

No. 616,647.

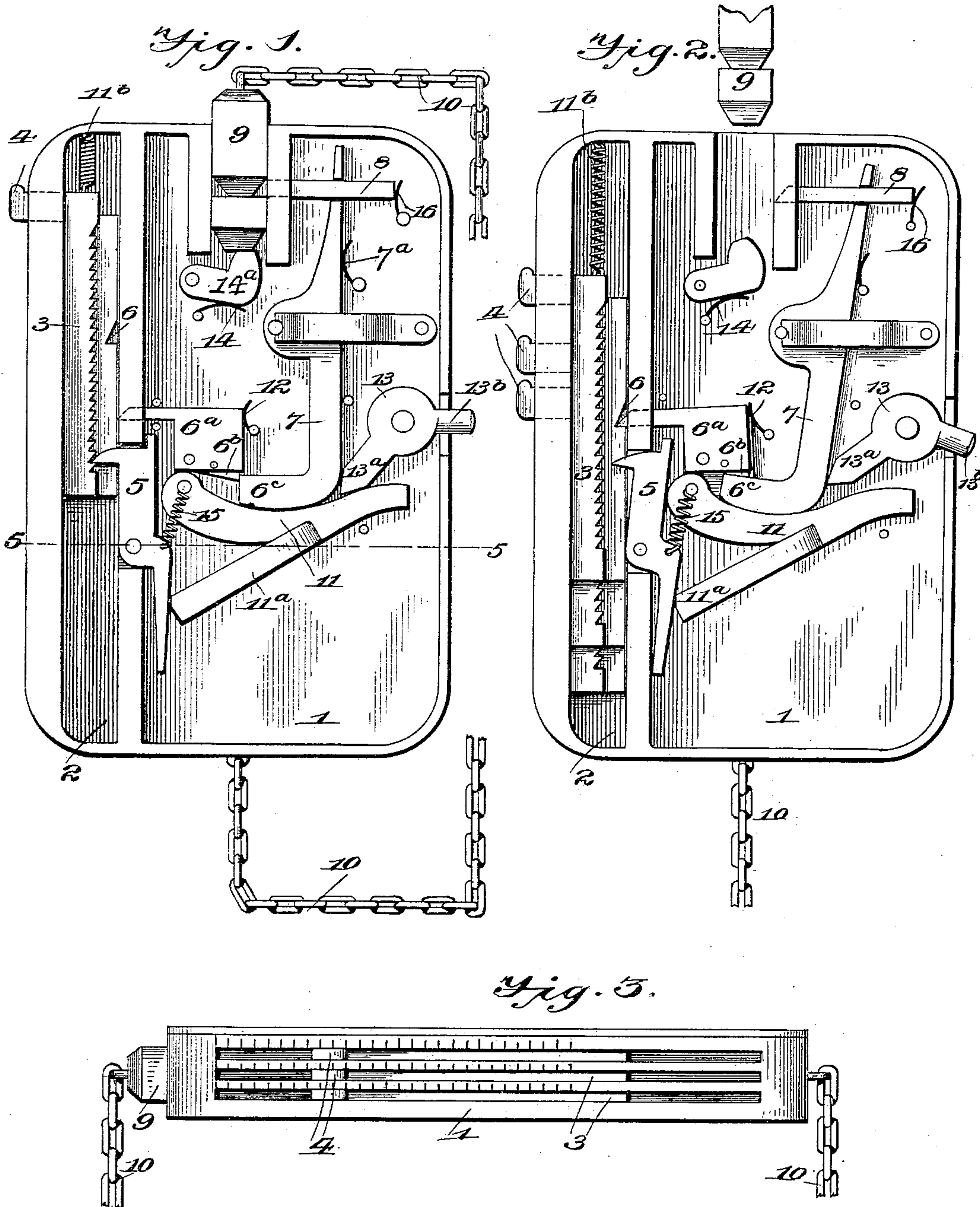
Patented Dec. 27, 1898.

G. E. WOODWARD.
PERMUTATION PADLOCK.

(Application filed Apr. 10, 1897.)

(No Model.)

4. Sheets—Sheet 1.



Witnesses
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4 Sheets—Sheet 2.

Fig. 1.

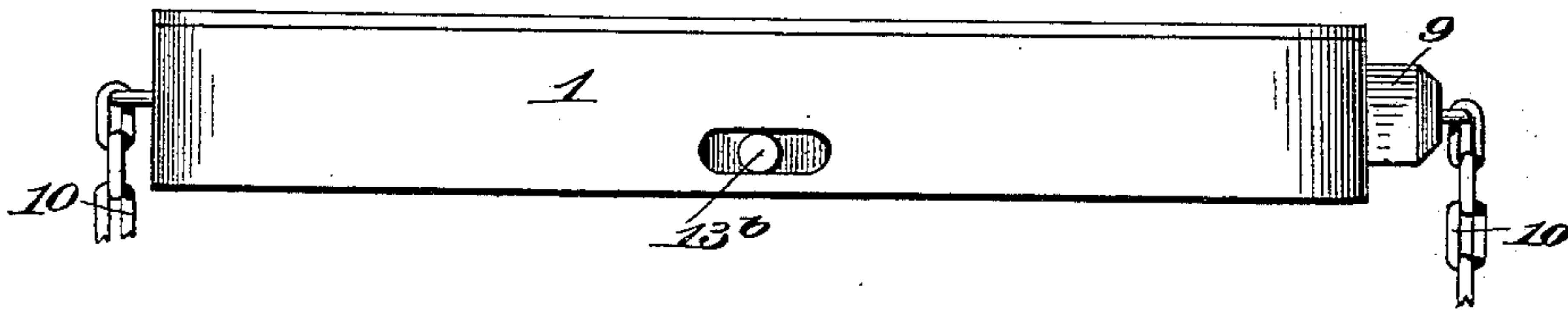


Fig. 5.

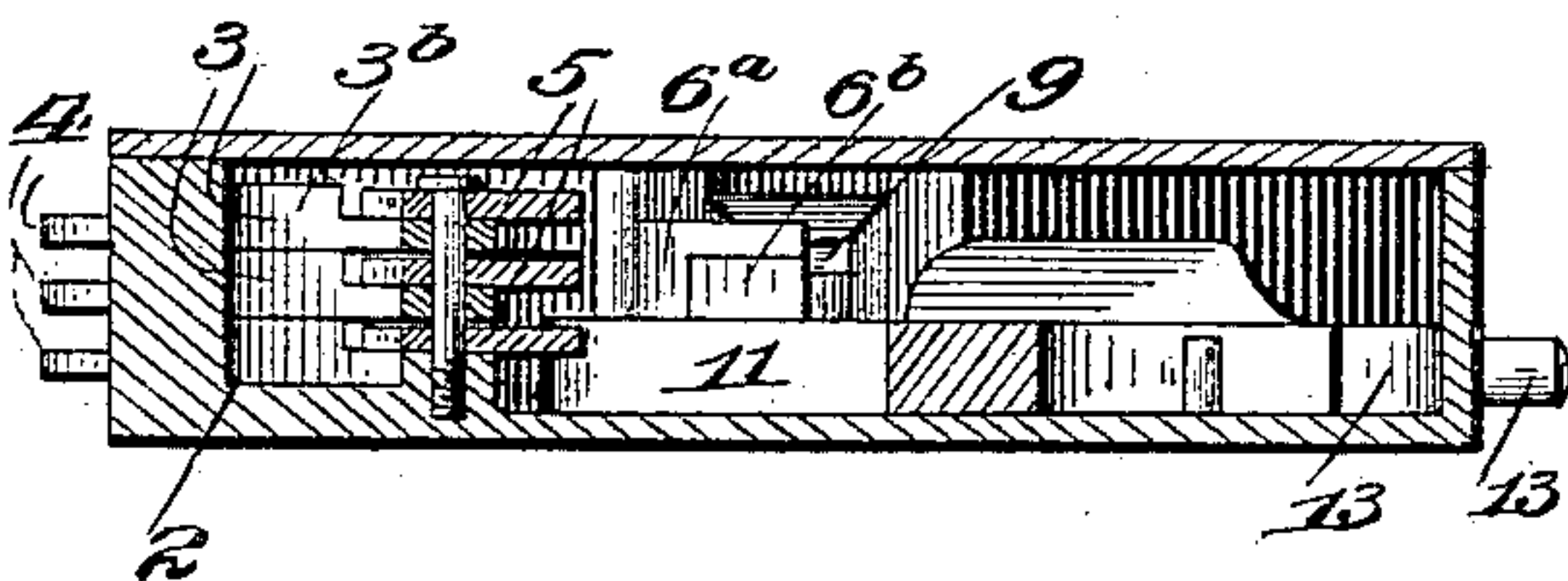


Fig. 6.

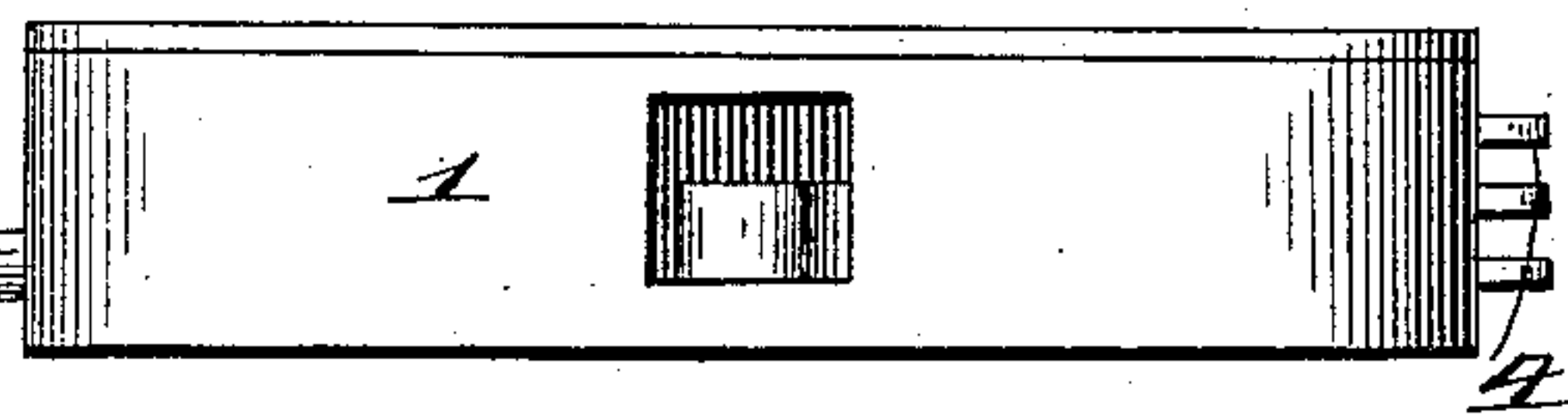


Fig. 7.

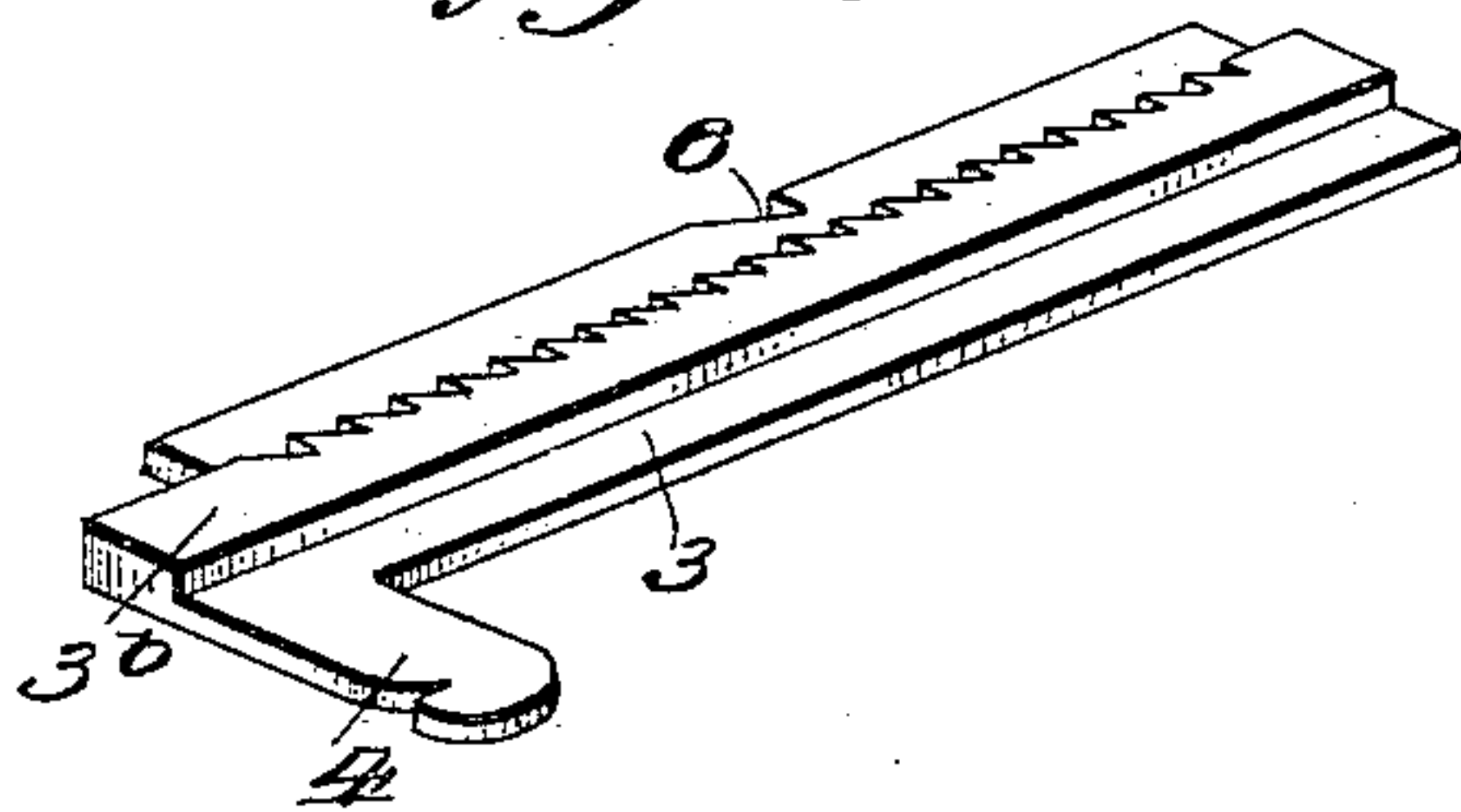
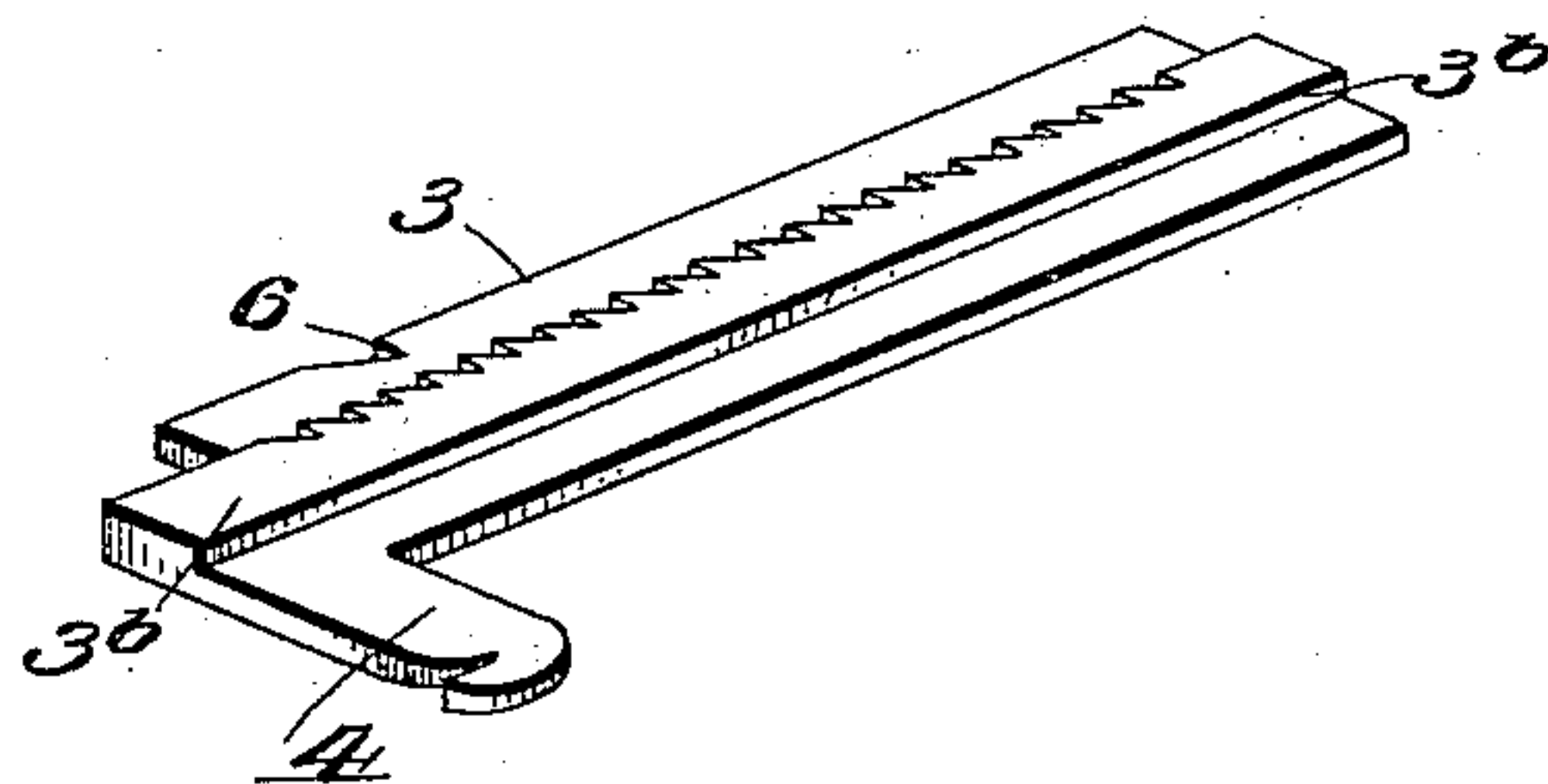


Fig. 8.



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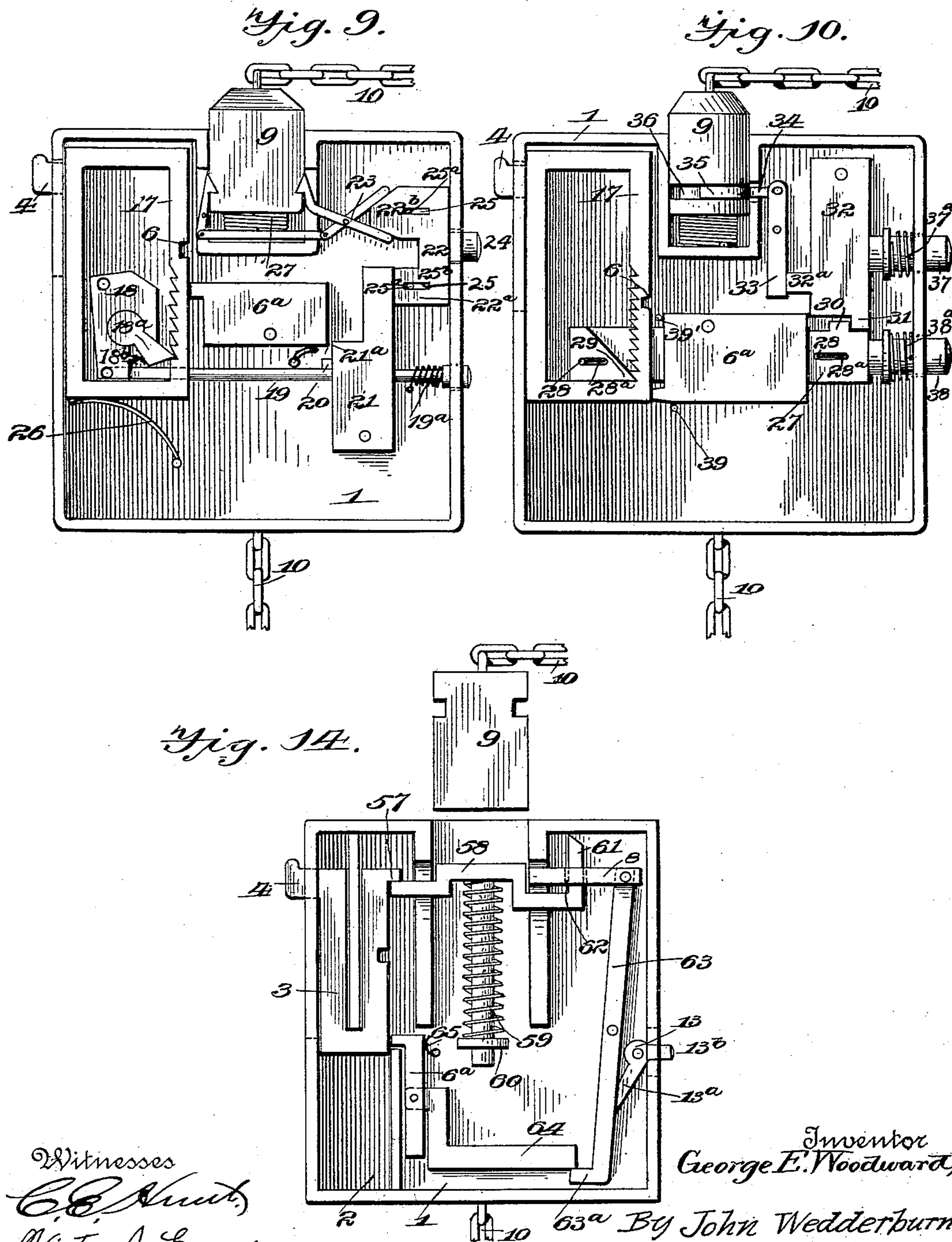
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4 Sheets—Sheet 3.



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4 Sheets—Sheet 4.

Fig. 11.

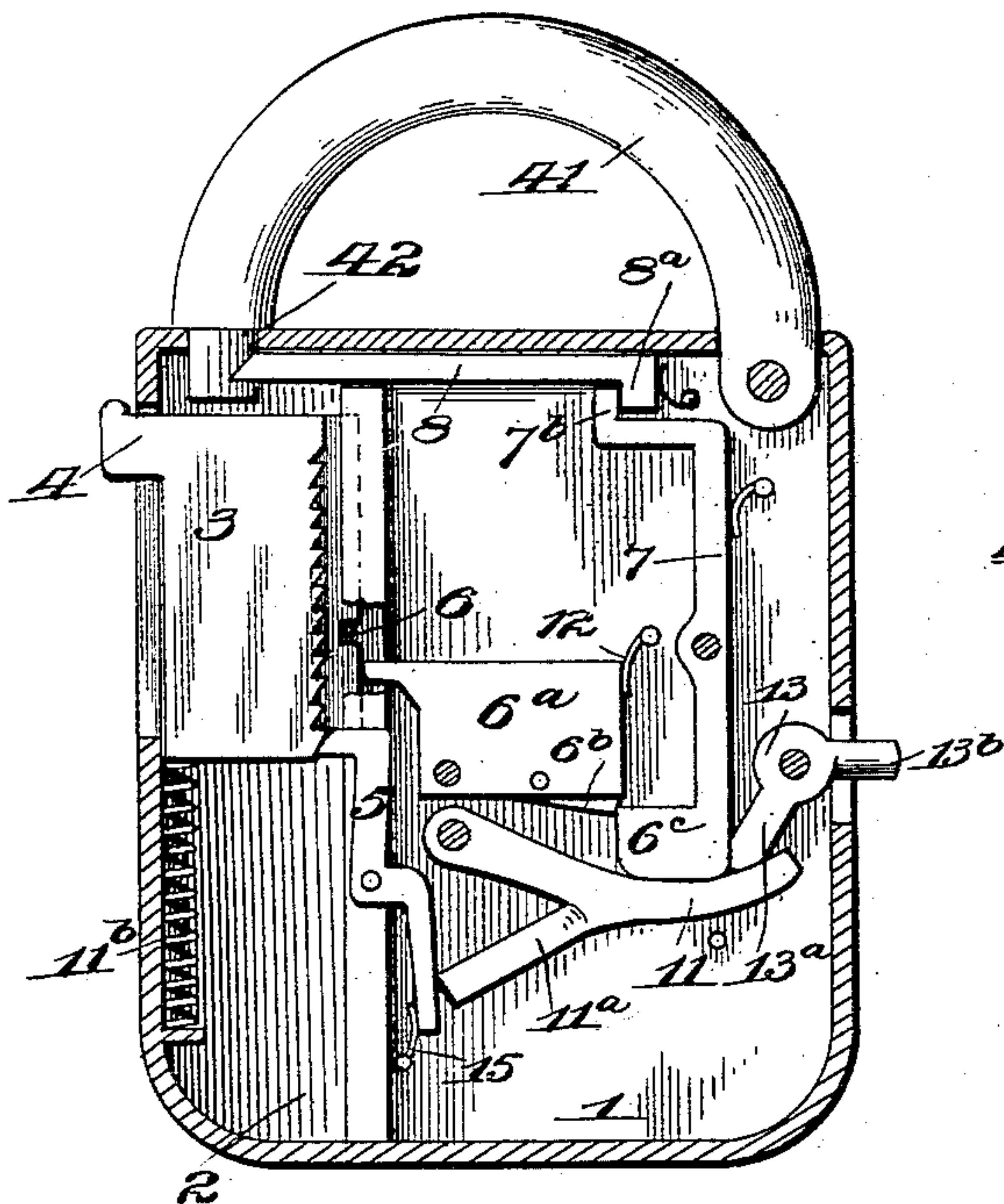


Fig. 12.

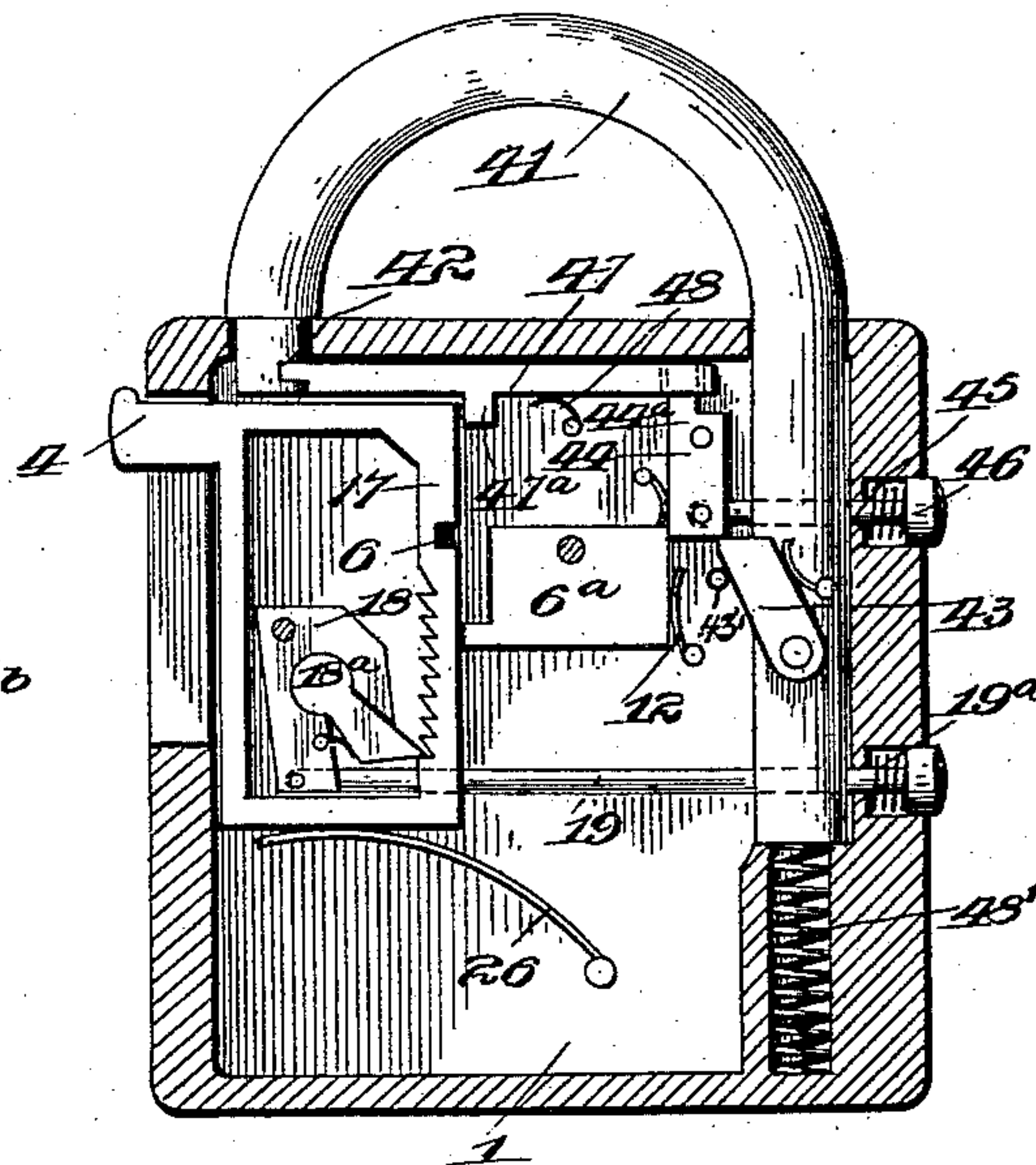
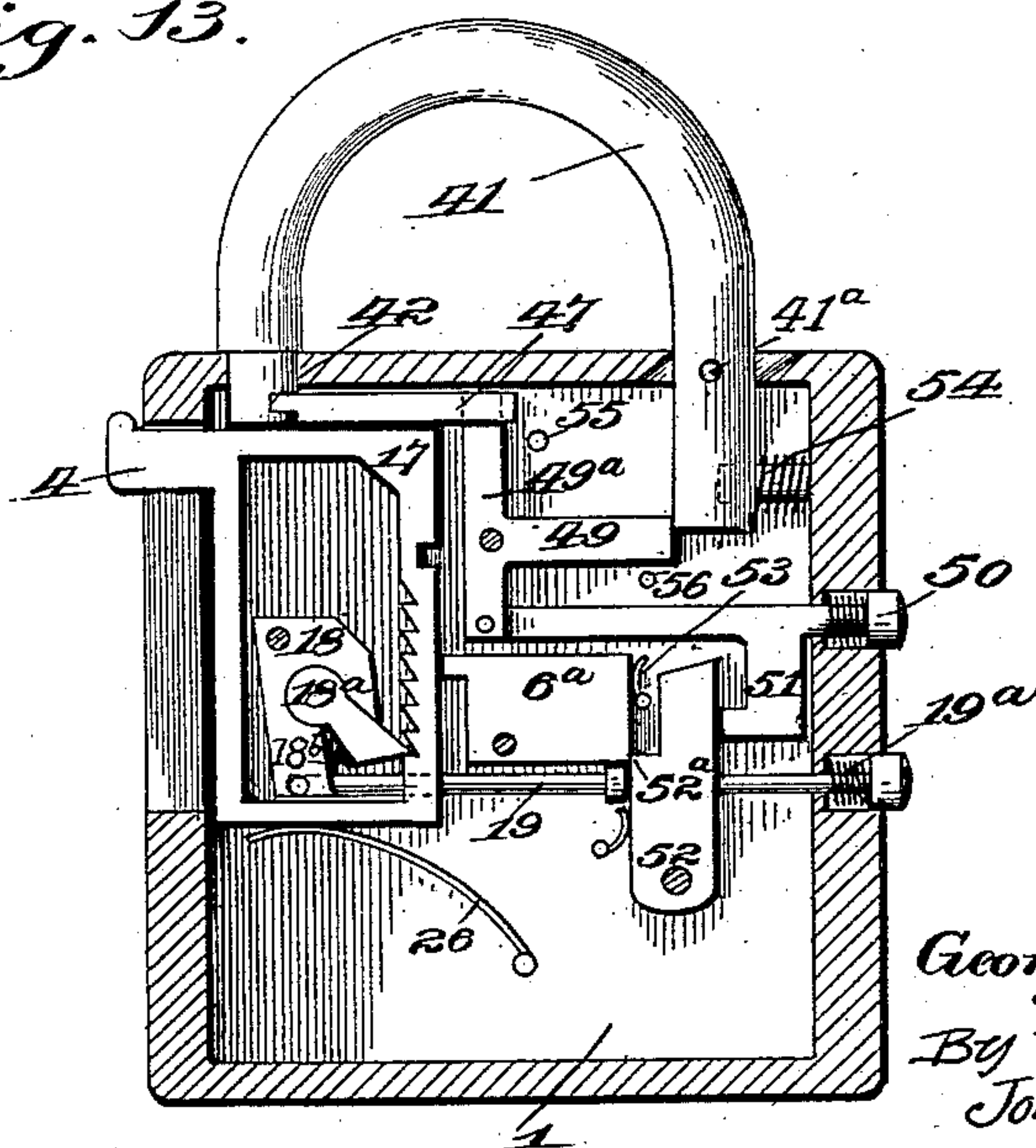


Fig. 13.



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UNITED STATES PATENT OFFICE.

GEORGE E. WOODWARD, OF MIDDLEBOROUGH, MASSACHUSETTS.

PERMUTATION-PADLOCK.

SPECIFICATION forming part of Letters Patent No. 616,647, dated December 27, 1898.

Application filed April 10, 1897. Serial No. 631,530. (No model.)

To all whom it may concern:

Be it known that I, GEORGE EDWARD WOODWARD, a citizen of the United States, residing at Middleborough, in the county of Plymouth and State of Massachusetts, have invented certain new and useful Improvements in Keyless or Combination Padlocks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in combination-locks which may be used for various purposes, the object being to provide a combination-lock which is simple and inexpensive in construction and which is so arranged that the possibility of opening the lock unless familiar with the combination is greatly lessened.

The invention comprises certain novel features of construction and arrangement of parts whereby the above and other important advantages are attained, as will be hereinafter fully described, and specifically defined in the appended claims.

In the accompanying drawings, Figure 1 represents a side elevation of the interior of a lock constructed in accordance with my invention, showing the parts in their locked or normal position. Fig. 2 is a similar view of the same, showing the parts in unlocked position. Fig. 3 is an edge elevation from the side where the combination devices are located. Fig. 4 is a similar view, but looking from the side opposite that of Fig. 3. Fig. 5 is a transverse section on the line 5 5 of Fig. 1. Fig. 6 is a view of the upper end of the lock, as shown in Fig. 2, the locking-block being removed. Figs. 7 and 8 are detail perspective views of the combination devices removed. Figs. 9 and 10 are modified forms of my invention. Figs. 11, 12, and 13 are views showing my invention used in the form of a padlock. Fig. 14 is a still further modified form to be described.

Similar reference-numerals indicate corresponding parts in all the figures of the drawings.

1 represents the casing of the lock, which may be of any desired or convenient shape, shown in this instance, however, as substan-

tially rectangular. At one side of the casing is arranged a guideway 2, which receives within it a series of combination devices, consisting of a plurality of slides 3, arranged one above the other, each being provided with projections or finger-pieces 4, which protrude through the end of the casing and slide within slots formed therein. These finger-pieces serve as a convenient means to move the combination devices to set them in position for unlocking. The slides 3 are formed with raised portions 3^b, which set back from the edge, and are provided with a series of teeth which engage locking devices, comprising a plurality of spring-pawls 5, pivotally arranged within the casing and corresponding in number to the number of slides used. These pawls serve to hold the slides until a depression 6, formed therein, is brought into line or registers with the finger of the dog 6^a, pivotally arranged within the casing. When all the slides are moved to bring their depressions into register with the finger of the dog, as above mentioned, the latter will enter therein and allow the outer end to move out of the path of the end of a lever 7, pivotally connected to the casing, as clearly shown. This lever is normally held away from the engagement with the end of the dog, and its opposite end carries a locking-bolt 8, which slides in suitable guideways, and is adapted to engage the shouldered end of a plug 9. This plug has attached to it one end of a chain 10, which in practice may be wound around the object to be locked, the opposite end of the chain being attached in any convenient manner to the outside of the casing.

An arm 11 is pivotally secured to the casing below the dog 6^a and has a downwardly-inclined extension 11^a, which is sufficiently long to embrace the extended ends of all the pawls 5, so that by a depression of the arm 11 the pawls will be moved simultaneously to disengage them from the teeth of the combination devices, which will then return to their normal position through the agency of the springs 11^b, located above each slide.

The dog 6^a is provided with a latch 6^b, which is normally in the path of the extension 6^c on lower end of the lever 7, and this prevents an inward movement thereof and the consequent

release of the plug until the depressions of the combination devices are brought into line with the finger of the dog, at which moment the spring 12 will serve to oscillate the dog 6^a to permit of the movement of the lever 7 to withdraw the bolt 8 from engagement with the shouldered end of the plug, and thus release it. A tripping device 13 is pivotally arranged within the casing 1, and comprises a hub having fingers 13^a and 13^b projecting therefrom, the former normally resting against the edge of the lever 7 and above the free end of the arm 11, and the latter, protruding through a suitable opening in the edge of the casing, serves as a suitable finger-piece to be grasped by the hand in moving it to push forward the lever 7 or oscillate the arm 11 to withdraw the bolt or release the pawls, as will be readily apparent.

A lever 14^a is pivoted within the casing below the plug 9 and is normally pressed outward by a spring 14, so that when the bolt 8 has been withdrawn from contact with the shouldered end of the plug the plug will be forced out instantly, so that no danger of it being locked again is incurred. Springs 15 and 16 are also provided, the former to keep the pawls pressed forward against the toothed portion of the slides 3 and the latter to keep the bolt 8 normally pressed forward. This arrangement will also serve to keep the lower end of the lever 7 normally drawn back out of engagement with the dog, or an independent spring may be used for the latter purpose, as indicated at 7^a.

In case the slides are moved by any one not familiar with the combination and the depressions therein moved beyond the finger of the dog an upward movement given to the tripping device will cause the finger 13^a to press against the free end of arm 11, causing its extension 11^a to move the extended ends of the pawls 5 to disengage them from the teeth of the slides 3, allowing them to be forced back to their normal position through the agency of the springs located above them, as above referred to.

The edge of the casing where the slides are located and in which the fingers of the combination devices move is provided with a series of graduations, each representing the length of one tooth of the slides 3. This serves as a guide to bring the depressions of the slides 3 into exact line or register with the finger or dog 6^a, thus enabling the user to quickly bring the parts in proper position to unlock. For example, assuming that the lock is provided with three slides and the combination is set for "357," the finger-piece of the first slide will be moved to bring three of its teeth beyond the contact-point with the pawl and the second and third slides will be moved five and seven teeth, respectively, which will bring the depressions in line with the projecting portion of the dog 6^a, thus permitting the latter to oscillate and lift the latch 6^b above the lower end of the lever 7, and thus permit-

ting the said lever to be moved by means of the tripping device 13 13^b to withdraw the locking-bolt 8 and release the plug 9.

In Fig. 9 I have shown a slightly-modified form of the parts, but in the main they operate in a somewhat similar manner to those above described. The teeth of the combination-slides, in this instance, are formed upon the inner edge of one side of a skeleton frame 17, and the pawls are located within the opening formed between the sides of the said skeleton frame. These pawls comprise blocks 18 and in number correspond with the number of slides used, being pivotally secured to the casing and provided with sockets to receive pawls 18^a, provided with springs 18^b, the said pawls 18^a engaging the teeth of the combination devices.

Bars 19 are pivotally secured to the lower end of the blocks 18, and their outer free ends pass through suitable openings at one end of the casing. These rods 19 are normally pressed outward by the springs 19^a, so that the spring-pawls 18^a will engage the teeth of the combination devices, and one of the said rods is provided with a finger 20, located in front of a tumbler 21, pivotally arranged within the casing, the intermediate portion of said tumbler being formed with a shoulder 21^a, which normally rests in a line with the corner of the dog 6^a.

A slide 22 is arranged above the rod 19, having extended ends 22^a and 22^b, the former resting behind the upper free end of the tumbler 21, and the latter, which has a beveled end, engages the ends of levers 23, pivotally secured to the casing. The opposite ends of these levers are connected to lever-catches which normally protrude through the casing into the socket that receives the plug 9 and secures the latter in place. The slide 22 is provided with a central finger-piece 24 and with slots 25 to receive therein pins 25^a, which serve as guides to keep the plate in its proper position within the casing.

As the combination devices are moved to bring their depressions into line or register with the finger of the dog the latter is free to be moved by a spring placed under its lower right-hand corner, thus permitting the tumbler 21 to oscillate, and also permitting inward movement of the slide and rods, which will withdraw the catches from engagement with the shouldered end of the plug 9 and the disengagement of the pawls 18^a with the teeth of the combination devices, which are thereupon returned to their normal position through the agency of the springs 26, located beneath them. A release of pressure upon the slide and rods will cause the projection 20 on the rod 19 to move the tumbler 21 back again, so that its shoulder 21^a will lie out of the path of the dog 6^a, allowing the latter to assume its normal position. This backward movement of the tumbler will serve to move the plate 22 so as to withdraw the beveled extension from pressure against the ends of the le-

vers 23, and thus the catches will again lie in the path of the plug, ready to engage behind the shoulders thereof. The spring 27 may be arranged at the end of the plug-receiving socket, so that after the catches have been released in the manner just described it will throw the plug out, as will be readily understood.

In Fig. 10 I have shown another modified form, which makes the lock particularly applicable as a bicycle-lock. This construction is somewhat simplified, but I use the same arrangement of skeleton combination devices just referred to and provide a series of slides 27, which are movably arranged within the casing and are guided therein by means of the pins 28, which pass through elongated openings 28^a at each end of the slides, and each slide is formed with a tooth 29 to engage with its respective combination device. One or all of the slides may be provided with a projection 30, which will lie in a direct line with an extension 31 of an arm 32, pivotally arranged within the casing, the lower end of which rests below the corner of the dog 6^a. This arm 32 is also provided with a lateral projection 32^a, which normally rests against the free end of a lever 33, pivotally secured to the casing, the opposite end of which lever connects with the extended end 34 of a yoke 35, which is so arranged within the socket as to engage an annular groove 36 in the plug. Push-buttons 37 and 38 are arranged within the end of the casing and are normally pressed outward by springs 37^a and 38^a, the former being arranged in a direct line with the arm 32, and the latter in line with the plates 27, so that when the combination devices have been moved to bring the depressions into line or register with the tooth of the dog these buttons may be moved to release the plug and combination device, as will be obvious. In order to prevent tampering with this lock by any person other than those to whom the combination may be known, it is necessary to arrange the parts so that they may not be moved to withdraw the yoke 35 from engagement with the groove in the plug. This I accomplish by pivotally arranging the dog so that its tendency at the side where its corner projects above the lower end of the arm 32 is to fall; but this is of course prevented by reason of the tooth of the dog bearing against the edge of the combination device, and to prevent an upward movement of the dog, which would occur if the push-button 37 were pressed inwardly, I provide a pin 39, located below the toothed end of the dog, and a pin 39' opposite the upper inner end of said dog. Thus as the combination devices are moved to bring their depressions into proper line with the tooth, as before mentioned, the corner of the dog will drop below the end of the frame 32, in which position the buttons may be pressed inwardly to release the yoke and combination-slides, as will be apparent. The projections 30 on

the end of the plates 27 will then engage with the extensions 31 on the end of the frame 32, and thus bring the latter back again to its former position.

In Fig. 11 I have shown the parts arranged when used in connection with the padlock, wherein the shackle 41 is pivoted to the casing. The parts are arranged in a similar manner to those described in connection with Figs. 1 to 8 of the drawings, except that the end of the lever 7 is provided with a projection 7^b, which rests behind a shoulder 8^a, formed on the end of the locking-bolt 8, whose opposite end is beveled in the usual manner to engage the depression 42, located at the free end of the shackle 41. This locking-bolt will of course be pressed forward by means of a spring or in any other suitable manner.

In Fig. 12 I have shown another modified form of parts used in connection with a padlock, wherein the shackle is bodily movable. In this construction the parts are very much similar to those described with relation to Fig. 9, using the same arrangement of skeleton combination devices, pawls to engage the teeth of the same, and spring-retained plates to keep the said pawls into engagement with the teeth. The shackle is provided with a spring dog or pawl 43, pivotally arranged thereon and normally resting against a fixed stop 43' below an arm 44, to which is secured the shank 45 of a push-button 46, which protrudes through an opening in the casing. The arm 44 is pivotally secured to the casing and has a reduced extension 44^a, which engages an open slot in a locking-bolt 47, the outer free end of which engages a depression 42 in the end of the shackle, and the locking-bolt is formed with a shoulder 47^a, which lies adjacent to the upper corner of the skeleton combination devices and serves to prevent a forward movement of the same. A spring 48 engages the said locking-bolt from below and prevents a downward movement thereof after the combination devices have been moved downwardly. The outward movement of the shackle is prevented by reason of the pawl or dog 43 engaging below the arm 44, and the engagement of the end of the bolt 47 with the depression 42 in the end of the shackle; but as the combination devices are moved to bring the depressions therein into line with the finger of the dog the latter will fall so as to bring its corner, which normally lies in the path of the arm 44, below it, so that the inward movement of the push-button 46 will be permitted. This movement causes the lower end of the arm 44 to pass out of line with the pawl or dog 43 and withdraws the bolt from engagement with the depression in the shackle, thus admitting of the partial removal of the latter from the casing. Suitable springs are arranged so as to keep the dog in its proper position against a stop 43 and to keep the combination devices and push-button 46 pressed normally upward

and outward, and a spring 48' is arranged below one end of the shackle, so as to throw the latter outwardly the moment the parts are released.

5 In Fig. 13 I have shown a further modification of the parts when arranged in connection with a padlock having the shackle pivotally secured thereto, as at 44^a. This shackle is provided with a depression at its end, with
10 which the locking-bolt engages, and the opposite end projects into the casing somewhat below its pivotal point, and this lower projecting end lies in the path of an intermediate extension 49 of a lever 49^a, pivotally secured
15 to the casing, one end of which engages with the locking-bolt and the other end with the shank of a push-button 50. The shank of the push-button 50 has an extension or finger 51, which bears upon the upper free end of a
20 pivotally-secured arm 52, a shoulder 52^a on which engages the lower corner of the dog 6^a, thus preventing any inward movement of the push-button 50, and consequent releasing of the shackle; but as the combination devices
25 are operated to bring the depressions into line with the tooth of the dog, as before described, its corner, through the agency of the spring 53, will rest above the shoulder 52^a and permit of the inward movement of the push-button 50,
30 which, through its connection with the lever 49^a, will cause the locking-bolt to be withdrawn and the extension 49 lowered beneath the extended end of the shackle. This operation releases the pawls which engage the
35 teeth of the combination devices, and it also allows of the lower extended end of the shackle being moved inwardly through the agency of a spring 54, causing its outer free end to be withdrawn from the opening made therefor
40 in the casing. Stops 55 and 56 are arranged within the casing to limit the movement of the shackle and extension 49, and springs are arranged in connection with the shank of the push-button to normally keep it pressed out-
45 ward, and, as will be observed, the opening in the lock-casing adjacent to the pivotal point of the shackle is splayed or beveled in order that the shackle may have a free movement therein.

50 In Fig. 14 I have shown a still further modified form of lock. In this construction the combination devices are arranged to operate in substantially the same manner as those hereinbefore described; but their inner
55 ends are provided with teeth 57, which are arranged above a bar 58, moving in slots located in the sides of the socket to receive the plug and lies transversely therein. This bar is normally pressed outward by means of a
60 spring 59, which engages thereunder, and rests upon a bracket 60, located within the casing, and one end of the bar 58 is bent upward at 61 and passes through an opening 62 in the locking-bolt and serves to keep the
65 latter normally withdrawn when the bar 58 is in its highest position. The locking-bolt connects with one end of a lever 63, pivotally

arranged within the casing, the opposite end of which is provided with a lateral projection 63^a, which takes under one end of a pivotally-
70 arranged finger 64 when the bolt engages the depressions in the socket. The finger 64 is pivotally connected to the dog 6^a, the lower end of which latter bears against the side of the vertical arm of the finger 64, so that when
75 the depressions in the combination devices are brought into register with the tooth of the dog the outer free end of the finger 64 will be caused to rise beyond the lateral projection 63^a of the lever 63, so that an operation of the
80 tripping device will withdraw the locking-bolt, and thus release the plug. A spring 65 is arranged so as to keep the finger and dog in their normal or operative position, so that the finger 64 may be brought into the path of
85 the lever 63 and prevent the withdrawal of the bolt, as will be readily understood.

It is evident that while I have shown many forms of mechanism to accomplish the desired results it must be evident that the differences are very slight, while the principle is closely sustained in each modification; and it is still further obvious that numerous other modifications can be made without departing from the essential features of my invention,
95 and I do not wish to be understood as limiting myself to the precise details of construction herein shown and described, reserving the right to make such other changes and alterations therein as may fairly fall within its
100 spirit and scope. It will also be seen that my invention provides a lock which is durable in construction, simple in operation, yet difficult to be opened unless familiar with the exact combination, the parts being so ar-
105 ranged that they are not liable to get out of order. The lock can be used for numerous purposes, and the combination devices may be multiplied to any extent, in which event it becomes, as will be readily understood,
110 more difficult to tamper with, but at the same time for ordinary use it might consist of but two combination devices and yet be difficult to open.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is as follows:

1. A lock for the purposes described, comprising a casing, combination devices located in said casing, each device being provided
120 with a depression and with a finger-piece projecting from the casing and a series of teeth, locking devices engaging said teeth, a dog adapted to engage the depressions in the combination devices when brought into line or
125 register therewith to release the locking-bolt, and means to release the locking devices and withdraw the bolt, substantially as described.

2. A lock for the purposes described, comprising a casing, combination devices located
130 within said casing, each device being provided with a depression and a series of teeth, a dog pivotally arranged in said casing and provided with a finger adapted to engage the

depressions in the combination devices when brought into line or register therewith, a lever pivoted in said casing, one end of said lever engaging a locking-bolt, and the other end adapted to engage the dog and prevent the withdrawal of the bolt, and means to release the locking devices and withdraw the bolt, substantially as described.

3. A lock for the purposes described, comprising a casing having a guideway at one side thereof, combination devices adapted to move in said guideways, each device being provided with a finger-piece adapted to protrude through slots in the end of the casing and with a depression and a series of teeth, locking devices comprising a plurality of spring-pawls adapted to engage the teeth of the combination devices, a dog pivotally arranged within said casing having a finger thereon adapted to engage the depressions in the combination devices when brought into proper line or register therewith, the said dog being provided with a spring-latch, a lever pivotally secured to said casing one end of which engages a locking-bolt and the other free end lying in the path of the dog when the combination devices are in their normal position, and means to release the locking devices, and move the said lever to withdraw the locking-bolt when the combination devices have been properly moved, substantially as described.

4. A lock for the purposes described, comprising a casing having a guideway at one side thereof, combination devices adapted to move in said guideways, each device being provided with a finger-piece adapted to move through slots in the end of the casing and with a depression and a series of teeth, springs to keep said combination devices in an unset or normal position, locking devices comprising a plurality of spring-pawls adapted to engage the teeth of the combination devices, a tripping-arm arranged to release said pawls, a dog pivotally arranged within said casing having a finger thereon adapted to engage the depression in the combination devices when brought into proper line or register therewith, said dog being provided with a spring-latch, a lever pivotally secured to said casing one end of which engages a locking-bolt and the other free end adapted to engage the said spring-latch when the combination devices are in their normal position, to prevent the removal of the locking-bolt, and means to move said lever to withdraw the locking-bolt when the combination devices have been properly moved, substantially as described.

5. A lock for the purposes described, comprising a casing having a guideway at one end thereof, combination devices consisting of a plurality of slides, each slide being provided with a finger-piece adapted to move through slots in the end of the casing, and with a depression and a series of teeth, springs to keep said slides in an unset or normal po-

sition, graduations arranged on the end of the casing to serve as guides in setting the combination, locking devices, comprising a plurality of spring-pawls adapted to engage the teeth of the combination devices, a tripping-arm arranged to release said pawls, a dog pivotally arranged within said casing having a finger thereon adapted to engage the depression in the slides when brought into proper line or register therewith, a lever pivotally secured to said casing, and held against movement by engagement with the dog, the other end of said lever engaging the locking-bolt, a plug having a shoulder to engage said locking-bolt, a chain engaging said plug with the casing, and a tripping device adapted to move the lever and arm to release the slides and withdraw the bolt after the slides have been moved to bring their depressions into line or register with the tooth of the dog, substantially as described.

6. A lock for the purposes described, comprising a casing having combination devices located therein, spring-pawls to engage said combination devices, a pivotally-arranged lever, a dog pivotally arranged within said casing and adapted to move out of the way of said pivotally-arranged lever when the combination devices are set to withdraw the bolt engaged by one end of said lever, a pivotally-arranged arm bearing upon the outer free end of the locking devices, a tripping device having a finger adapted to engage with said lever and arm to operate the same simultaneously by a movement in one direction thereof, and to operate the arm to release the locking devices by an opposite movement thereof, a plug having a depression adapted to engage with the end of the locking-bolt, and a spring located within a socket behind the plug and serving to force it outwardly when released by the locking-bolt, substantially as described.

7. A lock for the purposes described, comprising a casing having combination devices located therein, spring-pawls to engage said combination devices, a pivoted lever, a dog pivotally arranged within said casing adapted to move out of the way of the pivotally-arranged lever when the combination devices are set to withdraw the bolt adjacent to the other end of said lever, an arm adjacent to the outer free end of the combination devices, a tripping device adapted to engage with said lever and combination devices to withdraw the bolt and release the combination devices, substantially as described.

8. A lock for the purposes described, comprising a casing having combination devices consisting of a plurality of slides each having a series of teeth and a depression therein, locking devices adapted to engage said teeth, arms arranged adjacent to said locking devices by means of which the locking devices may be released from the teeth of the slides, a dog pivotally arranged within said casing, and having a finger adapted to engage in said depressions when brought into line

therewith, a pivotally-arranged lever normally in the path of said dog when the combination devices are unset or in their normal position, a tripping device arranged to move
5 within said casing to release said locking devices, and withdraw the bolts from engagement with the shoulder of the plug, and springs to return the parts to their normal position, substantially as described.
10 9. A lock for the purposes described, comprising a casing having combination devices and adapted to engage spring-pawls, arms connecting with said pawls and adapted to release the same when desired, a dog having
15 a finger thereon and normally resting in the path of a pivotally-arranged lever capable of

being brought out of the path thereof when the combination devices have been moved out of the path of the said lever, a tripping device arranged adjacent to the said lever
20 and adapted to be operated from the outside to move the lever out of the way to withdraw the locking-bolt and unlock the lock, substantially as described.

In testimony whereof I have signed this
25 specification in the presence of two subscribing witnesses.

GEORGE E. WOODWARD.

Witnesses:

EGBERT V. WARREN,
JAMES E. MCMANN.