(No Model.) 2 Sheets—Sheet 1.

W. J. O. JOHNSON.

ELECTRIC LOCK.

No. 463,155. Patented Nov. 17, 1891.

Fig. 1.

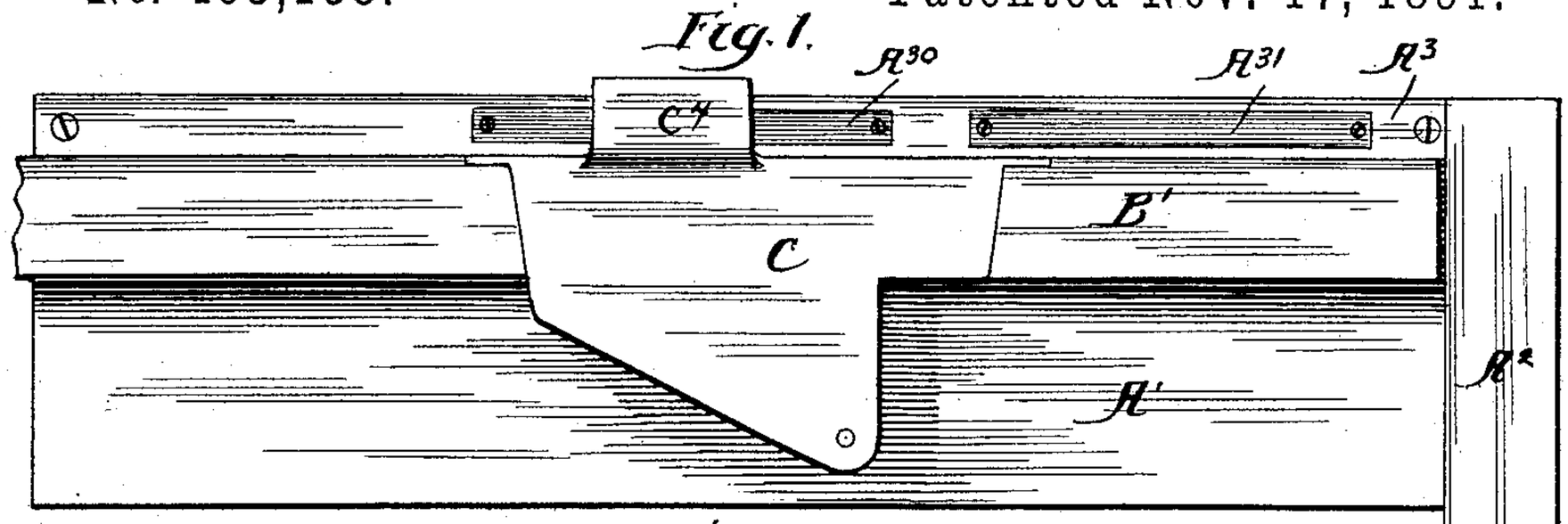


Fig. 2.

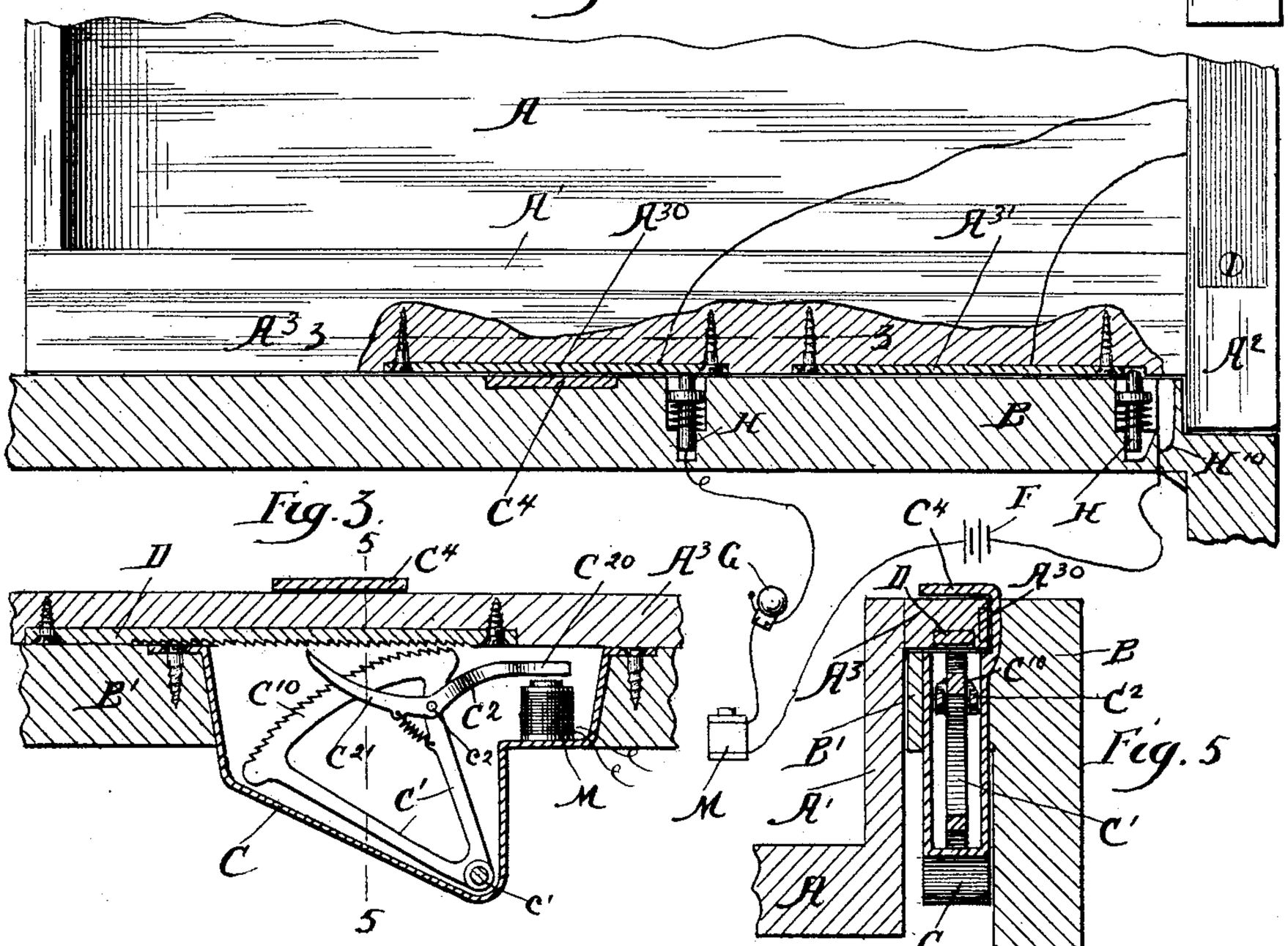
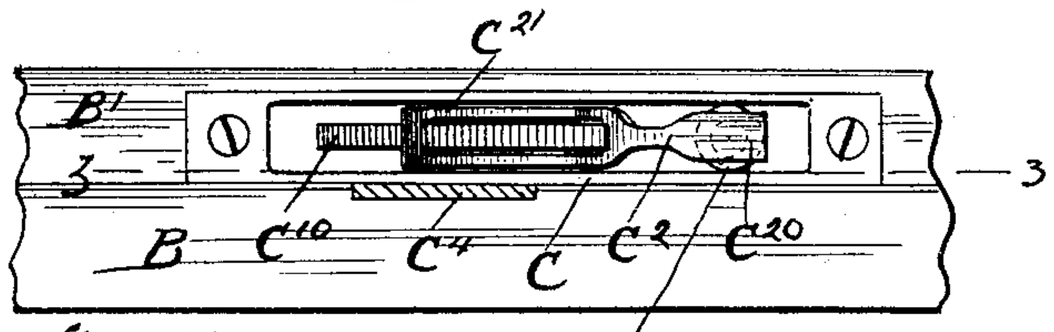


Fig. 3.

Fig. 4.

Fig. 5



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(No Model.) 2 Sheets—Sheet 2.

W. J. O. JOHNSON.

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Fig. 6.

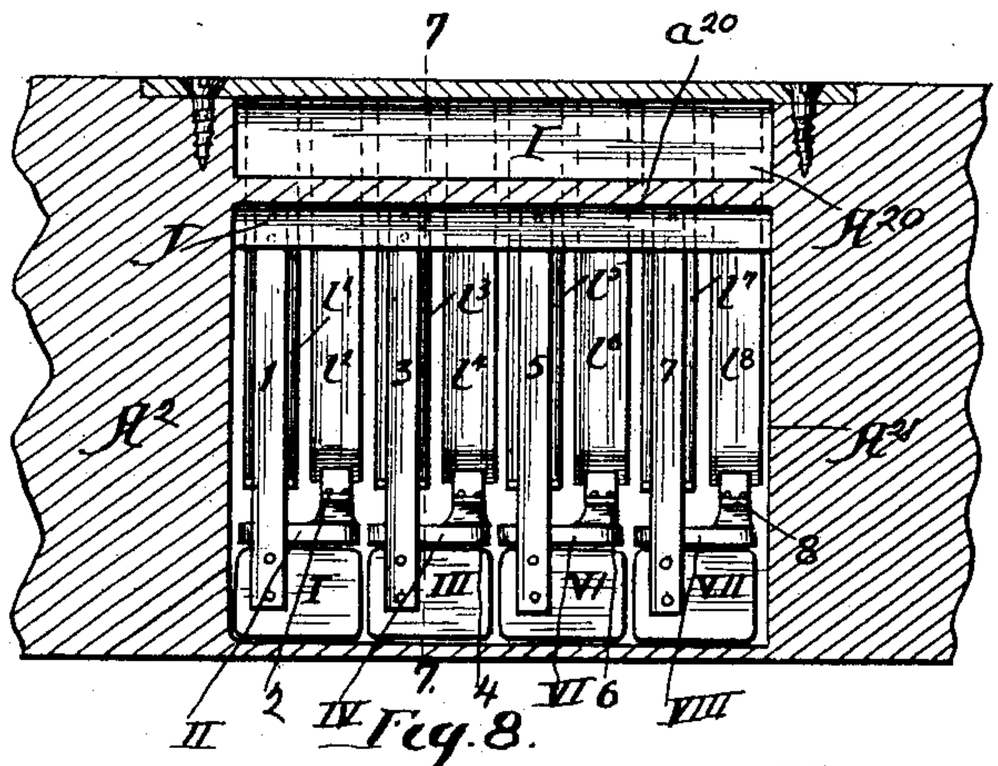


Fig. 7.

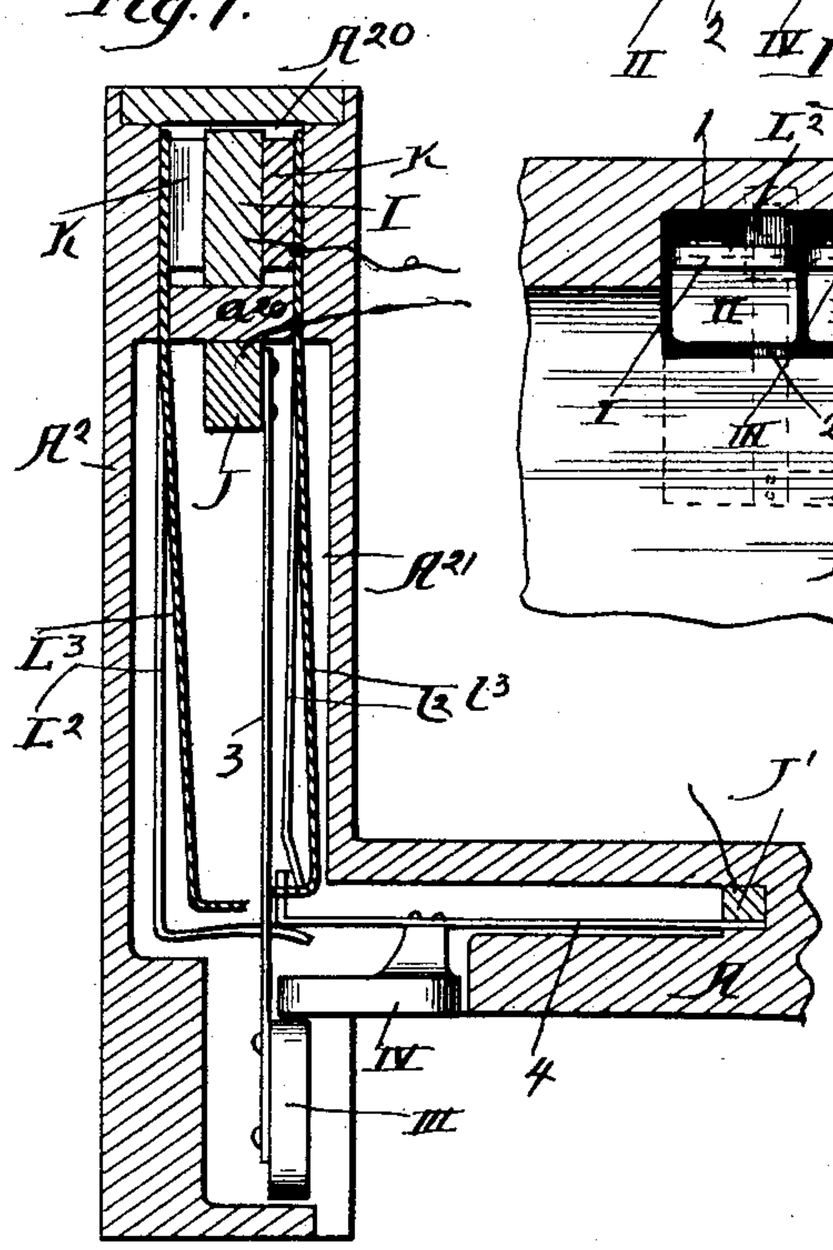


Fig. 8.

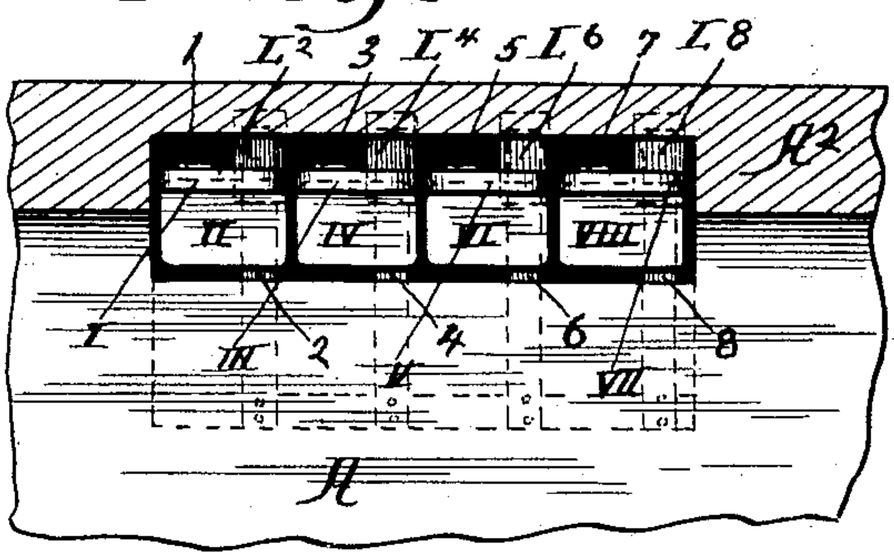
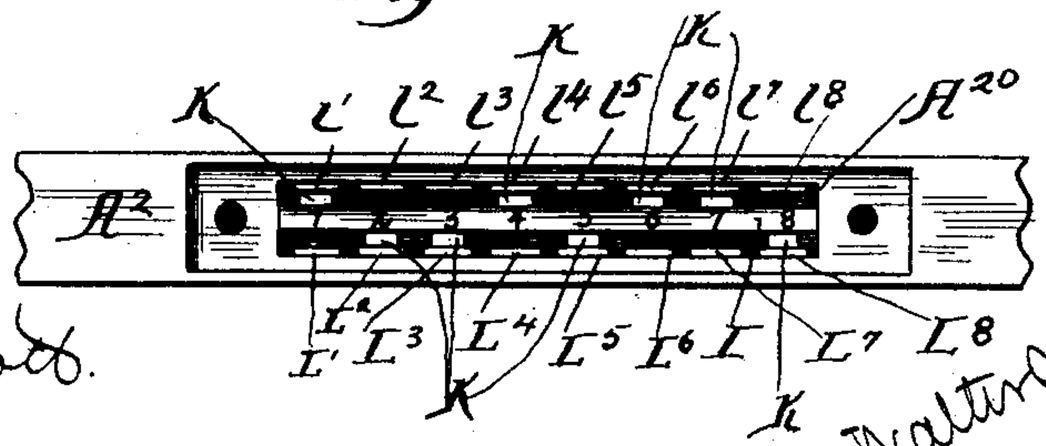


Fig. 9.



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UNITED STATES PATENT OFFICE.

WALTER J. O. JOHNSON, OF CHICAGO, ILLINOIS.

ELECTRIC LOCK.

SPECIFICATION forming part of Letters Patent No. 463,155, dated November 17, 1891.

Application filed February 25, 1891. Serial No. 382,734. (No model.)

To all whom it may concern:

Be it known that I, WALTER J. O. JOHNSON, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in an Electric Lock and Alarm for Cash-Drawers, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a side elevation of a drawer and a lateral slide-bar or run-way adjacent thereto having my invention applied to it. Fig. 2 is a top plan of part of the drawer and a portion of its run-way, which is broken out to show in horizontal section the electrical contact-pieces pertaining to the drawer and its case and a diagram of the electric circuit. Fig. 3 is a detail section through the locking mechanism at the line 3 3 on Fig. 2. Fig. 4 is a top plan of said locking mechanism. Fig. 5 is a section at the line 5 5 on Fig. 3. Fig. 6 is a sectional front elevation of mechanism located in the head or front end of the drawer connected with the finger-keys of the combination, a portion of the head of the drawer being cut away and shown in vertical section to show parts otherwise concealed. Fig. 7 is a section at the line 7 7 on Fig. 6. Fig. 8 is a bottom plan of the same parts, portion of the bottom of the drawer being broken away to show parts otherwise concealed. Fig. 9 is a top plan of the combination in the drawer-head, a covering-plate being removed.

A is the drawer-bottom.

A′ is one side of the drawer in which certain of the locking mechanism is located, which may also be duplicated on the other side.

A^2 is the drawer-head or forward end.

A^3 is a cleat made fast to the drawer side on its outer surface at its upper edge.

B is a fixed portion of the cabinet-case in which the drawer slides laterally adjacent to the drawer.

B′ is a slide-bar designed to be rigid with the cabinet in which the drawer runs, and it may constitute the support of the drawer in its sliding movement, and in any event the cleat A^3 runs upon its upper edge as the drawer slides.

I will first describe the locking mechanism, which may be employed and operated by different means from that herein shown and hereinafter described for operating it.

C is a lock-case, which is secured in the slide-bar B′, being open at its upper edge, which is flush with the upper edge of such slide-bar. As shown, but not necessarily, the slide-bar has less height or depth than the lock-case, so that the latter protrudes below it alongside of the drawer. Within the case is located an electro-magnet M, with its poles vertical.

C′ is a lever pivoted to the case at c'.

C^2 is a lever pivoted on the lever C′ at c^2, and having at one end an armature C^{20}, which overhangs the poles of the magnet and is adapted to contact the poles as the lever rocks on its pivot. The other end of the lever C^2 is a pawl C^{21}, which, when the armature is in contact with the electro-magnet, protrudes slightly above the plane of the upper edge of the slide-bar and lock-case, and is adapted to engage a downwardly-facing ratchet-bar D, which is secured to the under side of the cleat A^3.

The upper end of the lever C′ remote from its pivot c' is provided with a segmental ratchet-bar C^{10}, whose teeth face toward the faces of the teeth of the ratchet-bar D, and are adapted to engage therewith. This curved ratchet-bar C^{10} is eccentric to the pivot of the lever C′, and at its normal position (shown in Fig. 3) the end of said ratchet-bar nearest the pivot is just out of engagement with the ratchet-bar D, so that if the lever rocks over its pivot a very little toward the magnet, the curved ratchet-bar will come into engagement with the ratchet-bar D. The operation of this mechanism may be understood without the description of the remaining devices.

Assuming that by any means the electro-magnet M is energized so that it will attract the armature C^{20}, rocking the lever C^2 over its pivot on the lever C′, the ratchet-pawl C^{21} at the other end of the lever C^2 will be thrown up into engagement with the ratchet-bar D. This ratchet-bar being fixed on the cleat A^3, which is carried by the drawer, any outward movement of the drawer will cause the ratchet-bar D, through the lever C^2, to swing the lever C′ over its pivot, and the parts are so

closely situated that a very little such movement brings the curved ratchet-bar C^{10} on the lever C′ into engagement with the ratchet-bar D. When such engagement has been effected, further sliding movement becomes impossible, because, on account of the eccentricity of the ratchet-bar C^{10}, such movement would force the ratchet-bar D, and consequently the drawer, upward, which presumably is impossible, the drawer being supposed to be accurately fitted in its case. As a further precaution, however, to prevent the operativeness of the device being defeated by the loose construction of the drawer-case, I provide the lock-case C with a hook-extension C^4 on its outer side, which extends up outside the cleat A^3 and overhangs it, so that the said cleat is positively retained against vertical movement between the upper edge of the slide-bar B′ and the upper edge of the lock therein and said overhanging hook C^4. It will thus be apparent that whenever the electric circuit is operative to energize the magnet M it is impossible to open the drawer.

The remaining part of my invention relates to means for closing up the circuit which energizes the magnet and controlling the same to hold it open when it is desired to open the drawer; but the mechanism above described may be used independently of that hereinafter described in connection with any circuit to energize the magnet and any means to control such circuit and with any mechanism to effect the opening and closing of the same to unlock and lock the drawer.

I have applied this lock with an electric combination or combination of electrical contact-pieces with an electrical circuit, which I will now describe.

In any convenient part of the cabinet in which the drawer slides, or elsewhere, there is located an electric battery, (represented conventionally at F,) and also at any convenient point either in the cabinet or elsewhere, an electric bell G. Let into the outer edge of the cleat A^3 are two copper strips A^{30} A^{31}, with a short interval between their proximate ends. In the fixed bar B of the cabinet are set two spring-contact bolts H H′, whose operating-springs tend to protrude them into contact with the copper strips A^{30} A^{31} when the drawer is closed. The bolt H′ is set loosely in its socket, so that it may have tilting movement, but with a tendency to lean away from the contact-piece H^{10}, which is set near it. This latter contact-piece is preferably a spring with a tendency to react toward the bolt H′ after being flexed in the opposite direction. The circuit-wire from the battery extends to the electro-magnet M in the lock-case C, and from thence to one of the spring contact-pieces, as H^{10}, the wire from the other pole of the battery extending to the alarm-bell G and thence to the other contact-piece, as H. It will be obvious now that when the drawer is closed the circuit is broken between the two metal strips and also between the metal strip A^{31} and the contact-piece H^{10}; but a slight movement of the drawer in the direction to open it will cause the bolt H′ to be tilted over into contact with the spring contact-piece H^{10} and close up the gap at that point, but that the other intervals must also be closed up before the magnet will be energized. The relative location of the battery and alarm-bell in the circuit are not material, and they may be anywhere that is convenient. In a cavity A^{20} in the drawer-head A^2, I make fast the metal bar I. The wood of the drawer-head may be found sufficient insulation; but, if preferred, the bar I may be further insulated. From this bar the circuit-wire extends to the metal strip A^{31}. In the drawer-head, insulated from the bar I, and, as illustrated, in a cavity A^{21}, separated from the cavity A^{20} by a partition a^{20}, which affords means for securing the bar I, I secure the metallic bar J, from which spring-fingers 1 3 5 7 extend downward, each being provided at its lower end with a finger-piece I III V VII, respectively. In the drawer-head, insulated from each other and from all the other metallic parts therein, I secure at each side of the bar I eight metal strips, (sixteen in all,) whose ends extend up vertically in two rows parallel with the bar I at opposite sides thereof and at about an eighth of an inch therefrom. Those at the forward side are designated, respectively, L′ L^8 and those at the rear l' l^8. The strips L′ L^3 L^5 L^7 on the forward side extend down in front of the fingers 1 3 5 7, respectively, and at their lower ends are bent rearward and terminate a very short distance from the strips 1 3 5 7, respectively. The corresponding strips l' l^3 l^5 l^7 at the rear side extend down in a similar manner behind the strips 1 3 5 7, respectively, and are bent forward, and at the normal position of the parts contact respectively the fingers 1 3 5 7. These metal strips are held rigidly at their upper part, being most conveniently so secured by being bound between the back portion of the head A^2 and the partition a^{20}, and below said rigidly-secured part they are free to spring, and the rear set of said metal strips, which extend forwardly to the fingers 1 3 5 7, are so flexed that they normally would project farther forward than the said fingers, but are not stiff enough to force said fingers forward, but are stopped by the fingers. The metal strips L^2 L^4 L^6 L^8 on the forward side extend down to a point below the plane of the upper surface of the bottom of the drawer and are then bent rearward between the fingers 1 3 5 7, and extend thus rearward a short distance past said fingers. The rear metal strips l^2 l^4 l^6 l^8 are secured like the remainder and extend down and overhang the rearwardly-bent portions of the forward strips L^2 L^4 L^6 L^8, respectively. In the drawer-bottom I secure the metal bar J′, which is connected by an electrical conducting-wire to the bar J, so that it is electrically a continuation of said bar, and from said bar J′ the spring-fingers 2 4 6 8 extend forward, respectively, between the rear-

wardly-extended ends of the strips L^2 L^4 L^6 L^8 and the lower ends of the rear strips l^2 l^4 l^6 l^8 and slightly removed from contact with the overhanging ends of said rear strips. Preferably, in order to obtain the yielding action hereinafter described, the forward ends of the fingers 2 4 6 8 are bent up and the lower ends of the rear strips l^2 l^4 l^6 l^8 bend obliquely rearward, the upbent ends of the fingers 2 4 6 8 standing normally in front of the rearwardly-sloping ends of the overhanging strips l^2 l^4 l^6 l^8. The spring-fingers 2 4 6 8 are each provided with finger-keys (indicated by II IV VI VIII) on their lower side, facing downward and overhanging a space immediately in the rear of the finger-keys I III V VII, the purpose being to adapt said spring-fingers to be actuated upward by the ends of the fingers of the operator. I provide small metallic wedges or blocks K, which may be inserted between the bar I and the upwardly-protruding ends of any number of metal strips, thereby establishing electrical connection between the bar and strips, between which and the bar the said contact-blocks K are placed; but the bar should not be thus electrically connected with two opposite strips, for reasons which will hereinafter appear. In the drawings I have represented these contact-blocks K placed so as to electrically connect the bar I with the forward strips L^3 L^5 and L^2 L^8 and with the rear strips l' l^7 and l^4 l^6. As above stated, the metal strip A^{31} is in electrical connection by a circuit-wire with the bar I. The bars J and J′ are electrically connected together, as above stated, and either of them is electrically connected by proper wire with the metallic strip A^{30}. The operation of this electrical combination may be understood by considering what will be the effect of actuating certain of the finger-keys or of omitting to operate certain of them. First, it will be observed that the connection established between the bars J and J′ and the strip A^{30}, and the fact that the strips l' and l^7 are electrically connected with the bar I, said strips l' and l^7 being in contact normally with the spring-fingers 1 and 7, respectively, which fingers are electrical extensions of the bar J, or the fact that the strips L^4 and L^6 are electrically connected with the bar I, and at their lower ends are normally in contact with the spring-fingers 6 and 8, respectively, which are electrical extensions of the bar J′, makes electrical connection between the bar I on the one hand and the bars J and J′ on the other, and that such electrical connection is complete through any one of the strips L′, L^7, L^4, and L^6 with its corresponding spring-finger and bar J or J′, as the case may be—that is to say, there are four complete electrical paths between the bar I on the one hand and the bars J J′ on the other hand, and since the bar I is connected to the metal plate A^{31} and the bars J J′ to the metal plate A^{30}, there are four courses which the current may take between the two plates A^{30} and A^{31}, and that thus one of the gaps mentioned in the circuit is closed by quadruple connection, leaving open only the gap between the contact-piece H^{10} and the strip A^{31}. This gap, as above stated, may be closed by a very slight forward movement of the drawer, and upon such movement being made without breaking all four of the connections above described between the bars J and I the magnet M will be energized, the locking mechanism operated, and the alarm rung. To prevent thus locking the drawer and ringing the alarm it is necessary to break all four of the connections between I and J J′. The connections made by the strips l' and l^7 will be broken by pulling forward the keys I and VII, since thereby the spring-arms 1 and 7 will be moved out of contact with the lower ends of the strips l' and l^7, respectively, and the circuit made through the strips l^4 and l^6 will be broken by pushing up keys IV and VI, carrying the spring-fingers 4 and 6 up out of contact with the rearwardly-bent ends of the strips L^4 and L^6. The operator, therefore, who is informed as to the combinations, will with the fingers of one hand simultaneously press forward keys I and VII and press upward keys IV and VI before attempting to draw out the drawer, and since he will thereby break the circuit completely between the strips A^{30} and A^{31}, the closing of the circuit between the contact-piece H^{10} and the strip A^{31}, which will be effected by the forward movement of the drawer, will be ineffectual to operate the lock or the alarm. If, however, one not informed as to the combination should attempt to manipulate the keys and should, for example, pull forward all the keys I III V VII and press upward all the keys II IV VI VIII, he would break the circuits which should be broken, but he would at the same time institute four new circuits through the fingers of the keys wrongly manipulated, for when one of the vertical keys, as for example III, is pulled forward, its spring-finger 3 is withdrawn from the strip l^3, but said strip having itself an elastic forward tendency follows the movement of the spring-finger 3 a short distance, and these strips are so flexed and placed that the finger 3 will reach the rearwardly-projecting end of the strip L^3 and make electrical contact therewith before the strip l^3 will cease following the movement of the finger, so that at some position there will exist electrical contact of the finger with both the strips, and it will be necessary to move the key and finger a little farther forward in order to leave behind the strip l^3. Now it will be observed that in placing the contact-blocks K the bar I is electrically connected with one or the other of every pair of strips, (the two strips opposite each other being counted a pair,) and that following this rule the strip L^3 is electrically connected by the block K with the bar I, and that the manipulation of the key III by pressing the same forward, as above described, has broken a

metallic contact between the finger 3 and the strip l^3, which was ineffective to make an electric circuit because the finger l^3 was not electrically connected with the bar I and has made metallic connection between the finger 3 and the strip L^3, which is electrically connected with the bar I, whereby an electrical connection has been established between the plates A^{30} and A^{31}, so that in this error the opening of the lock has been defeated. From this description it will be understood that it is necessary not only to manipulate each of the keys, whose fingers are electrically in circuit between the bars I and J or J′, but also to omit to manipulate each key which is not thus in circuit, because if a key not in circuit is manipulated it is thereby brought into circuit, and there is no position of the keys or of the spring-fingers which carry them, respectively, in which said spring-fingers are not in contact with one or the other of the pair of strips between which said fingers oscillate. In case of the horizontal fingers 2 4 6 8, contact being normally made, as stated, with the rearwardly-projecting ends of the strips L^2 L^4 L^6 L^8, said rearwardly-projecting ends of the fingers contact the overhanging strips l^2 l^4 l^6 l^8, and the fingers being further pushed forward, leave the spring ends of the fingers L^2 L^4 L^6 L^8 and slide up on the sloping ends of the strips l^2 l^4 l^6 l^8 during such further movement as may be given them, so that in case of these, as well as in case of the vertical fingers, metallic contact with one member of the pair of strips is not broken before like metallic contact is made with the opposite member.

I do not limit myself to the mechanical arrangement herein described of the metallic strips and their corresponding keys and fingers, although I do regard the arrangement of the keys in two banks, those in one bank being operated by vertical movement and those in the other by horizontal movement, as particularly desirable, because thereby eight keys can be easily operated with the four fingers of one hand.

I claim—

1. In combination with a sliding drawer and the fixed part of the case adjacent to which it slides, a lever pivoted on one of said parts, and a bar on the other part adapted to be engaged by the lever when the latter is rocked over its pivot, an electro-magnet and a circuit which energizes it, a second lever pivoted to the first, having an armature for the electro-magnet, and an arm which engages the bar when the armature approaches the magnet, whereby the sliding of the drawer when the magnet is energized causes the second lever by its engagement with the bar to rock the first lever to bring it also into engagement with the bar, substantially as set forth.

2. In combination with a sliding bar and a fixed part of the case adjacent to which it slides, a lever pivoted on one of said parts, having an arc arm eccentric to its pivot, the end of said arm which is nearest the pivot being normally just out of contact with the other part, an electro-magnet and a circuit which energizes it, a bar fixed on said other part, and a second lever pivoted on the first lever, having an armature for the electro-magnet and adapted to engage said bar when the armature approaches the magnet, whereby the sliding of the drawer when the electro-magnet is energized causes the second lever to rock the first and clamp it to the part having the bar, substantially as set forth.

3. In combination with a sliding drawer and the fixed part of the case adjacent to which it slides, a serrated bar on one of said parts, and a lever pivoted on the other, having a serrated arc eccentric to the pivot of the lever, the end of which nearest to the pivot is normally out of engagement with the serrated bar, an electro-magnet and a circuit which energizes it, a second lever pivoted on the first and having an armature for the magnet and adapted to engage the serrated bar when the armature approaches the magnet, whereby the sliding of the drawer when the magnet is energized causes the second lever to actuate the first to effect engagement of the serrated arc of the first lever with the serrated bar, substantially as set forth.

4. In combination, substantially as set forth, a lock operated by a closed circuit, a plurality of contact-making keys any one of which at normal position closes the circuit, and a plurality of keys any one of which out of normal position closes the circuit, the keys of the first class being externally undistinguishable from the keys of the second class.

5. In combination, substantially as set forth, a lock operated by a closed circuit, an alarm in such circuit, a plurality of contact-making keys any one of which at normal position closes the circuit, and a plurality of keys any one of which out of normal position closes the circuit, the keys of the first class being externally undistinguishable from the keys of the second class.

6. In combination with the drawer, the mechanism which locks it to its case, the electric circuit which operates such lock mounted partly on the drawer and partly on the case and comprising contact-pieces which are out of contact when the drawer is fully closed, whereby the circuit is broken at that position, the remainder of the circuit comprising a plurality of contact-making keys any one of which at normal position closes that portion of the circuit, and a plurality of contact-making keys any one of which out of normal position closes the same, whereby when the drawer is moved from closed position the circuit can be broken only by moving all the first set and none of the second set of contact-keys out of normal position, substantially as set forth.

7. In combination with the locking mechanism operated by an electro-magnet, the cir-

cuit which energizes such magnet comprising the bars I and J, normally insulated from each other, the double series of metal strips insulated from each other and arranged in two series adjacent to the bar I, each individual of each series being paired with an individual of the other series, and the contact-making fingers adapted to oscillate each between the individuals of a pair and normally in contact with one of such pairs, and the contact-making blocks K, inserted between said bar and one strip of each pair, all said fingers being electrically connected to the bar J, substantially as set forth.

8. In combination with the bars I and J and the circuit which contains them, the metal strips constituting pairs, one individual of each of which is electrically connected to the bar I, the spring-fingers of the bar J, each located between the individuals of a pair of strips and normally in contact with one individual of the pair, such individually tending elastically toward the other, the other individual adapted to yield elastically away from the first, substantially as set forth.

9. In combination with the bars I and J and the circuit which contains them, the two series of strips and the contact-making fingers which operate between them, the keys on said fingers arranged in two banks, one adapted to be operated horizontally and the other adapted to be operated vertically, whereby each finger of the operator may operate one horizontal and one vertical key, substantially as set forth.

10. In combination with a drawer and the case in which it slides, mechanism adapted to lock it to its case, and an electric circuit which operates said mechanism contained partly in the drawer and partly in the case, contact-making pieces on the drawer and case, respectively, which complete said circuit when in contact and which are out of contact when the drawer is fully closed, one of said contact-pieces being adapted to be moved into electrical contact to complete the circuit by the sliding movement of the drawer in opening and to be moved out of contact position by the closing movement of the drawer, substantially as set forth.

11. In combination with the drawer and the case adjacent to which it slides, an electric circuit partly contained in the drawer and partly in the case, comprising the contact-piece A^{31} upon one of said parts and the contact-piece H^{10} on the other part, and the tilting contact-bolt H′, adapted to be contacted at the end by the piece A^{31} and adapted to be rocked toward the contacting-piece H^{10} in the opening movement of the drawer and away from it in the closing movement, whereby it completes the circuit only when actuated by said opening movement, substantially as set forth.

In testimony whereof I have hereunto set my hand at Chicago, Illinois, in the presence of two witnesses, this 23d day of February, 1891.

WALTER J. O. JOHNSON.

Witnesses:

CHAS. S. BURTON,

H. B. HALLOCK.