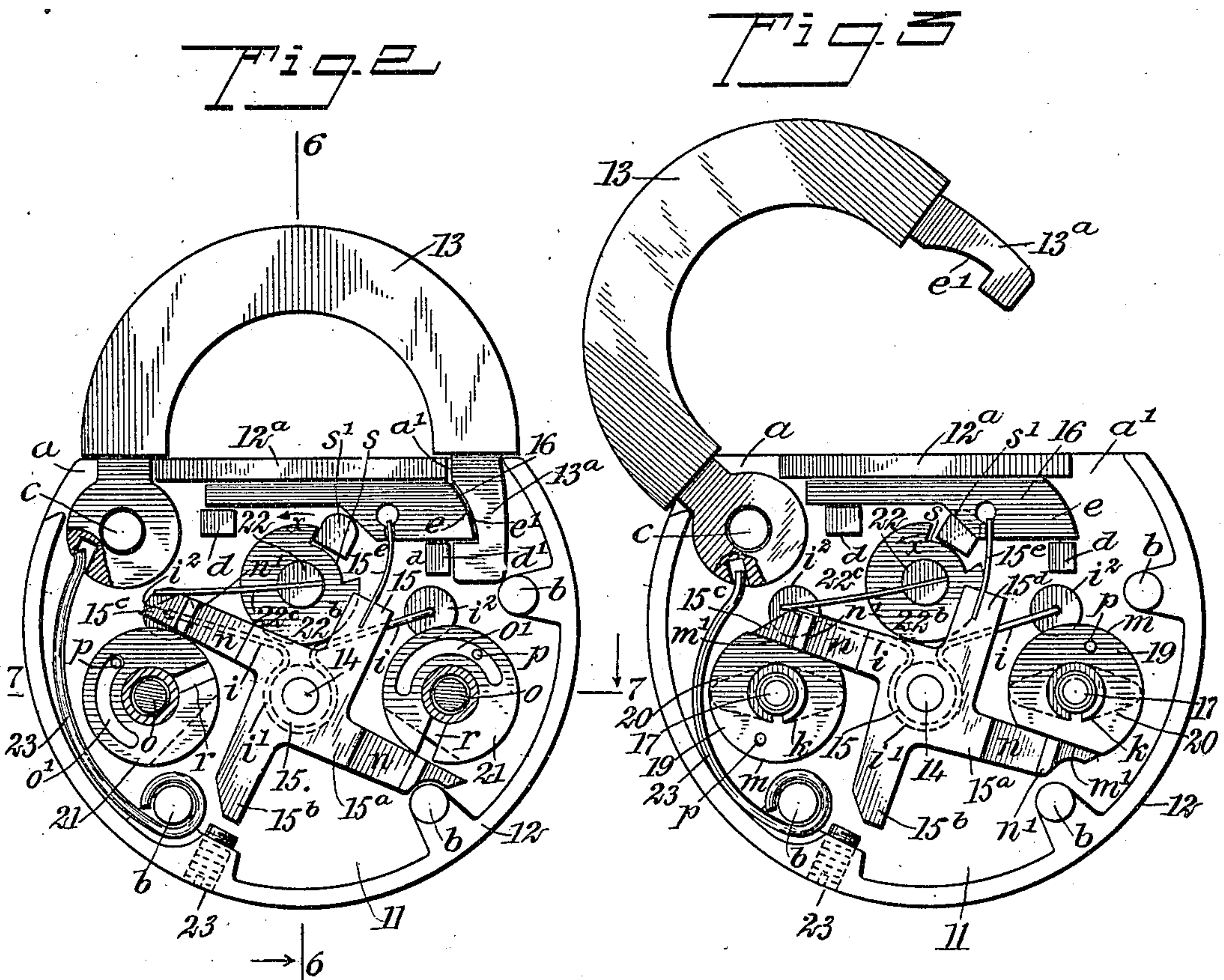
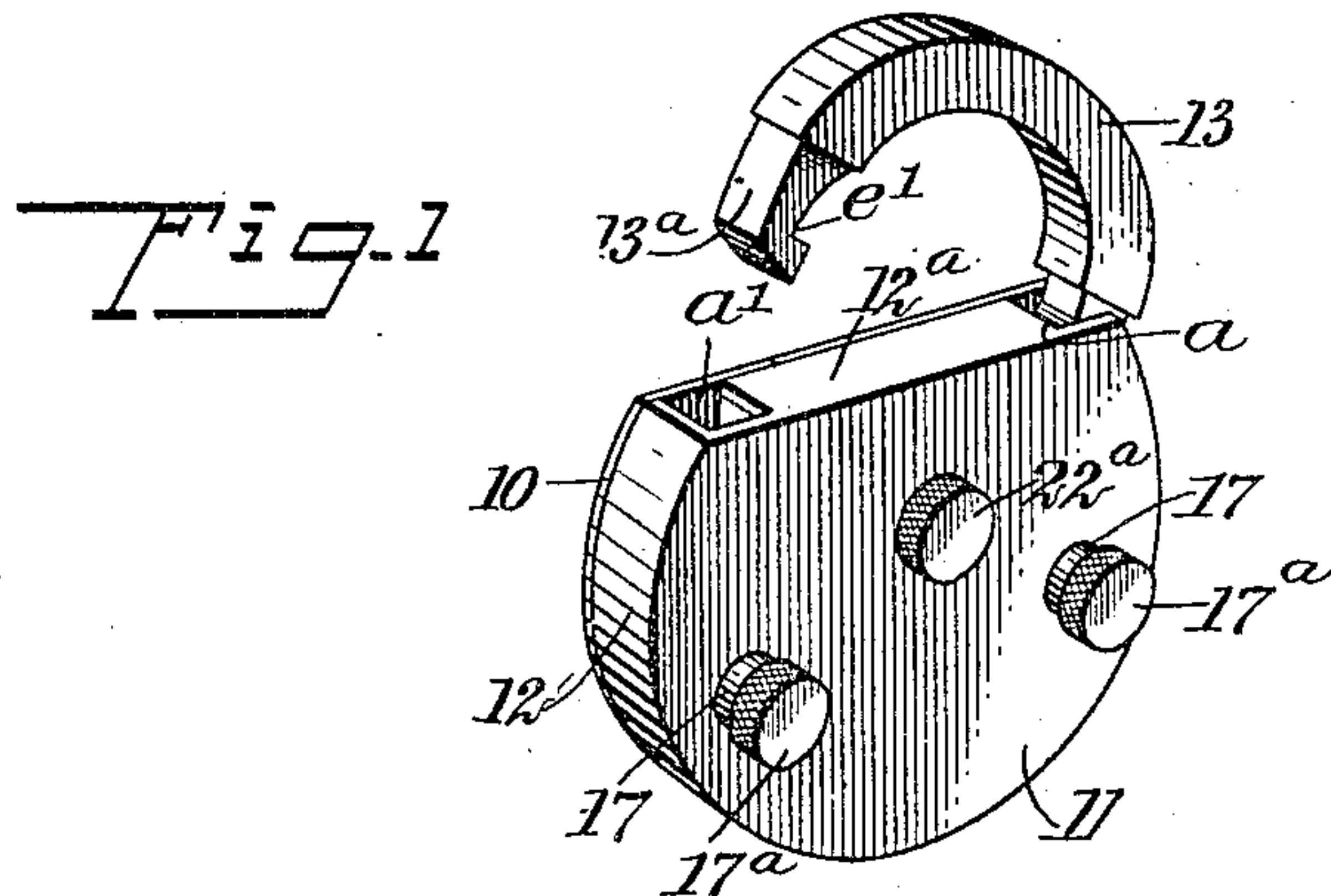


No. 825,735.

PATENTED JULY 10, 1906.

O. KATZENBERGER.  
PERMUTATION LOCK.  
APPLICATION FILED AUG. 24, 1905.

2 SHEETS—SHEET 1.



WITNESSES:

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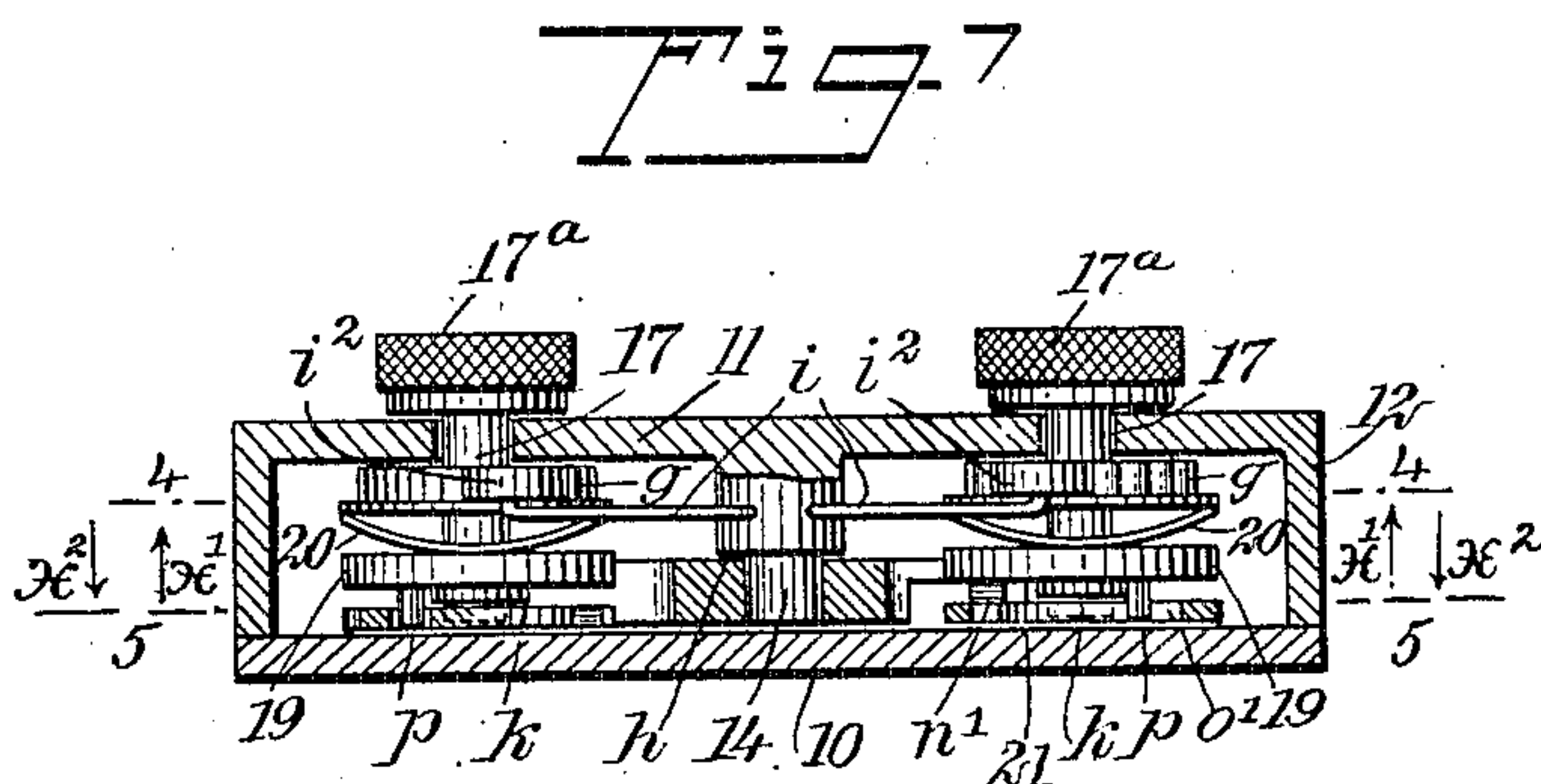
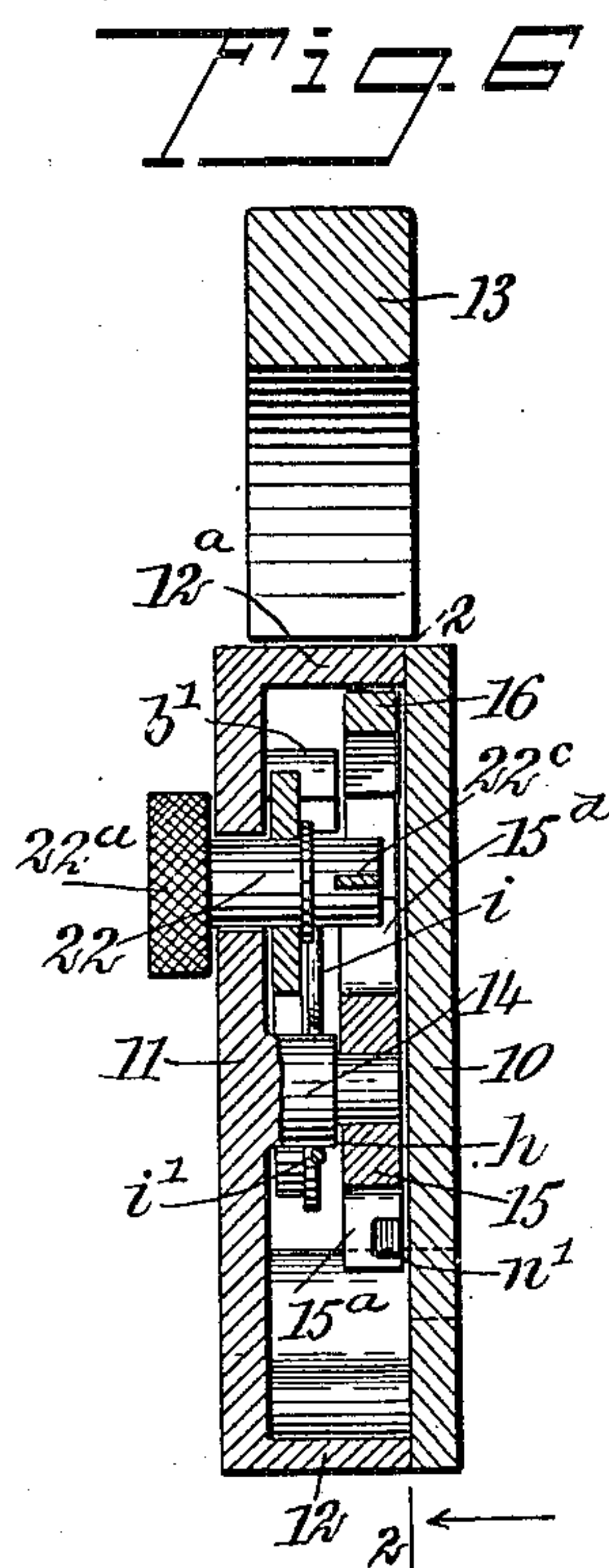
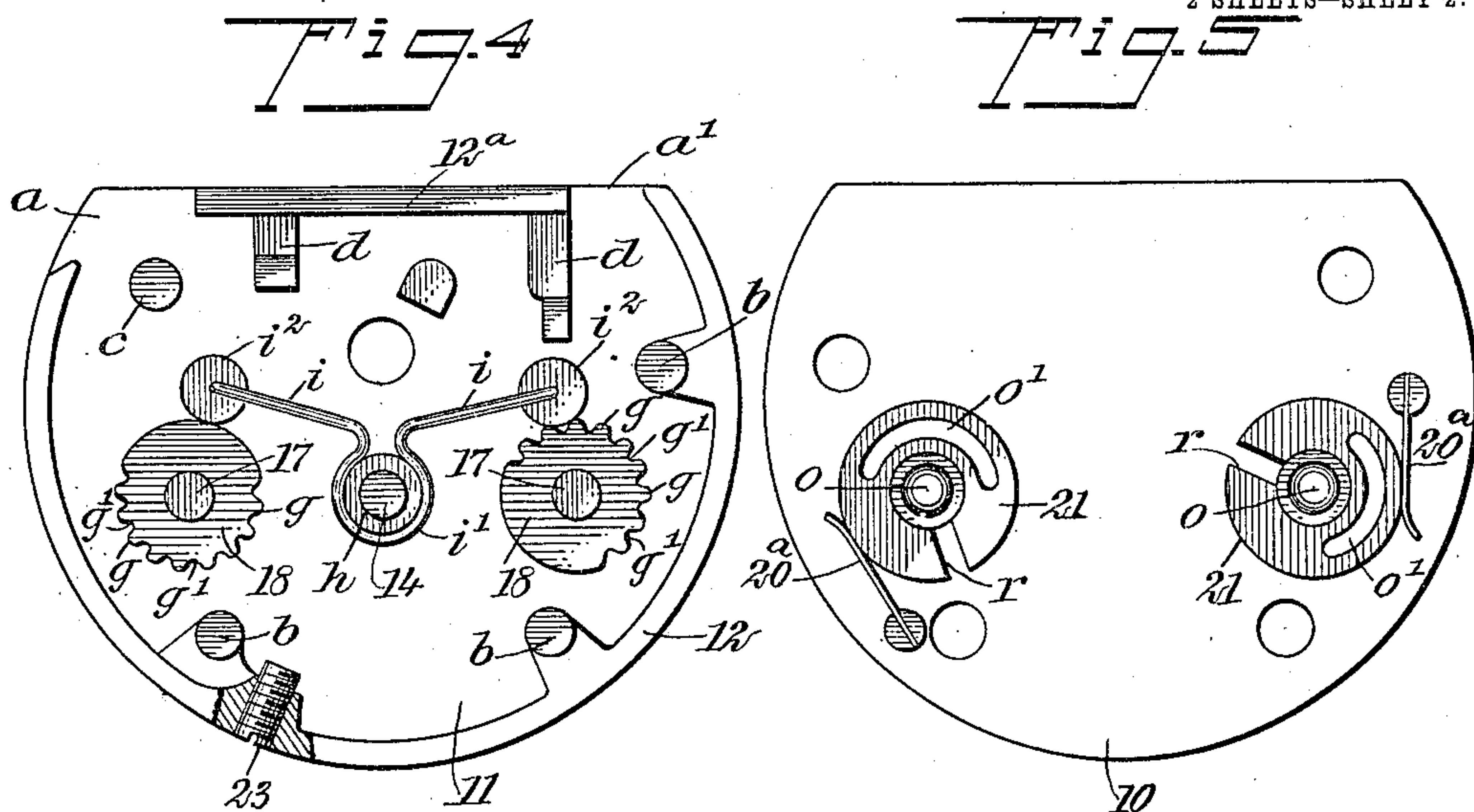
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2 SHEETS—SHEET 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

OSCAR KATZENBERGER, OF SAN ANTONIO, TEXAS.

## PERMUTATION-LOCK.

No. 825,735.

Specification of Letters Patent.

Patented July 10, 1906.

Application filed August 24, 1905. Serial No. 275,555.

*To all whom it may concern:*

Be it known that I, OSCAR KATZENBERGER, a citizen of the United States, and a resident of San Antonio, in the county of Bexar and State of Texas, have invented certain Improvements in Permutation-Locks, of which the following is a full, clear, and exact description.

This invention has for its object to provide novel details of construction for a permutation-lock, and more particularly to improve and simplify the construction of the lock patented by me November 24, 1903, No. 745,064, said improvements being also applicable to various locks of the class indicated, in which the features of novelty may be advantageously embodied, thus providing a very simple lock that is convenient to operate, may be unlocked in the dark by the sense of touch or by sound of impinging parts, or by both means.

The features of the present improvement are particularly well adapted for use as working parts of a padlock and to illustrate their application and operation are represented as applied to form a lock of that character.

In the drawings, which represent the construction and adjustments of parts for locking and unlocking the same, similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a perspective view of the padlock in opened condition. Fig. 2 is an enlarged partly-sectional side view of the lock on the line 2 2 in Fig. 6, exposing the interior mechanism in locked adjustment, the side wall of the lock-case being removed. Fig. 3 is a view similar to that shown in Fig. 2, but representing the working parts adjusted for release of the shackle-bow. Fig. 4 is a side view of the lock-case, partly in section, on the line 4 4 in Fig. 7, one side wall being removed, together with certain working parts, exposing other details that remain in the case, seen in the direction of the arrows  $x'$  in said figure. Fig. 5 is a partly-sectional side view of details on the line 5 5 in Fig. 7, parts being seen in the direction of the arrows  $x''$  in said figure. Fig. 6 is a vertical transverse sectional view of the lock substantially on the line 6 6 in Fig. 2, and Fig. 7 is a horizontal transverse sectional view substantially on the line 7 7 in Fig. 2.

The lock-case is of the usual form given to padlocks of the class to which this improve-

ment belongs and consists of a back wall 10, a front wall 11, and a curved peripheral wall 12, the latter being preferably formed integral with the front wall and the back wall rendered removable for the convenient introduction of the works of the lock into the case in proper relative positions. There is a straight portion 12<sup>a</sup> formed on the front wall 11 as a section of the periphery, leaving two openings between its ends and those of the curved wall 12, said openings  $a$   $a'$ , respectively, accommodating the ends of a bowed shackle-bar 13. A plurality of studs  $b$  are preferably formed in the lock-case at suitable points, ends of these studs that project from the case serving as rivets for securing the removable back plate or wall 10 upon the rear edge of the peripheral walls 12 12<sup>a</sup> when the case is to be closed.

As shown in Figs. 2 and 3, a pivot-stud  $c$  is secured in the case near the opening  $a$  for pivoting one end of the shackle-bow 13 within the case, free to rock a suitable degree, the opposite end or latch-nose 13<sup>a</sup> rocking into the other opening  $a'$  when the shackle-bow is to be locked fast at both ends within the case. Near the center of the front wall 11 and within the lock-case a pivot-post 14 is erected on said wall of a height to nearly touch the back plate 10 when the latter is secured in place on the lock-case. A preferably four-armed detent-block 15 is employed that is perforated laterally at or near the radial center of its arms, and in said perforation the pivot-post 14 is inserted, thus supporting the detent-block flatwise within the case free to turn on said post. The radial arms 15<sup>a</sup>, 15<sup>b</sup>, 15<sup>c</sup>, and 15<sup>d</sup> on the detent-block 15 are projected nearly opposite each other in pairs. The pair of opposite arms 15<sup>a</sup> 15<sup>c</sup> are somewhat longer than the other pair of arms 15<sup>b</sup> 15<sup>d</sup>, as appears in Figs. 2 and 3, and the arm 15<sup>a</sup> may engage with its outer end an adjacent stud  $b$ , which will limit the rocking movement of said arm in a direction away from the latch-nose of the shackle-bow when it is inserted in the opening  $a'$ . Upon suitable projections  $d$  from the inner surface of the front wall 11 a latch-bolt 16 is supported to slide in loose contact with the peripheral wall 12<sup>a</sup>, and, as shown in Figs. 2 and 3, the end  $e$  of the latch-bolt nearest to the opening  $a'$  is rendered convex and its upper corner removed to facilitate the latching engagement of said end of the bolt 16 with the latch-nose 13<sup>a</sup> on the shackle-bow 13, said nose



having a correspondingly - shaped notch  $e'$  therein, into which the end  $e$  of the latch-bolt may be slid when the shackle-bow is closed, and thus secure the latter in closed condition.

5 The means for controlling the slidable movement of the latch-bolt 16 comprises the following details:

In the front wall 11 at an equal distance from the pivot-post 14 two perforations are  
10 respectively formed and two similar tumbler-shafts 17 are journaled therein, each shaft having a preferably cylindrical head  $17^a$ , which heads have their peripheries rough-  
15 ened to facilitate a rotatable adjustment of said heads and the shafts they are on. Each shaft 17 is of sufficient length to extend to-  
ward the back wall 10, but have a space be-  
20 tween the inner end of the shaft and said back wall. A mainly circular lock-set tumbler-wheel 18 is fixedly mounted upon each shaft  
17 and contacts with the flat inner surface of the front wall 11. In the periphery of each  
lock-set tumbler-wheel 18 a plurality of de-  
25 tent-teeth  $g$  are formed, these teeth being preferably sufficient in number to occupy  
about one-half of the contour of each wheel, and for effective service the teeth are slightly  
tapered toward their outer ends, producing  
essentially V-shaped spaces  $g'$  between them.  
30 The post 14 is of reduced diameter where it is engaged by the four-armed detent-block  
15, and the latter is seated upon the annular shoulder  $h$ , formed on the post by said reduc-  
tion, which supports the detent-block free to  
35 rock in a plane near to and parallel with the back plate or wall 10. On the portion of the  
post 14 that is between the shoulder  $h$  and in-  
ner surface of the front wall 11 a pair of re-  
siliant arms  $i$  are mounted by forming an in-  
40 tegral open spring-coil  $i'$  from the material composing the arms. Said coil that is at the  
center of length of the material clasps the post, and the arms thereon project oppositely to-  
ward and over respective tumbler-wheels 18.  
45 Upon the free end of each arm  $i$  a preferably circular hammer-head  $i^2$  is mounted, these  
heads having enforced engagement with the periphery of the tumbler-wheels 18.

On the inner end of each tumbler-shaft 17  
50 an abutment-disk 19 is removably secured, preferably, by means of a spring-collar  $k$ , that  
engages the end of the shaft in a shallow groove therein, the disks being pressed for-  
cibly against one side of a dished resilient  
55 washer 20, which presses upon the adjacent tumbler-wheel 18, as clearly shown in Fig. 7.  
The disks 19 of similar form each has a mainly circular periphery  $m$ , that is joined with a flat  
portion  $m'$  thereon, and when the parts of the  
60 lock are assembled said flat portions of the peripheries of the disks 19 may be impinged  
upon by a straight edge of a respective arm  
 $15^a$   $15^c$ , which will permit said arms of the de-  
tent-block 15 to rock somewhat toward the  
65 centers of the shafts 17, and obviously if

these shafts are turned so as to cause the cir-  
cular edge portions  $m$  of the abutment-disks  
to ride upon the arms  $15^a$   $15^c$  said arms will  
be rocked farther away from the center of the  
tumbler-shafts 17.

In the rear side of each detent-arm  $15^a$   $15^c$   
70 an open recess  $n$  is formed by removal of the material forming the arms, the thinner por-  
tions that remain about equaling in thickness  
the abutment-disks 19 whereon said portions  
75 of the detent-arms have contact, the arm  $15^a$   
from below and the arm  $15^c$  from above a re-  
spective disk. From the rear sides of each of  
the detent-arms  $15^a$   $15^c$  in the open recesses  $n$   
a tongue  $n'$  projects, these similar tongues  
80 having parallel sides extending across the  
arms, their height being such as to render  
their end surfaces about level with the rear  
sides of the thicker portions of the detent-  
arms.

A locking tumbler-wheel 21, equal in diame-  
ter with that of the abutment-disks 19, is pivot-  
ally supported on the back plate 10 of the case  
respectively opposite one of said disks, their  
thickness permitting said tumbler-wheels to  
90 work freely in the recesses  $n$  and have clear-  
ance edgewise from the arms when the edges  
of the latter are pressed upon by the circular  
edge portion of each abutment-disk 19, as is  
indicated in Fig. 2. Each locking tumbler-  
95 wheel 21, as shown in Figs. 2, 5, and 7, con-  
sists of a flat circular plate of metal cen-  
trally pivoted, as at  $o$ , upon the true inner  
surface of the back wall or plate 10 and hav-  
ing an arcuate slot  $o'$  arranged concentrically  
100 with the pivot and circular edge thereof.

From each abutment-disk 19 a pin  $p$  is pro-  
jected rearwardly, which enters the slot  $o'$  in  
a respective locking tumbler-wheel 21, and  
in the edge of each of said tumbler-wheels a  
105 radial slot  $r$  is formed in a portion of the  
same that is nearly opposite the arcuate slot  
 $o'$  therein, and it will be seen that when the  
detent-arms  $15^a$   $15^c$  have clearance from the  
peripheral edge portions  $m$  on the abutment-  
110 disks 19, or, in other words, engage the flat  
places  $m'$  thereon, the tongues  $n'$ , that nor-  
mally ride upon the edges of the locking  
tumbler-wheels 21, when brought opposite  
the slots  $r$  by a turning movement of these  
115 wheels may enter the slots  $r$ , and thus permit  
the arms  $15^a$   $15^c$  to rock a proper degree to-  
ward the tumbler-shafts 17 for release of the  
latch-bolt 16, as will be hereinafter fully de-  
scribed. To prevent the tumbler-wheels  
120 21 from too free a rotatable movement,  
which would accidentally displace the slot  $r$   
in either wheel in relation to other working  
parts, a finger-spring  $20^a$  is held by one end  
on the back plate 10 and is in resilient en-  
125 gagement with a respective wheel bearing  
upon its periphery, as shown in Fig. 5.

A resilient plate-metal extension-arm  $15^e$   
projects from the end of the detent-arm  $15^d$   
toward and into engagement with the lower  
130



edge portion of the latch-bolt 16, the extension-arm being adapted for transmitting motion from the arm 15<sup>d</sup> to the latch-bolt and causing the latch-bolt to slide toward or from the locking-nose 13<sup>a</sup> on the shackle-bow 13 in accord with the rocking movement of said detent-arm 15<sup>d</sup>.

A third shaft 22 is journaled in a perforation in the front wall 11 of the lock-case, having a cylindrical or other head 22<sup>a</sup> thereon for its manipulation, said shaft being positioned in the same vertical plane with the post 17. Upon the end portion of the shaft 22 that is within the lock-case a collar 22<sup>b</sup> is secured, this flat circular collar having sufficient friction in contact with the inner side of the front wall 11 to prevent an accidental turning movement of the shaft. In the edge of the collar 22<sup>b</sup> a notch *s* is formed, and from the inner surface of the front wall 11 a stud *s'* projects into the notch, the stud serving to limit the rocking movement of the shaft 22 when turned by a manipulation of its head 22<sup>a</sup>. The shaft 22 on its inner end also carries a finger-bar 22<sup>c</sup>, that projects over and toward the free end of the detent-arm 15<sup>c</sup>, so that a rocking movement of the shaft in the direction of the arrow *x* will press the free end of the finger-bar upon the detent-arm 15<sup>c</sup> and rock it toward the abutment-disk 19.

There may be an ordinary throw-up spring 23 employed for automatically opening the shackle-bow 13, its location and operation being clearly shown in Figs. 2 and 3. In service, however, it is found that the spring 23 may be dispensed with, as when the bow is released from the latch-bolt 13 the weight of the lock will be sufficient to effect the opening of the shackle-bow or a slight pull will do so if the lock is supported in the hand while opening it.

In arranging the working details of the lock for service the tumbler-wheels 21 should be adjusted on the back plate 10, so as to adapt their slots *r* to receive the tongues *n'* after the lock has been worked in accord with a predetermined rotatable movement of the shafts 17. Having selected the combinations that determine the turning movements of the shafts 17 to effect a corresponding movement of the abutment-disks 19 for opening the lock, this rotatable movement of each shaft 17, that is toward the right a predetermined degree for each shaft independently, will cause the pin *p* on the disk that is being adjusted to traverse a portion of the slot *o'* it occupies, and after impingement on the end of said slot turn the locking tumbler-wheel 21 a proper extent for disposal of the radial slot *r* therein at a proper point for the reception of a corresponding tongue *n'*.

It should be stated that the locking adjustment of the latch-bolt 16 may be quickly effected after the shackle-bow 13 has been closed by simply turning either or both of

the shafts 17 in either direction sufficiently to cause the edges of the arms 15<sup>a</sup> 15<sup>c</sup> to ride upon the circular edges *m* on the abutment-disks 19 and at the same time cause the adjacent ends of the tongues *n'* to contact with the peripheral edges of the locking tumbler-wheels 21. This adjustment will simultaneously push the latch-bolt 16 into the notch in the shackle-bow nose 13<sup>a</sup>, which is effected by the arm 15<sup>d</sup> and its extension 15<sup>e</sup>, as is shown in Fig. 2.

For explanation of the operation that may be conducted for opening the lock by means of manipulation in accord with a preselected combination it may be assumed that the releasing combination for the mechanism at the left of the lock in Figs. 2 and 3 is "74" and for the right side is "52." Now without regard to the relative positions assumed by working parts when locked the first step for unlocking the lock is commenced by turning the left-hand shaft 17 toward the right until the hammer-head *i*<sup>2</sup> on an appropriate spring-arm *i* rides on the teeth *g*, the turning operation being continued until there has been seven successive strokes of the hammer-head *i*<sup>2</sup> produced, which are indicated audibly and also by the sense of feeling the jar that results from the strokes of the hammer-head on the tumbler-wheel 18. The rotation of the shaft operated upon is now reversed in direction, so that four teeth are passed in reversed order, which makes the combination "74" and disposes the slot *r* directly opposite the tongue *n'* at the left side of the lock. In a like manner the right-hand shaft 17 is turned toward the right until the hammer-head *i*<sup>2</sup> on the remaining spring-arm *i* has successively engaged within five notches between the teeth on the lock-set tumbler-wheel 18, carried by said shaft. The rotatable movement of the shaft 18 at the right is now reversed in direction, and two notches in the tumbler-wheel are successively engaged by the hammer-head *i*<sup>2</sup>, which will give the combination "52" for the right-hand lock-set tumbler-wheel and connected parts. It may here be explained that the formation of the hammer-heads *i*<sup>2</sup> is an advantageous feature of the present improvement, as it has been found that the shape and added weight increases the sound of impact had as these heads successively strike upon the tumbler-wheels 18, and the jar is very sensibly felt, so that knowing the combinations a person can in the dark readily open the lock. The turning movements of the shafts 17 a predetermined degree for each one, as is indicated by the vibrations of the hammer-heads *i*<sup>2</sup>, will so relatively dispose the abutment-disks 19 and the locking tumbler-wheels 21 that the tongues *n'* may be simultaneously thrown into respective slots *r* by turning the shaft 22 and the arms 15<sup>a</sup> 15<sup>c</sup> rocked into close engagement with the flat edge portions *m'* on



the abutment-disks, which will adapt the arm 15<sup>d</sup> and its extension member 15<sup>e</sup> to slide the bolt 16 away from the nose 13<sup>a</sup> of the shackle-bow 13 when the shaft 22 is rocked so as to  
 5 press the finger-bar 22<sup>c</sup> into engagement with the detent-arm 15<sup>c</sup>, thus releasing the shackle-bow for its opening movement.

It will be understood that the releasing operation depends upon the relative positions  
 10 of the pins *p* in the arcuate slots *o'*, thus controlling the rotatable adjustment of the locking and releasing tumbler-wheels in unison with the turning movements of the shafts 17, as indicated on the teeth of the tumbler-  
 15 wheels 18, and it is to be understood that the exact combination for control of the rotatable movement of each tumbler-shaft 17 must be employed unless the combinations are changed, and said combinations must be man-  
 20 ually produced in the order recited for the opening of the lock.

The provision of the locking and releasing tumbler-wheels 21 is a feature of this im-  
 25 provement and adds greatly to the security of the lock, as for the proper setting of these wheels a reversed movement of the shafts 17 must be given thereto, and the employment of tongues on the detent-arms which enter slots in the tumbler-wheels for release of the  
 30 latch-bolt is another detail of the invention. A feature shown in Patent No. 745,064 is employed also in this improvement for changing the combinations of the lock and consists of a set-screw 23, that screws through the edge  
 35 wall 12 of the case at a point that disposes the set-screw opposite and near to the free end of the arm 15<sup>b</sup>. In effecting the change of combination the set-screw is forced against the end of said arm and holds the detent-  
 40 block 15 stationary. The shafts 17 or either one of them may now be turned, so that the flat sides *m'* on the abutment-disks 19 will be correspondingly turned. It will be seen that this will require the engagement of the ham-  
 45 mer-heads 2<sup>2</sup> with a different number of teeth for unlocking the lock. As there is no claim made for this detail in this case, a further description is not deemed necessary.

Having thus described my invention, I  
 50 claim as new and desire to secure by Letters Patent—

1. A lock embodying a case, a latch-bolt slidable in the case, a tumbler-shaft jour-  
 55 naled in a side wall of the case, a tumbler-wheel having teeth on part of its periphery and mounted to turn with the tumbler-shaft, a post in the case, an armed detent-block rockable on the post, a resilient extension on one arm of the detent-block engaging its pro-  
 60 jected end with the slide-bolt and normally projecting said bolt, a second shaft journaled in the same side wall of the case above the post, means mounted upon said shaft and engaging one arm of the detent-block for a  
 65 partial rotation of said block, and a retrac-

tion of the slide-bolt by a turning movement of the second shaft, and a device carried by the post and having contact with the teeth on the tumbler-wheel for indicating the degree of turning movement given to said tumbler-  
 70 wheel.

2. A lock embodying a case, a latch-bolt slidable in the case for locking or release of the locking-nose on a rockable shackle-bow, two tumbler-shafts spaced apart and jour-  
 75 naled in one side wall of the case, a tumbler-wheel carried by each shaft and having teeth on a portion of the periphery thereof, a post central in the case, a four-armed detent-block rockable on the post, a thin resilient  
 80 extension on one arm of the detent-block engaging its projected end with the latch-bolt and normally projecting said bolt, a sounder device carried by the post comprising two spring-arms, and a cylindrical hammer-head  
 85 on the free end of each arm seating upon the periphery of a respective tumbler-wheel, a rotatable shaft journaled in the same side wall of the case above the post, a finger-bar on the inner end of said shaft and engaging  
 90 one arm of the detent-block for a partial rotation of said block, and a retraction of the slide-bolt by a turning movement of the shaft having said bar thereon.

3. A lock embodying a case, a post central  
 95 in the case, a tumbler-shaft rotatable in one side wall of the case, a spring-pressed tumbler-wheel on the shaft and turning with it, an abutment-disk fixed on the tumbler-shaft and having its mainly circular periphery flat-  
 100 tened at one point, a detent-block rockable on the post, one arm of said block engaging the periphery of the abutment-disk, said arm having a recessed rear side and a tongue pro-  
 105 jected from said side, and a locking and releasing tumbler-wheel pivoted on the adjacent side wall of the case, said tumbler-wheel having an arcuate slot therein receiving a pin that projects from the near side of the abut-  
 110 ment-disk and also having a radial slot wherein the tongue on the detent-arm may engage.

4. In a lock of the character described, the combination with a case, a tumbler-shaft  
 115 journaled in the case, a toothed tumbler-wheel mounted on the shaft, means for engaging the toothed tumbler-wheel to indicate the degree of turning movement given to said wheel, a flat-edged abutment-disk secured on the inner end of the shaft, a detent-block  
 120 having a plurality of arms, one of said arms having a tongue thereon, a locking and releasing tumbler-wheel pivoted on a side wall of the case adjacent to and opposite the abut-  
 125 ment-disk, said wheel having an arcuate slot concentric with its pivot, a pin projected from the abutment-disk into said slot, said locking and releasing disk also having a radial slot that cuts through its periphery op-  
 130 posite from the arcuate slot, the tongue on



the detent-arm engaging within said slot when the detent-arm carrying said tongue impinges on the flattened edge portion of the periphery of the locking and releasing tumbler-wheel.

5 5. In a lock of the character described, the device for indicating a numerical combination for opening the lock, comprising as details a tumbler-shaft held to rotate within  
10 the case of the lock, a tumbler-wheel on the shaft having a circular periphery and a plurality of teeth forming part of said periphery spaced apart by V-shaped notches, a post carried by the case, a spring-arm extending

over the tumbler-wheel and having an integral open spring-coil clasp ing the said post, and a circular weighty hammer-head on the free end of said arm adapted to ride upon the teeth and fall into the notches successively when the wheel is turned.

20 In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

OSCAR KATZENBERGER.

Witnesses:

JAMES McCLOSKEY,  
J. P. LONG.