means is reduced by relieving the same from the impact due to the weight and movement of the said usual dial. The number of detachable parts is reduced by eliminating said rotating dial and combining the handle, the indicator, and the cover in two removable units, thereby reducing the liability of operation of the device without the predetermined indicating means—as, for example, if the usual indicator be lost. The usual aperture in the cover for exposing the indicator to view and also the cost of insulating the said rotary dial from the rotary contact are dis-

pensated with and the device is made substantially dust, moisture, and insect proof, an important consideration in devices of this class.

The part E^2 is preferably fixed rigidly to the handle E . The portion E^3 , which screws onto the spindle G^3 , is preferably hexagonal, so as not to turn in the handle. It has a relatively slender middle portion, about which a coiled spring is loosely wound, with one end fixed to the upper end of the sliding threaded piece and the other end of the spring fixed to the handle proper, so as to press the threaded sliding piece into the handle. This spring arrangement has been usual to hold the cover snugly to the base. It performs a like service in this device, but in addition it holds the part E^2 to the collar and spindle G^3 with a moderate yielding pressure sufficient to prevent the part from unscrewing too freely. It permits of the raising of the ratchet-tooth E^2 away from and out of engagement with the collar F , so as to start it on another revolution on the spindle, and when the tooth E^2 again comes in line with the slot in the collar F the spring causes it to snap down into the said slot, so as to engage the ratchet-tooth on the collar F to a greater depth than before and to yieldingly lock the parts together, so that upon a backward turning of the handle the inclined rearward surface of the tooth E^2 causes it to withdraw under spring-pressure from the slot in the collar F .

When the cooperative positioning means first come into engagement, the spring in the handle only urges the parts into position for engagement. When the handle is screwed farther down on the spindle, the rearward inclined portion of E^2 coacts with the said spring and one side of the slot in F , so that the positioning-surfaces of E^2 and F are pressed into actual engagement—that is to say, the spring in the handle not only urges the said cooperative positioning means into position where a turning of the handle will cause cooperative engagement, but it also (when screwed down) urges the same into actual engagement. The said greater engagement of the ratchet-teeth obtained by the sliding and spring arrangements is more useful in large than small devices. The cover N and the part A^4 are provided with notches, so as to engage a projection on the base to hold those parts in a predetermined relative position. The words "On" and "Off" are marked on the cover in suitable positions. When the parts are in the position shown in Fig. 1, the part L is in engagement with the face of one and the bottom of the preceding detent. This bottom engagement of the part L tends to hold the movable contact against free backward turning thereof, prevents further backward turning of the cam, and keeps the spring J under moderate stress. On turning the handle to operate the device

the stress of the spring J is gradually increased, and the latch L is gradually withdrawn from engagement with the detent by the action of the cam. When freed from that
 5 detent, the contact and part L are by the action of the spring J carried around with greater celerity than the cam L', which causes the part L to descend about on a line with the inclined surface of the fixed detaining means,
 10 so as to engage the next detent, as before described.

I claim—

1. In a rotary snap-switch, a rotary contact, means for operating the same, said operating means including a handle normally
 15 movable in one rotary direction without operating the said contact, and means disposed at an angle to the plane of rotary movement of said contact for positioning the said handle
 20 relatively to the said movable contact.

2. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a movable contact rotating about
 25 an axis to cooperate with the first-mentioned contact, operating means including yielding means for actuating said movable contact with snap movements and a handle having driving connection therewith, said
 30 handle being normally rotatable in one direction without operating the said movable contact, a cover for parts of the device, means exterior to the cover for indicating the position of the movable contact, said means having
 35 normal movement independent of said movable contact and a stopping-bearing for positioning the said indicator relatively to the movable contact which bearing is disposed at an angle to the plane of normal rotary
 40 movement of the said indicator, to normally determine and assure certain invariable relative positions of the said indicator and movable contact whereby the position of the latter at all times may be truly indicated.

3. In a circuit-controlling device, a suitable support, an electrical contact carried
 45 thereby, a movable contact rotating about an axis to cooperate with the first-mentioned contact, a mounting-journal for an operating-handle, operating means including
 50 yielding means for actuating said movable contact with snap movements and an operating-handle, said handle being normally rotatable in one direction without operating the said movable contact, a driving connection
 55 between said handle and said operating means, said driving connection including a positioning-bearing adjacent the said handle-mounting journal, said positioning-bearing being disposed at an angle to the plane of normal rotary movement of the handle, for normally
 60 determining and assuring certain invariable relative positions of the said handle and movable contact.

4. In a circuit-controlling device, a suitable support, an electrical contact carried

thereby, a movable contact rotating about an axis to cooperate with the first-mentioned contact, a journal part for an operating-handle, operating means including yielding
 70 means for actuating said movable contact with snap movements, an operating-handle comprising a bearing part whereon it is normally rotatable upon said journal part in one direction without operating the said movable
 75 contact, a casing or cover for parts of the device, circuit-indicating means exterior to the said cover, positioning means borne by the said indicator for positioning the same relatively to the said movable contact, said positioning means being movable rela-
 80 tively to the said bearing part on the handle.

5. In a rotary snap-switch having a removable cover for parts of the device, a rotary contact, means for operating the same,
 85 said operating means bearing a portion normally movable in one rotary direction without operating the said contact, means exterior to the cover for indicating the position of the rotary contact, and means for positioning the said indicator relatively to the
 90 said contact which means comprises a grooved portion and a second part cooperatively engaging a face of the said groove for normally determining and assuring certain invariable relative positions of said indicator
 95 and contact whereby the position of the latter at all times may be truly indicated.

6. In a circuit-controlling device, a suitable support, an electrical contact carried
 100 thereby, a movable contact rotating about an axis to cooperate with the first-mentioned contact, operating means including yielding means for actuating said movable contact with snap movements and a handle having
 105 driving connection therewith, said handle being normally rotatable in one direction without operating the said movable contact, a casing or cover for parts of the device, circuit-indicating means exterior to the cover, said means having normal movement inde-
 110 pendent of the movable contact, a connection between the said indicating means and the said movable contact, said connection comprising a toothed portion and a second part cooperatively engaging a face of the said tooth
 115 for normally determining and assuring certain invariable relative positions of the said indicator and movable contact whereby the position of the latter at all times may be truly indicated.
 120

7. In a rotary snap-switch, a rotary contact, means for operating the same, said operating means bearing a portion normally movable in one rotary direction without operating the said contact, means for indicating
 125 the position of the movable contact, and a ratchet connection for positioning the said indicating means relatively to the said movable contact.

8. In a circuit-controlling device, a suit- 130

able support, an electrical contact carried thereby, a movable contact rotating about an axis to cooperate with the first-mentioned contact, operating means including yielding means for actuating said movable contact with snap movements and a handle having driving connection therewith, said handle being normally rotatable in one direction without operating the said movable contact, circuit-indicating means, means secured to the said operating means for positioning said indicating means, cooperative positioning means secured to the indicator, and yielding means for urging the said coacting positioning means into engagement.

9. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a movable contact rotating about an axis to cooperate with the first-mentioned contact, operating means including yielding means for actuating said contact with snap movements and a handle having a driving connection therewith, said connection of said handle with said operating means normally permitting a rotary movement of the handle in one direction without operating the said movable contact, a driven bearing or connection on said operating means for engagement with said driving connection of the handle, and yielding means urging the said operating connections or bearings into position for engagement.

10. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a movable contact rotating about an axis to cooperate with the first-mentioned contact, operating means including yielding means for actuating said movable contact with snap movements and a handle having driving connection therewith, said handle being normally rotatable in one direction without operating the said movable contact, a casing or cover for parts of the device, circuit-indicating means exterior to the cover, means secured to the said operating means for positioning said indicator, a second positioning means secured to the indicator, and yielding means for urging the said cooperative positioning means into position for engagement.

11. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a movable contact rotating about an axis to cooperate with the first-mentioned contact, operating means including yielding means for actuating said contact with snap movements and a handle having a threaded and a driving connection therewith, said handle being normally rotatable in one direction without operating the said movable contact, a driven connection on said operating means for engagement with said driving connection of the handle, said driven connection comprising a positioning-face disposed at an angle to the plane of normal rotating movement

of the said driving connection, for normally determining and assuring certain invariable relative positions of the said handle and movable contact whereby the position of the latter at all times may be truly indicated.

12. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, yielding means for actuating said second contact with snap movements, an operating-handle and connections therefrom to said yielding means, said handle threading onto said connections to be removable therefrom and normally rotatable in one direction without operating the said movable contact, a stop carried by said handle, a second stop positioned in the path of the said first stop to permit said first stop to move into the path of the said second stop, said stops having relative movement after the first stop is in the path of the said second stop and effecting operative engagement therebetween.

13. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a rotary spindle, a rotary contact connected with said spindle and adapted to cooperate with the first-mentioned contact, yielding actuating means operatively connected with the said rotary contact, energizing means normally rotatable in one direction without operating the movable contact with which the said yielding actuating means is also operatively connected, fixed detaining means for the movable contact, a collar bearing means for positioning the said energizing means disposed at an angle to the plane of movement of the movable contact relatively to the movable contact, said collar having an opening in the side into which the aforesaid spindle is fitted and thereby secured, means cooperating with the said fixed detaining means for successively detaining and releasing the said rotary contact, whereby the cooperative contacts are urged together and apart by said yielding actuating means.

14. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, yielding means for actuating said second contact with snap movements, means for energizing said actuating means, means for detaining said second contact and means for releasing said second contact from said detaining means, said releasing means comprising a cam movable about an axis and having a cam-surface extended in an oblique plane on opposite sides of the said axis, to release the detaining means from its connection with the movable contact.

15. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact,

yielding means for actuating said second contact with snap movements, means for energizing said actuating means, means for detaining said second contact and means for releasing said second contact from said detaining means, said releasing means comprising a cam movable about an axis and having a cam-surface extended in an oblique plane around and to opposite sides of the said axis, to release the detaining means from its connection with the movable contact.

16. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to operate with the first-mentioned contact, yielding means for actuating said second contact with snap movements, means for energizing said actuating means, means for detaining said second contact and means for releasing said second contact from said detaining means, said releasing means comprising a rotary shaft, a plate mounted thereon having a surface through which said shaft passes at an oblique angle thereto, said surface engaging said detaining means and acting as a cam to actuate said means to release said movable contact upon sufficient rotation of the shaft.

17. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to cooperate with said first-mentioned contact, yielding means for actuating said second contact with snap movements, means for energizing said actuating means, means for detaining said second contact and means for releasing said second contact from said detaining means, said releasing means comprising a rotary shaft, a part slotted to engage a groove in said shaft and be carried thereby, said part having a cam-surface in an oblique plane relatively to the axis of the movable contact to release the said yieldingly-actuated parts.

18. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to cooperate with said first-mentioned contact, yielding means for actuating said second contact with snap movements, means for energizing said actuating means, means for detaining said second contact and means for releasing said second contact from said detaining means, said releasing means comprising a rotary shaft, a portion comprising substantially parallel cam-surfaces in oblique planes relatively to the said shaft, and said detaining means having a portion bearing on both of said cam-surfaces for operating the said detaining means to release the said movable contact.

19. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact,

yielding means for actuating said second contact with snap movements, means for energizing said actuating means, a rotary shaft connected to said energizing means to be turned thereby, means for detaining said second contact, a detent mounted to swing on the said shaft the axis of which swinging movement lies in a plane substantially at right angles to said shaft, and a cam turned by said shaft to rock said detent out of stopping engagement with said detaining means to release the said yieldingly-actuated parts.

20. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, yielding means for actuating said second contact with snap movements, means for energizing said actuating means, means for detaining said second contact and means for releasing said second contact from said detaining means, said releasing means comprising a rotary shaft, a plate slotted to engage a groove in said shaft and be carried thereby, said plate having a portion of the metal thereof displaced to protrude into the slot to act as a lock for the plate to the shaft, said plate having a cam-surface for operating said releasing means to release the said yieldingly-actuated parts.

21. In a snap opening and closing circuit-controlling device, a suitable support, an electrical contact carried thereby, a contact member movable about an axis into and out of engagement with the first-mentioned contact, a portion of insulating material having a downwardly-extending grooved part, said movable contact having a portion extending downwardly into said groove but permanently spaced from the said insulating portion and adapted to cooperatively engage the said first contact, and means for effecting a snap opening and closing of the circuit.

22. In a snap opening and closing circuit-controlling device, a support of insulating material having a depression therein forming a restricted passage-way extending downwardly and below the central portion of the support, an electrical contact carried by the said support, a contact part arranged over the said central portion of the support and movable about an axis into and out of engagement with the first-mentioned contact, said movable contact having a portion extending downwardly below the central portion of the support to travel in the said restricted passage-way but permanently spaced from the said insulation, and adapted to cooperatively engage the said first contact, and means for effecting a snap opening and closing of the circuit.

23. In a snap opening and closing circuit-controlling device, a suitable support, a portion of insulating material having a downwardly-extending cavity formed therein, a

contacting portion in the said cavity, a contact member movable about an axis into and out of engagement with the said contacting portion, and a restricted passage-way for said movable contact formed in said insulating material adjacent said cavity, and means for effecting a snap opening and closing of the circuit.

24. In a snap opening and closing circuit-controlling device, an insulating-support, an electrical contact carried thereby, a contact member mounted on the said support and movable about an axis into and out of engagement with the first-mentioned contact, means for effecting a snap opening and closing of the circuit, a removable cover for inclosing moving parts of the device, said removable cover comprising a jutting barrier of insulating material of irregular contour to conform to the irregularities of the parts, said barrier being spaced from the said support and movable contact member to form a restricted passage-way between the said barrier and the said support in which passage-way the free end of the said contact member moves.

25. In a snap opening and closing circuit-controlling device, a suitable support, an electrical contact carried thereby, a contact member movable about an axis into and out of engagement with the first-mentioned contact, a portion of insulating material having a downwardly-extending grooved part, said movable contact having a portion extending downwardly into said groove but permanently spaced from the said insulating portion and adapted to coöperatively engage the said first contact, a barrier of insulating material superimposed over and closely adjacent to the said groove and means for effecting a snap opening and closing of the circuit.

26. In a snap opening and closing circuit-controlling device, a support of insulating material having a depression therein forming a restricted passage-way extending downwardly and below the central portion of the support, an electrical contact carried by the said support, a contact part arranged over the said central portion of the support and movable about an axis into and out of engagement with the first-mentioned contact, said movable contact having a portion extending downwardly below the central portion of the support to travel in the said restricted passage-way but permanently spaced from the said insulation and adapted to coöperatively engage the said first contact, a barrier of insulating material superimposed over and closely adjacent to the said downwardly-extending restricted passage-way, and means for effecting a snap opening and closing of the circuit.

27. In a snap opening and closing circuit-controlling device, an insulating-support, an

electrical contact carried thereby, a contact member mounted on the said support and movable about an axis into and out of engagement with the first-mentioned contact, means for effecting a snap opening and closing of the circuit, removable means for inclosing parts of the device, said removable means comprising a barrier of insulating material conforming with the contour of the upper surface of the support and parts carried thereby, said barrier being spaced apart from the movable contact and disposed adjacent the movable and fixed conductive parts to restrict arcing therebetween.

28. In a circuit-controlling device, a suitable support, a contact carried thereby, a second contact rotating about an axis to co-operate with the first-mentioned contact, yielding means for actuating the said second contact with snap movements, means for energizing said actuating means, a rotary shaft connected with said energizing means to be turned thereby, means for detaining said second contact, a detent mounted to swing on the said shaft, the axis of which swinging movement intersects said shaft at substantially right angles thereto, and a cam turned by said shaft to rock said detent out of stopping engagement with said detaining means to release the said yielding-actuated parts.

29. In a quick-break switch the combination with wire-fastening means, of a spring contact part having plural substantially U-shaped members one of said U-shaped members being disposed within the other and permanently spaced therefrom, and means at the extremity of said U-shaped portions for fastening the same to the said wire-fastening means.

30. In a rotary snap-switch, a rotary contact, means for operating the same, said operating means including a portion normally movable in one rotary direction without operating the said contact, said portion bearing means for indicating the position of the rotary contact which indicating means has normal movement independent of said rotary contact and abutting means disposed at an angle to the plane of rotary movement of the said contact for positioning the indicator relatively to said contact.

31. In a rotary snap-switch, a rotary contact, means for operating the same, said operating means including a portion normally movable in one rotary direction without operating the said contact, a cover for parts of the device, indicating means exterior to the said cover, said indicating means having normal operative movement independent of the said rotary contact, and abutting means disposed at an angle to the plane of rotary movement of the said contact for positioning said indicator relatively to said rotary contact.

32. In a rotary snap-switch, a rotary contact, means for operating the same, said operating means including an operating-handle detachable from the device and normally movable in one rotary direction without operating the said contact, a cover for parts of the device, means exterior to the cover for indicating the position of the rotary contact said indicating means being attached to the said handle and carried thereby, and means disposed at an angle to the plane of rotary movement of the said contact for positioning the said indicator relatively to the said rotary contact.
33. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, yielding means for actuating said second contact with snap movements, an operating-handle and a circuit-indicating means operatively connected with the device, said handle threading onto said connections and removable therefrom and normally rotatable in one direction without operating the said movable contact, a stop for positioning said indicating means, another stop carried by said device and extending through a plane in which the said first stop rotates and engaging the said first stop, the engagement of said stops acting to position the indicator on its connections and thereby to determine and indicate accurately the position of the movable contact actuated through such connections.
34. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, means whereby the device may be operated, said means being normally rotatable in one direction without operating said second contact, indicating means, and means for positioning the said indicating means, said positioning means including a part having an inclined bearing-surface and a screw-thread for holding said positioning means in a predetermined position.
35. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, means whereby the device may be operated, said means being normally rotatable in one direction without operating said second contact, indicating means having normal rotary movement independent of the said rotary contact, and means for positioning the said indicating means, said position-

ing means including an inclined bearing-surface.

36. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, means whereby the device may be operated, said means being normally rotatable in one direction without operating said second contact, indicating means having normal rotary movement independent of the said rotary contact, and means for positioning the said indicating means, said positioning means including a bearing-surface inclined relatively to the plane of movement of the movable contact.

37. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, means whereby the device may be operated, said means being normally rotatable in one direction without operating said second contact, indicating means, means for positioning the said indicating means, and yielding means for urging the said indicator into a predetermined position.

38. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, means whereby the device may be operated, said means being normally rotatable in one direction without operating said second contact, indicating means, means for positioning the said indicating means, said positioning means including an inclined bearing-surface, and yielding means for urging the said positioning means into a predetermined position.

39. In a circuit-controlling device, a suitable support, an electrical contact carried thereby, a second contact rotating about an axis to cooperate with the first-mentioned contact, an operating-handle, said handle being normally rotatable in one direction without operating said second contact, and means for positioning the said operating-handle relatively to the movable contact, said positioning means including a bearing-surface inclined relatively to the plane of movement of the movable contact.

St. Louis, Missouri, October 6, 1904.

JULIUS K. LUX.

Witnesses:

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