

A. W. DOWE.
 LOCK.
 APPLICATION FILED MAR. 10, 1910.

964,465.

Patented July 12, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

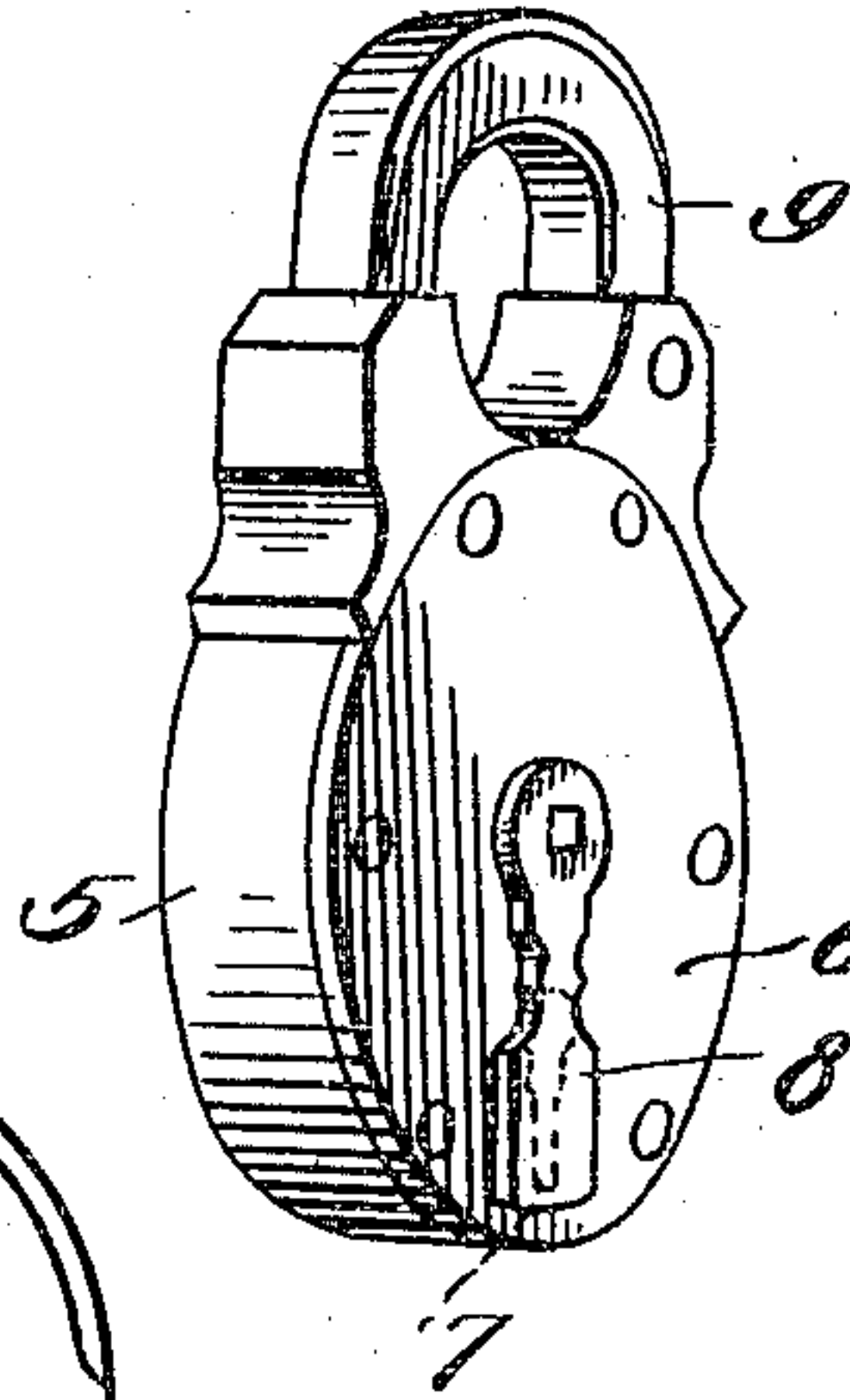


Fig. 2.

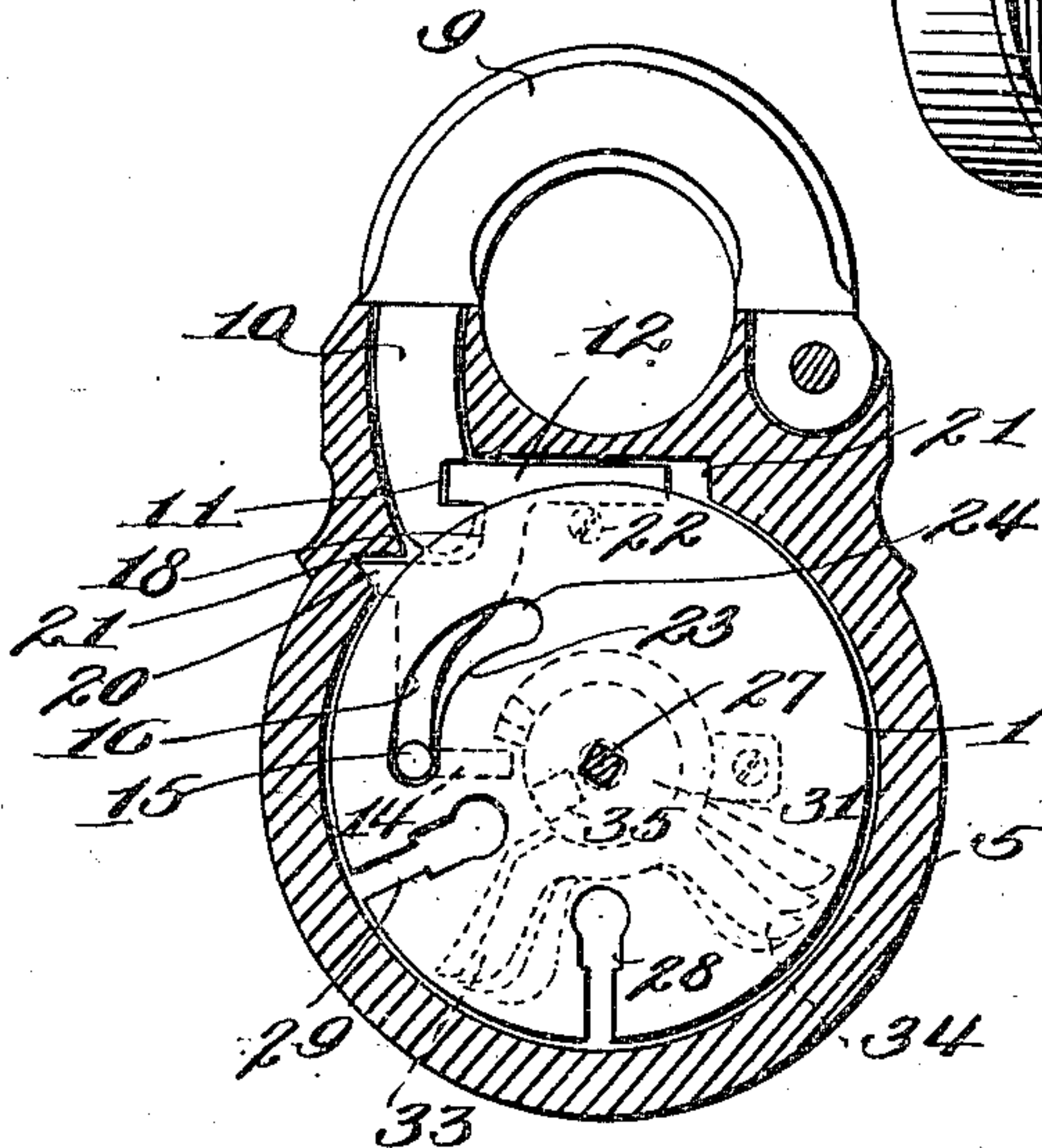


Fig. 3.

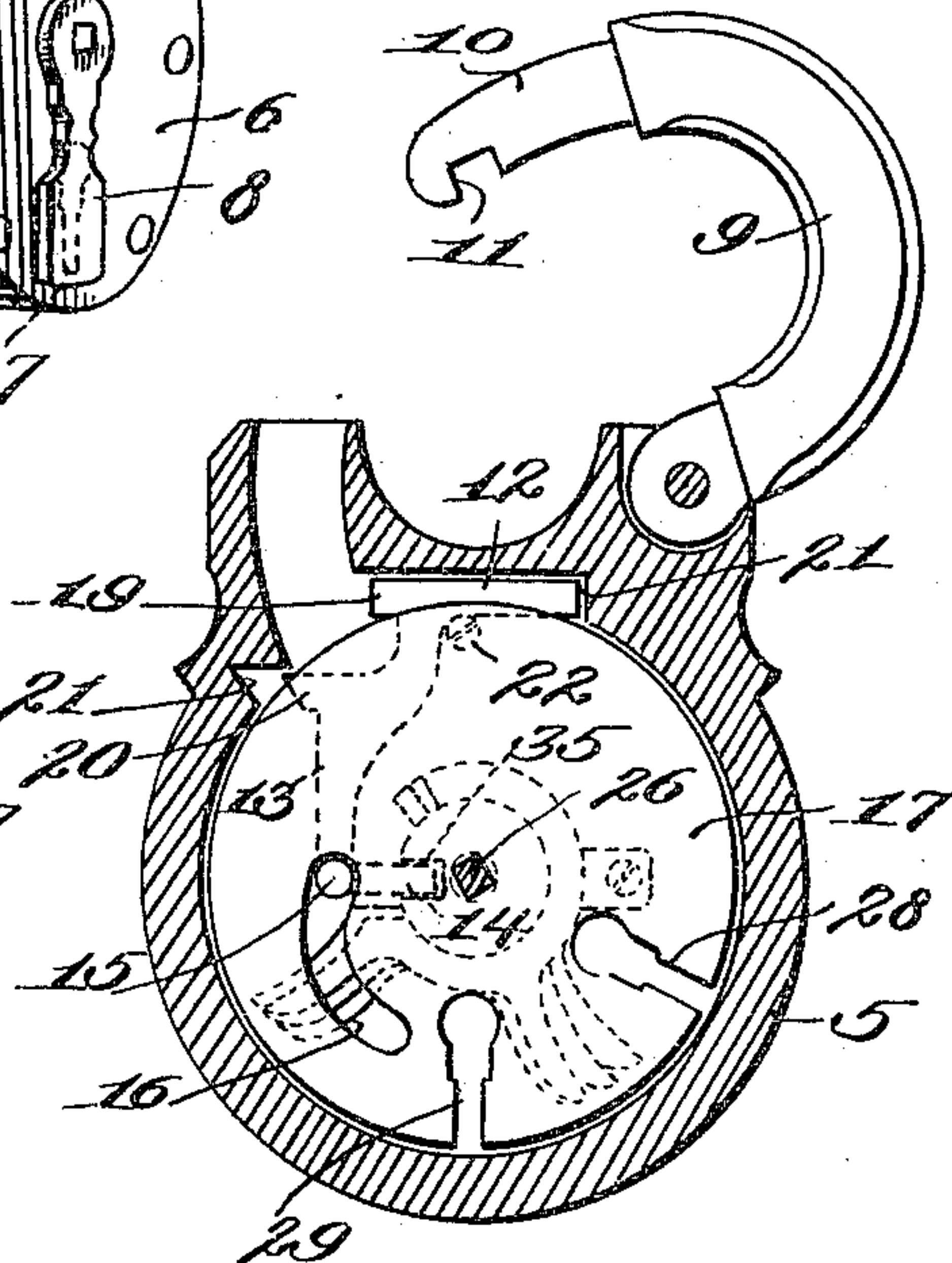


Fig. 4.

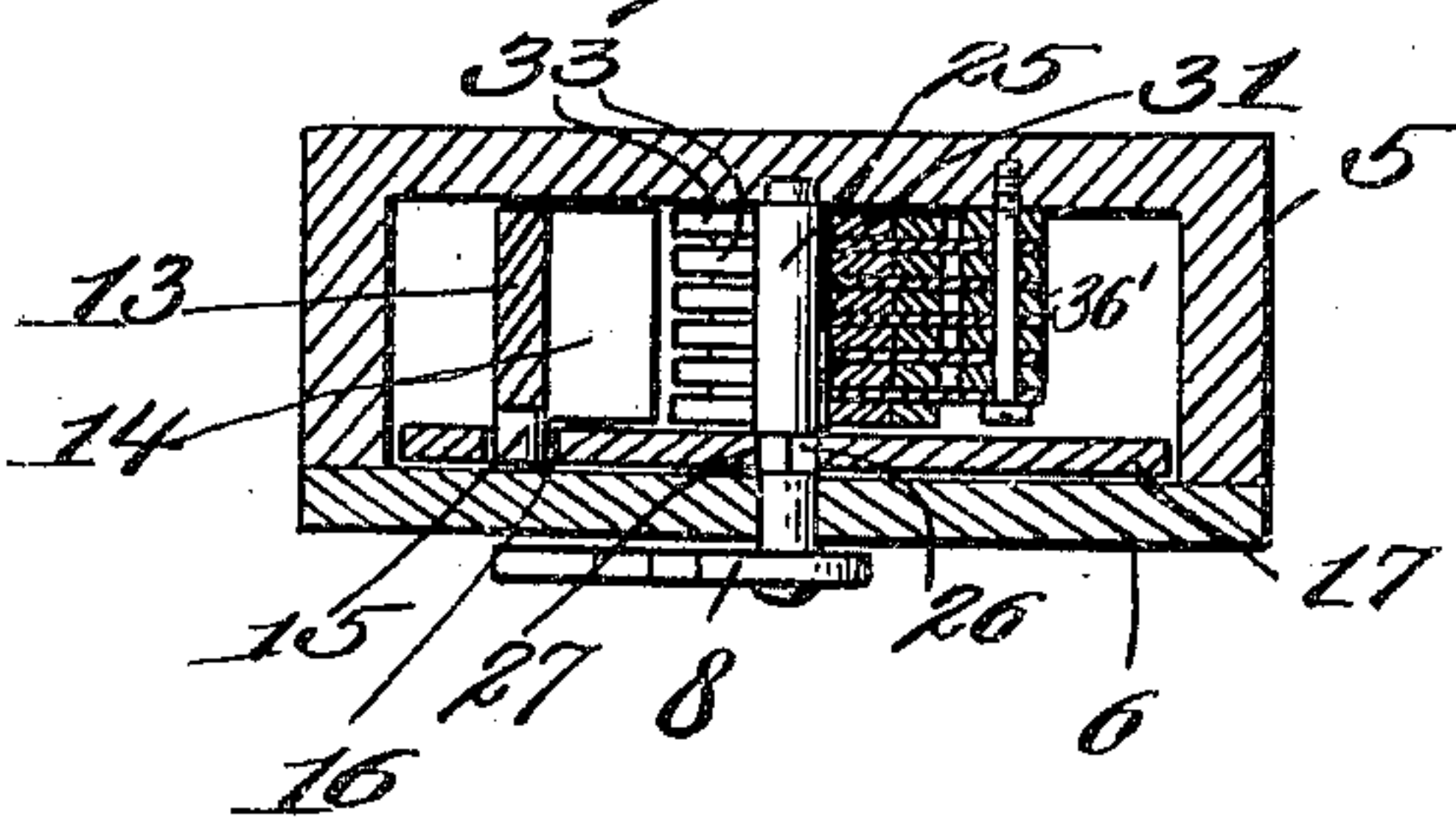
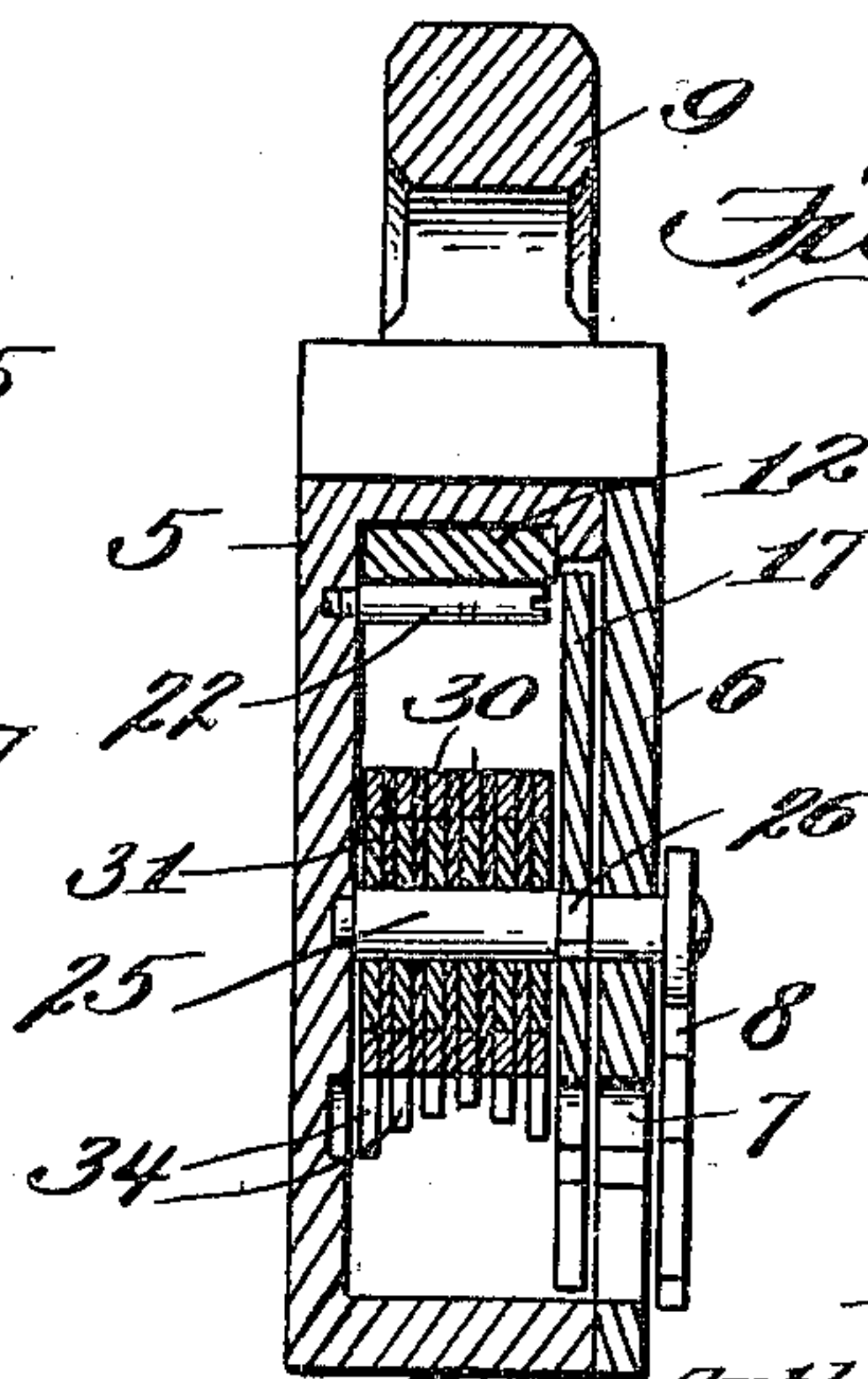


Fig. 5.



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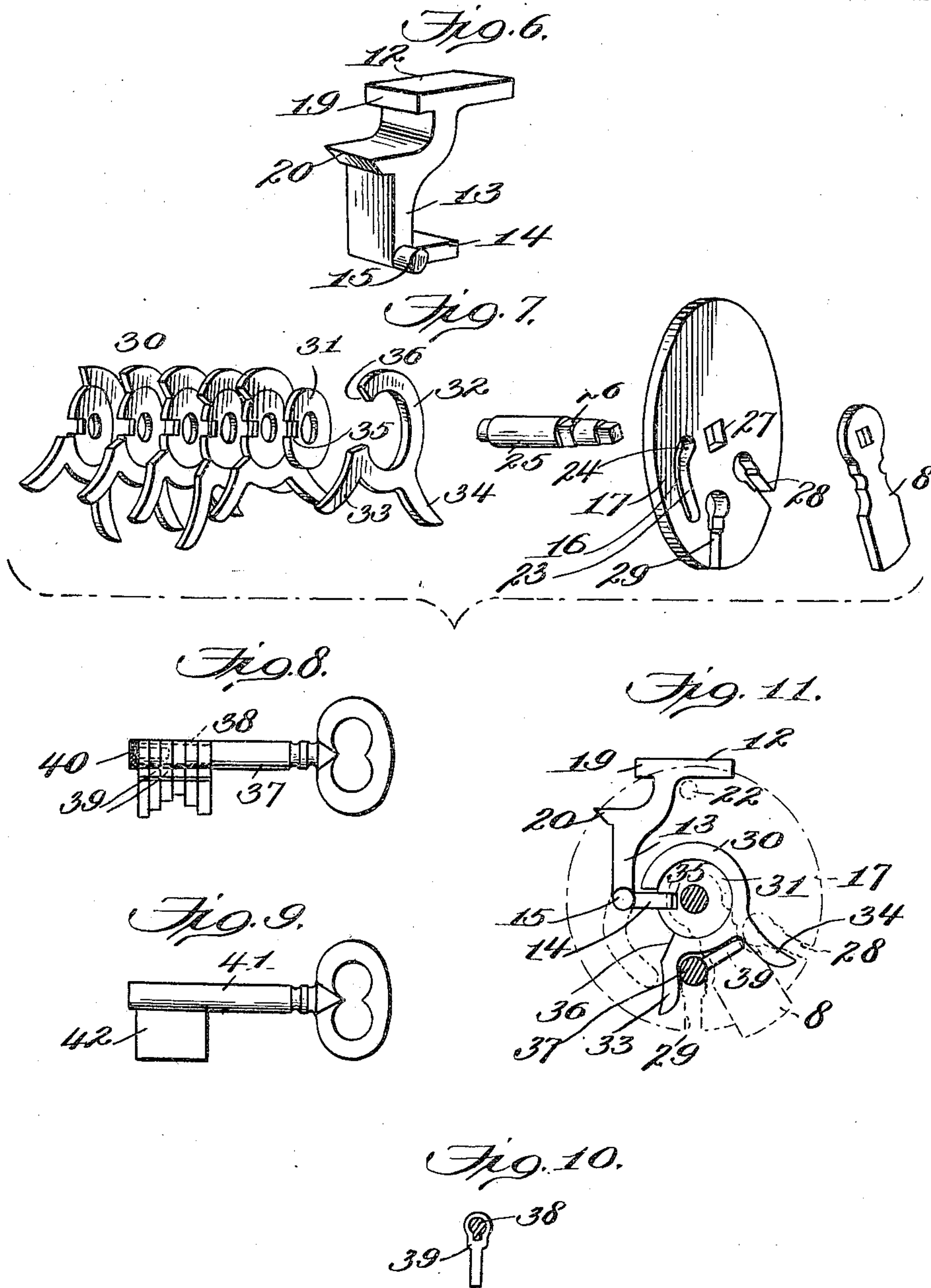
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2 SHEETS—SHEET 2.



Witnesses:
Robert Everett

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UNITED STATES PATENT OFFICE.

ARTHUR W. DOWE, OF LOS ANGELES, CALIFORNIA.

LOCK.

964,465.

Specification of Letters Patent.

Patented July 12, 1910.

Application filed March 10, 1910. Serial No. 548,345.

To all whom it may concern:

Be it known that I, ARTHUR W. DOWE, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Locks, of which the following is a specification.

This invention relates to that class of locking devices known as changeable or combination key locks, and though capable of a general application has been particularly devised for use in portable locks of the type known as padlocks.

The primary object of the present improvement is the construction of locks in such manner that the interior mechanism, or the combination of the internal movable parts, may be changed at pleasure, according to the form given to or change made in the key, without the necessity of arranging the movable parts of the lock by hand or removing the lock or any part thereof from the door or other closure with which it is used. In locks constructed in accordance with this plan the key may be altered at pleasure and the act of locking and throwing out the bolt of a lock produces the particular arrangement of the internal parts corresponding to that of the key for the time being. While the bolt remains locked the internal parts retain the relation or arrangement imparted thereto by the key until the lock is unlocked and the bolt withdrawn, the unlocking operation being accomplished only by a key of the precise form and dimensions of the key by which the parts were made to assume such particular arrangement in the act of locking the bolt. The key has movable bits and the combination thereof can be varied or changed at will, but this change must be made only while the lock is unlocked so that the combination of the internal movable parts of the lock may be likewise changed when subsequent locking action ensues. The key may have one or more extra sets of movable bits and may thus be changed to any one of the forms within the number of permutations to which the internal movable parts of the lock are susceptible.

A further object of the invention is to construct a lock that will absolutely resist unauthorized opening or picking, and the reduction to a minimum of the chance of making a duplicate key from soap or wax impressions, the constant changing of the form

of the key which is pursued and the corresponding change in the internal movable parts of the lock making the construction of a duplicate key practically useless.

With these and other objects and advantages in view the invention consists in the construction and arrangement of the several parts which will be more fully hereinafter specified.

In the drawings: Figure 1 is a perspective view of the lock embodying the features of the invention. Fig. 2 is a sectional elevation of the lock showing the bolt in locking position and the movable parts or tumblers in corresponding position in dotted lines. Fig. 3 is a view similar to Fig. 2 showing the bolt released, the shackle of the lock open and the tumblers in the position ready for engagement with a cooperating key. Fig. 4 is a horizontal section through the center of the lock. Fig. 5 is a transverse vertical section through the lock. Fig. 6 is a detail perspective view of the bolt. Fig. 7 shows perspective views of the working or movable parts of the lock including the tumblers, the latter being disposed in one arrangement for actuation by a key having corresponding bits. Fig. 8 is a detail elevation of a key embodying adjustable bits and adapted for use with the lock. Fig. 9 is a detail elevation of a restoring key for unifying the position of the tumblers. Fig. 10 is a detail cross-sectional view of the key shown by Fig. 8. Fig. 11 is a diagrammatic view showing the operation of the alining key relatively to the tumblers and prior to a change of combination.

The numeral 5 designates a casing having a face plate 6 with a key-hole opening 7 in the lower portion of the center thereof, a key-hole guard 8 movable on the face plate 6 and a shackle 9 hinged at one end to the upper part of the frame and having an opposite reduced extremity 10 movable into the upper portion of the casing and provided with a bolt-receiving recess 11 near its free end. Within the casing is a sliding bolt 12 with a depending or inwardly extending projection or arm 13 having at its free end an angularly inwardly extending fence 14 and a stud 15 engaging a slot 16 in the actuating or controlling disk 17 rotatably disposed within the casing. The projection or arm 13 of the bolt 12 is recessed as at 18 to permit the free end of the reduced extremity 10 of the shackle to enter the same

and provide for the formation of a catch nose 19 on the outer end of the bolt to fit the recess 11. Below the recess 8 the projection or arm 13 at its outer portion is formed with an angular reinforcing lug 20 which enters a recess 21 in the lock casing when the bolt is moved outwardly into locking position and operates to strengthen the bolt in performing its locking function by resisting breakage of the latter when unusual strain is exerted on the shackle 9. The top part of the casing 5 has its interior wall as at 21 recessed to accommodate the bolt 12, and the latter is limited in its inward movement by a stop pin 22 adapted to engage the point of intersection of the upper portion of the inner edge of the projection or arm 13 with the lower portion of the bolt, as shown by Fig. 3. The lower portion of the slot 16 up to about the point 23 is concentric with relation to the center of the disk 17 and the remaining portion 24 of said slot is eccentric and operates through the stud 15 moving there-through to withdraw the bolt from the recess 11 or to force said bolt outwardly into said recess in accordance with the direction of movement of the disk 17.

Extending centrally with relation to the lock casing, as clearly shown by Figs. 4 and 5, is a spindle 25 having a squared portion 26 fitting in a correspondingly shaped opening 27 in the center of the disk 17. The spindle 25 continues through the face plate 6 of the lock and has the key-hole guard 8 mounted thereon, the key-hole guard being movable laterally in opposite directions and serving not only to open and close the key-hole 7 in the said face-plate, but also to shift the disk 17 in opposite directions to bring either one of two key-holes 28 and 29 in registration with the key-hole 7 or to bring a blank portion of the said disk over and interiorly close the key-hole 7. Owing to a large portion of the slot 16 being concentric with relation to the disk 17, the latter has considerable range in movement without actuating the bolt 12 through the medium of the eccentric portion 24 of the slot. In this connection it will be understood that while the stud 15 is in the concentric portion of the slot 16 no movement in either direction will be imparted to the bolt 12 because the said stud always occupies the same relation to or is at the same distance from the center of the disk 17. Therefore, in the operation of the disk through the key guard 8 to a limited extent in opposite directions, as for instance to cover through the medium of the disk 17 the key-hole 7, there will be no change of position of the movable parts of the lock or of the bolt 12.

The spindle 25 has its rear end rotatably engaging the back of the lock casing 5, as shown by Figs. 4 and 5, and thereon is loosely mounted a plurality of tumblers 30

which in the present instance are shown as six in number, the said tumblers being composed of inner core disks 31 and cut rings 32, each ring having a pair of divergent contact arms 33 and 34 which are spaced apart a predetermined distance. The disks 31 are each radially slotted as at 35, and the rings 32 are each cut or have a segment thereof removed to form an opening or slot 36 to expose the slot 35 of the disk with which each ring engages, as clearly shown by Fig. 7. Each ring 32 is frictionally held on its disk 31, or one of the said disks is fitted in each ring, and the frictional engagement between each ring and disk is sufficiently tight to resist movement of one part with relation to the other under ordinary key operations with relation to the tumblers. In changing the combination, by means which will be hereinafter specified, the rings 32 may be moved on the disks 31 to rearrange the arms 33 and 34 of the several rings in relation to each other. The tumblers are held in spaced relation on the spindle 25 by separating plates 36' secured to the back of the lock casing of a size corresponding to the tumblers or the combined disks 31 and rings 32, as clearly shown by Fig. 4, and by this means the movement of one tumbler is prevented from effecting in the least the adjacent tumblers and also fill up the spaces between the tumblers and prevent feeling the slots in the disks 31 by means of a thin watch spring inserted from the exterior of the lock.

The key for coöperating with the tumblers to dispose the slots 35 in alinement to receive the fence 14 forming part of the bolt 12 is shown by Fig. 8 and comprises a shank 37 having a reduced extremity 38 on which a plurality of bits 39 is removably and adjustably held by a screw or analogous fastening 40. The bits 39 may be shifted at will to change the combination of the tumblers, and if desired an extra set of bits may be provided with each key to make it possible to change the combination of the tumblers *ad infinitum*. In order to dispose the several tumblers in position to change the combination thereof or to modify the relative positions of the tumbler arms 33 and 34, an alining key 41, as shown by Fig. 9, is used and has a plain or straight bit 42.

The mechanism hereinbefore described is not confined in its use to a padlock, the latter being shown simply as an illustration of one application of the mechanism. The same type of movable parts could be used in connection with an ordinary door lock or in a lock for any other kind of closure and under these particular modifications the bolt 12 would be elongated and engage a part of the frame in the same manner as the bolt shown in the accompanying drawings engages the shackle 9. This change of appli-

cation or use of the locking mechanism would not involve the exercise of invention, as it would require only a modification in the proportions of the bolt 12, the other movable parts being unchanged and disposed as hereinbefore explained.

Assuming that the lock is in open condition, as shown by Fig. 3, and it is desired to secure the shackle 9, the latter is closed so that the reduced extremity 10 thereof is fully projected into the upper portion of the lock casing with the recess 11 in alinement with the locking nose 19 of the withdrawn bolt 12. When the bolt is withdrawn, as shown by Fig. 3, the disk 17 has been turned its full limit to the right or as far as allowed by the stud 15 which at such time engages the upper terminal wall or end of the eccentric portion 24 of the slot 16, and at such time also the fence 14 is projected into the slots 35 of the disks 31 of the tumblers which will have been alined by manipulation of the said tumblers through the medium of the key shown by Fig. 8 prior to the actuation of the disk 17 to withdraw the bolt 12. Therefore, the parts being in the position just specified and the shackle having been moved to cause its reduced extremity 10 to project fully into the lock casing, the said disk 17 is turned or rotated to the left and the eccentricity of the portion of the slot then in engagement with the stud 15 forces the bolt 12 outwardly, the outward movement of the bolt continuing until the stud 15 reaches and moves in the concentric portion of the slot 16. The outward movement of the bolt 12 into full locking position through the actuation of the disk 17 as just explained causes the fence 14 to be fully withdrawn or cleared from the slots 35 of the disks 31, and the tumblers are then in condition for operation by the key, as shown by Fig. 8, to throw the said slots 35 out of alinement with relation to the fence 14. The shifting movement or rotation of the disk 17 to the left to throw the bolt 12 into locking position brings the key-hole 28 of said disk in alinement with the key-hole 7 of the lock casing and the key shown by Fig. 8 is then inserted and turned to the right to engage the plurality of tumblers 34 then disposed at the right of the key-holes in various positions in accordance with the arrangement of the bits 39 and the consequent formation of the wards, and by turning the key to the right the tumblers are uniformly turned or the rings 32 and their disks 31 have unitary movements imparted thereto and the slots 35 of the said disks 31 are thrown out of alinement with relation to the fence 14, as shown by Fig. 2. When the tumblers are turned to the right as just specified the arms 34 are thrown away from the key-hole 28 as will be readily understood, and at the same time the arms 33 will be disposed adjacent to said key-hole and in posi-

tion for ready engagement by the key shown by Fig. 8 to release the bolt 12 or unlock the same or to dispose the tumblers in such position that the slots 35 will be again arranged so as to aline with and receive the fence 14. After the bolt 12 has been forced outwardly its full extent into locking position and the tumblers have been operated by the key to throw the slots 35 out of alinement with relation to the fence 14, the key is withdrawn from the lock and the key-hole guard 8 is then preferably shifted a short distance to cover the key-hole 7 and simultaneously move the disk 17 so that a blank portion of the latter is moved over the interior outlet of the said key-hole 7, or to throw the key-hole 28 out of registration with the key-hole 7. This movement of the disk 17 without affecting the locking position of the bolt 12 is permitted by the length of the concentric portion of the slot 16. When it is desired to open the lock the key-hole guard 8 is first shifted slightly to the left in order to bring the key-hole 28 in registration with the key-hole 7 or to arrange the parts in the position as shown by Fig. 2, or the key-hole guard 8 may be shifted directly to the right to bring the key-hole 29 in registration with the key-hole 7, and this movement of the disk 17 to the right does not move the stud out of the concentric portion of the slot 16 into the eccentric portion 24 of said slot and movement of the disk 17 too far to the right is obstructed by reason of the fact that the slots 35 of the disks 31 have not as yet been shifted into alinement with the fence 14, and if the stud 15 did enter a part of the eccentric portion 24 of the slot 16 before the slots 35 of the disks 31 were elevated in position to receive the fence, the inner terminal of the latter would strike against the unslotted portions of the peripheries of the disks 31 then in alinement with the fence. In view of this operation and the restriction to movement of the bolt 12, it is imperative that the tumblers be actuated to bring the slots 35 of the disks 31 into alinement with the fence 14, and consequently the key shown by Fig. 8 is inserted in the key-hole 7 and through the key-hole 28 and turned to the left to engage the projecting arms 33 of the tumbler rings and move the said arms to the position shown by Fig. 3 to bring the slots 35 in alinement with the fence 14. The movement of the disk 17 through the medium of the key-hole guard 8 is then continued to the right and the bolt 12 is withdrawn or released from the shackle by the stud 15 entering the eccentric portion 24 of the slot 16.

While the parts of the lock are in the position shown by Fig. 3 the combination of the tumblers may be changed by first alining the arms 33 and 34 through the medium of the key 41, shown by Fig. 9, the latter key being inserted through the key-

holes 7 and 29 and turned to the right with considerable force and rotate all of the rings 32 on their disks 31 until the upper end walls of the openings or slots 36 of the rings contact with or bear upon the upper surface of the fence 14. All of the arms 33 and 34 will be equally moved or alined by reason of the blank formation of the bit 42 of the key 41. After the unification of the arms 33 and 34 has been accomplished, the bits 39 on the key, shown by Fig. 8, may be readjusted at will and secured, and the said key as shown by Fig. 8 in its readjusted position is then inserted in the lock and turned to the left to reposition the arms 33 and 34 relatively to each other and to the changed combination of the bits 39 by engaging the arms 33 and shifting the rings 32 on the disks 31 proportionately to the distance the several bits 39 project from the shank 37. The lock is then ready for actuation under the new combination arrangement and the operation of locking and unlocking the bolt 12 will be pursued, as hereinbefore explained, through the medium of the key shown by Fig. 8 until the latter has its bits again rearranged to produce a new combination. The change of the combination of the lock may be readily accomplished in view of the fact that such change is accomplished from the exterior of the lock by simply changing the bits of the key and without requiring separation of the parts of the lock and reorganization or modification of the relation of the tumblers. Furthermore, as the key is used in changing the combination the locking and unlocking movements of the bolt will positively ensue by the use of the same key and without the least liability of irregular or obstructive action of the tumblers. The two key-holes 28 and 29 in the disk 17 are provided to permit the key-hole 28, to be used for insertion of the key, as shown by Fig. 8, to unlock and lock the bolt 12, and the key-hole 29 is at such a distance from the key-hole 28 that when the disk 17 is shifted fully to the right to withdraw the bolt 12 from locking position, the said key-hole 29 will be disposed in registration with the key-hole 7 and close to the right arms 34 of the tumblers, as shown by Fig. 3, or the said key-hole 29 will be in position to permit the entrance of the alining key 41 into the lock to engage the arms 34 for the purpose of changing the combination of the tumblers while the latter are in the position they assume when operated to bring the slots 35 in receptive alinement to the fence 14 and during the time also that said fence is in the slots. The key-hole 29 in its relative position to the key-hole 28 also renders it unnecessary to rearrange or move any of the working parts of the lock to change the combination, and the combination is changed without in the least

disturbing the unlocked position of the bolt 12.

It will be observed that the disks 31 are fully inclosed by the rings 32 within the portion of the lock nearest the key-holes and are thus guarded and access to the slots 35 is absolutely impossible, and should the key-hole guard 8 be turned to the left for the purpose of picking the lock by what is known as the "tentative" method, or "feeling" the fence or stump by pressing it against the disks 31 until the slots 35 are opposite the fence, it will be found that the concentric portion of the slot 16 prevents any contact between the fence and the said disks and hence no "feeling" is possible and such an attempt is fruitless. Of course, if the key-hole guard 8 is turned to the right, the stud 15 in reaching the eccentric part of the slot will cause the key-hole 7 to be completely covered inside and outside and thus render it impossible to insert any instrument.

Another advantage of the improved lock is that the tumblers 30 are each composed of duplicate parts, that is, all of the rings 32 are similar in construction and likewise the disks 31 with material advantages in the cost of manufacture of the lock. It will also be seen that in view of the functions performed by the working parts their number is comparatively few, and, furthermore, all the parts are strong and durable, and changes in the proportions, dimensions and minor details may be adopted without departing from the spirit of the invention.

What is claimed as new is:

1. A lock having a casing, a single locking organization comprising a bolt slidably mounted within the casing and a plurality of tumblers coöperating with the bolt to control the movement of the latter, a changeable key insertible in the casing to directly engage and operate portions of the tumblers, and a device also removably insertible in the casing to directly engage similar portions of the tumblers to change their relation relatively to the change made in the said key.

2. A lock having a sliding bolt, a single set of tumblers arranged to perform a particular combination function, means for releasing said tumblers from the sliding bolt, and means removably insertible in and directly engaging the tumblers and operable from the exterior of the lock to change the combination of the tumblers.

3. A lock having a casing, a bolt slidably mounted in the casing, a single set of tumblers coöperating with the bolt to secure and release the latter and consisting of a plurality of independently movable members having a common axis, and means movably inserted in the lock from the exterior of the latter and directly engaging and op-

erating the tumblers to secure and release the bolt and also for changing the combination of the tumblers.

4. A lock operated by a key provided with means for changing the arrangement of the wards and having a sliding bolt, and a plurality of tumblers assembled in a single group and inclosed within the lock, the tumblers consisting of independently movable members having a common axis and preliminarily set in relative combination by the key and in accordance with the arrangement of the wards of the latter by inserting the said key in the lock.

5. A lock having a casing, a bolt slidably mounted in the casing, a plurality of tumblers individually slotted to receive a portion of the bolt, the tumblers consisting of a single group of independently movable members having a common axis and preliminarily set to perform a particular combination function, and a key insertible in the lock and provided with shiftable bits, the tumblers being operated to release and secure the bolt and also changed as to their combination by the key from the exterior of the lock.

6. A lock having a casing with a keyhole therein, a bolt slidably mounted in the casing, a plurality of tumblers cooperating with the bolt, a key for operating the tumblers to secure and release the bolt, and means having keyholes therein for shifting the bolt independent of the key and manually operative from the exterior of the lock to set up a registration of the keyholes thereof with the keyhole of the casing.

7. A lock having a casing with a keyhole therein, a bolt slidably mounted in the casing, a plurality of tumblers cooperating with the bolt, a key for operating the tumblers from the exterior of the lock to secure and release the bolt, and means having keyholes therein and shiftable in opposite directions to set up registration of the keyholes thereof with the keyhole of the casing and engaging a portion of the bolt for moving the latter independently of the tumblers.

8. A lock having a casing, a bolt slidably mounted in the casing and provided with a fence, a plurality of tumblers having alining slots in portions thereof to receive the fence, a key for operating the tumblers to secure and release the bolt, and means engaging a portion of the bolt to shift the latter independently of the key and move the fence outwardly and inwardly in relation to the said alining slots, said means being operative from the exterior of the lock.

9. In a lock, a casing, a slidable bolt mounted in the casing, a plurality of tumblers each comprising a disk and ring retained in adjusted position by mutual friction, and a key for operating the tumblers

to release and secure the bolt and also to change the relative relation of the rings and disks.

10. A lock comprising a bolt having a fence, and a plurality of tumblers each comprising an inner disk and an outer ring with projections, the disks being slotted and the disks and rings retained in their relative arrangement by mutual friction under ordinary operative conditions, the rings being shiftable on the disks to change the combination of the tumblers when sufficient force is applied to the rings.

11. A lock comprising a bolt having a fence, a plurality of tumblers each comprising an inner disk and an outer ring with projections, the disks being slotted and the disks and rings retained in their relative arrangement by mutual friction under ordinary operative conditions, the rings being shiftable on the disks to change the combination of the tumblers when sufficient force is applied to the rings, and shiftable means within the lock engaging a portion of the bolt to slide the latter when released, said shiftable means being operable from the exterior of the lock.

12. A lock comprising a bolt having a projection, a plurality of tumblers provided with means for engagement by a portion of the bolt, and a shiftable disk within the lock having a slot which is partially concentric and partially eccentric and engaged by the projection of the bolt to move the latter in opposite directions when released by the tumblers.

13. A lock comprising a casing having a keyhole, a bolt slidable in the casing and provided with a projection, a plurality of tumblers for engaging a portion of the bolt, a shiftable disk having a slot partially concentric and partially eccentric and engaged by the projection of the bolt, the disk also having key-holes in spaced relation, and a key insertible from the exterior of the lock through the key-holes in the casing and disk to operate the tumblers.

14. A lock comprising a casing having a keyhole, a bolt slidable in the casing and provided with a projection, a plurality of tumblers for engaging a portion of the bolt, a shiftable disk having a slot partially concentric and partially eccentric and engaged by the projection of the bolt, the disk also having key-holes in spaced relation, a keyhole guard on the casing connected to the disk for operating the latter, and a key insertible in the lock through the key-holes in the casing and disk to operate the tumblers.

15. A lock comprising a casing, a bolt slidable in the casing, a plurality of tumblers for engaging a portion of the bolt and comprising inner disks and outer rings retained in operative relation by mutual friction, the disks being inclosed and guarded

by the rings and having slots therein, and means insertible in the lock for operating the tumblers by engaging portions of the rings.

5 16. In a lock, a casing having a key-hole therein, a slidable bolt in the casing, a plurality of tumblers cooperating with the bolt to release and secure the latter, and a shift-
10 able device having two key-holes therein and engaging a portion of the bolt, the key-holes of the shiftable device being movable into registration with the key-hole of the casing, and one of the key-holes of the shiftable device being adapted to receive means for lock-
15 ing and unlocking the tumblers and the other key-hole for receiving means for changing the combination of the tumblers.

17. A lock having a casing, a bolt slidably mounted within the casing, a plurality of
20 tumblers cooperating with the bolt to control the movement of the latter, and devices removably insertible in the casing to engage similar portions of the tumblers to respec-
25 tively operate the latter to secure and release the bolt and change their relative combination arrangement.

18. A lock having a casing, a plurality of tumblers, a bolt slidably mounted within the casing and controlled as to its movement by
30 the tumblers, each of the tumblers having a pair of spaced projections extending downwardly therefrom, keys for engaging the projections of the tumblers to respectively operate said tumblers to secure and release
35 the bolt and to change the combination of the tumblers, and shiftable means within the lock engaging a portion of the bolt to slide the latter when released and operable from the exterior of the lock.

40 19. A lock comprising a casing having a

keyhole, a slidable bolt in the casing, a plurality of tumblers for engaging a portion of the bolt, a shiftable disk inclosed within the lock and also engaging a portion of the bolt and provided with a keyhole to register with
45 the keyhole of the casing, means on the exterior of the casing for shifting the disk, and a key insertible in the lock through the key-holes in the casing and disk to operate the tumblers.

20. A lock comprising a casing having a freely sliding bolt therein, a plurality of tumblers for engaging a portion of the bolt to secure the latter against movement, said
55 tumblers consisting of a group of independently adjustable members having a common axis, a shiftable shield disposed in the casing to guard the tumblers and operative from the exterior of the lock to shift the
60 bolt, and means insertible through the casing and shield to engage and operate the tumblers.

21. A lock comprising a casing having a bolt therein, a plurality of tumblers for engaging a portion of the bolt to secure the
65 latter against movement, a shiftable shield disposed in the casing to guard the tumblers and movably connected to a portion of the bolt to move the latter when released, and means insertible through the casing and
70 shield to engage and operate the tumblers to release the bolt.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ARTHUR W. DOWE.

Witnesses:

A. E. RASSMANN,
CHAS. T. PARNELL.