

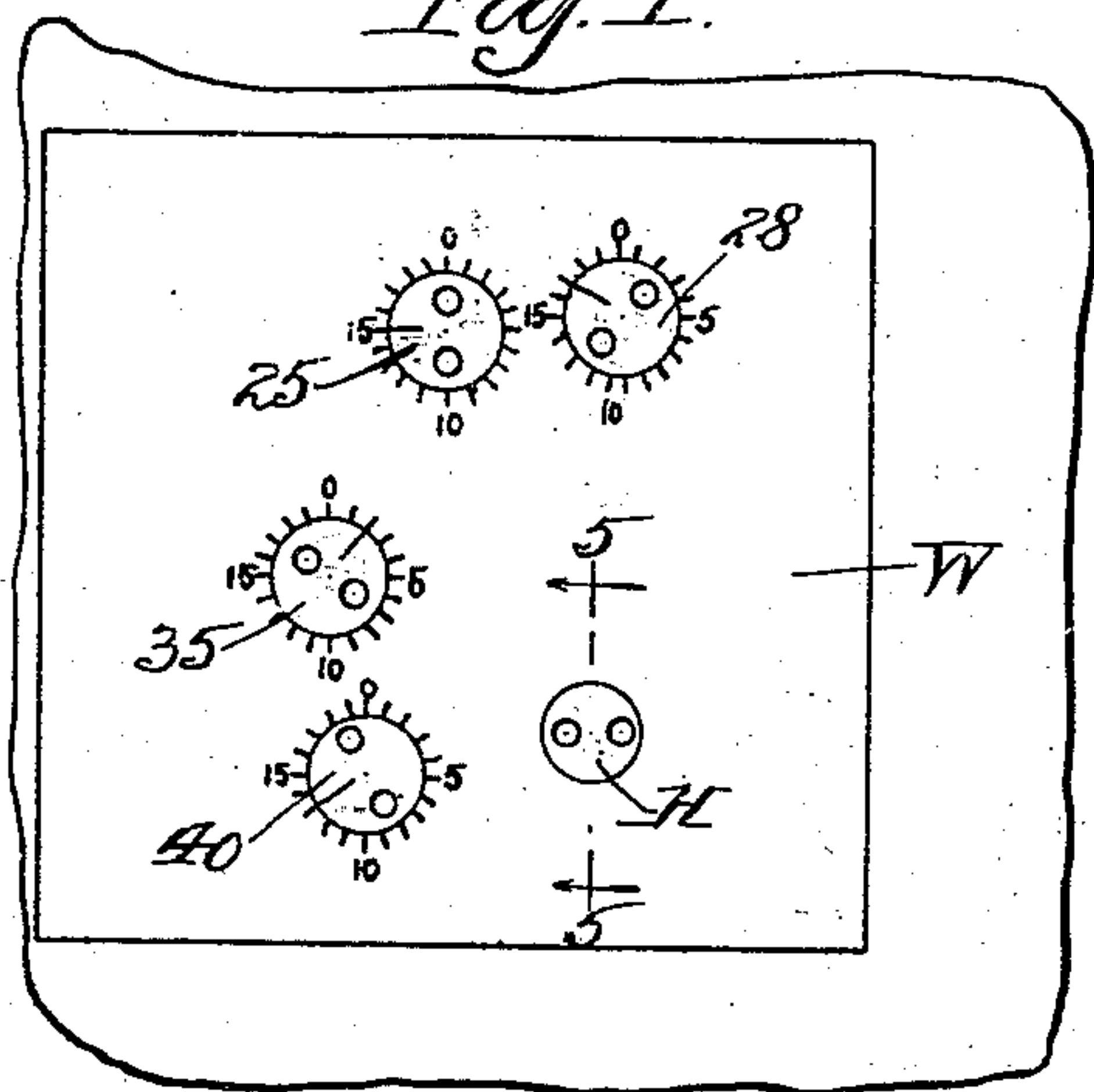
(No Model.)

E. GRAY.  
LOCK.

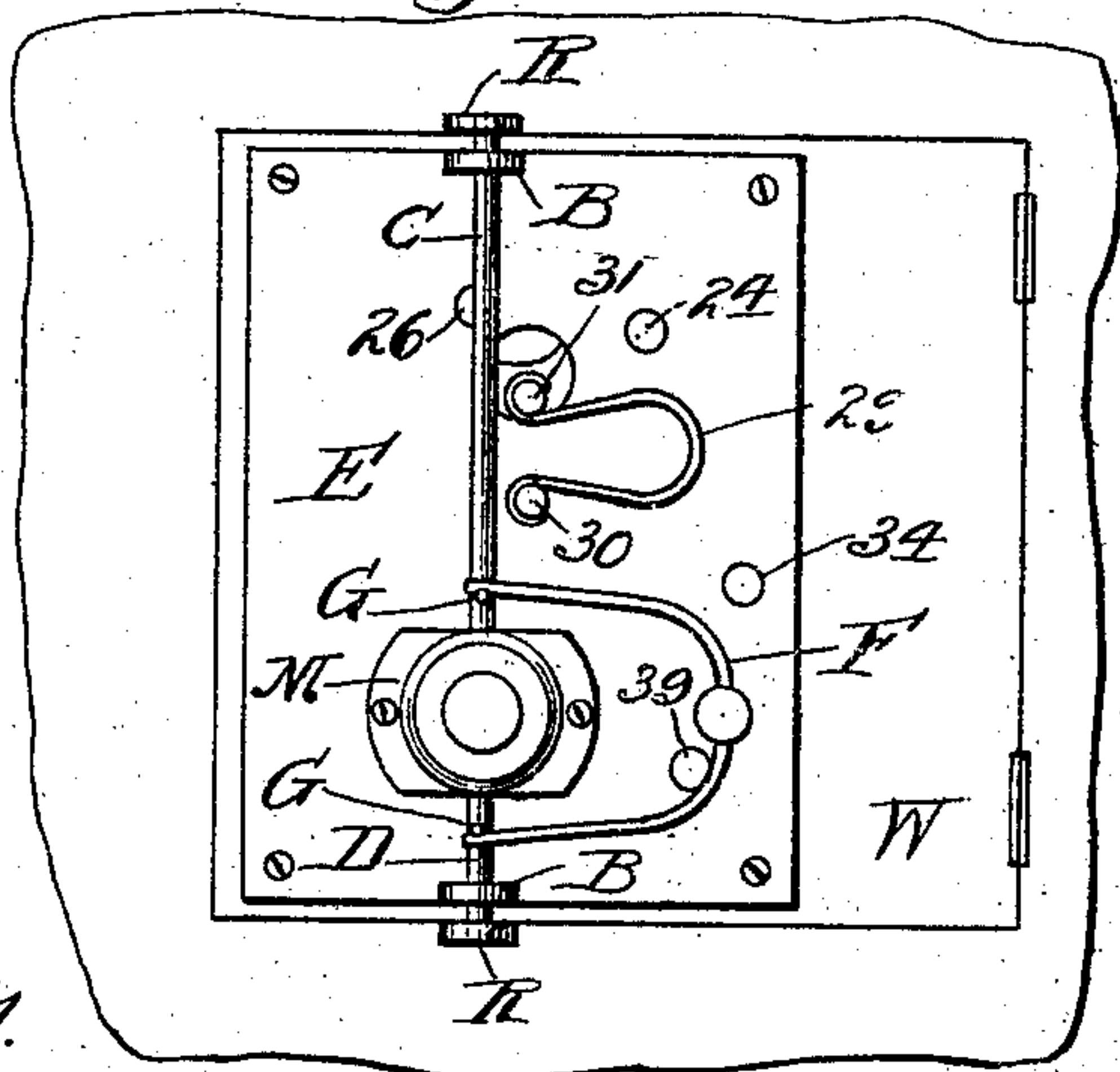
No. 572,633.

Patented Dec. 8, 1896.

*Fig. 1.*



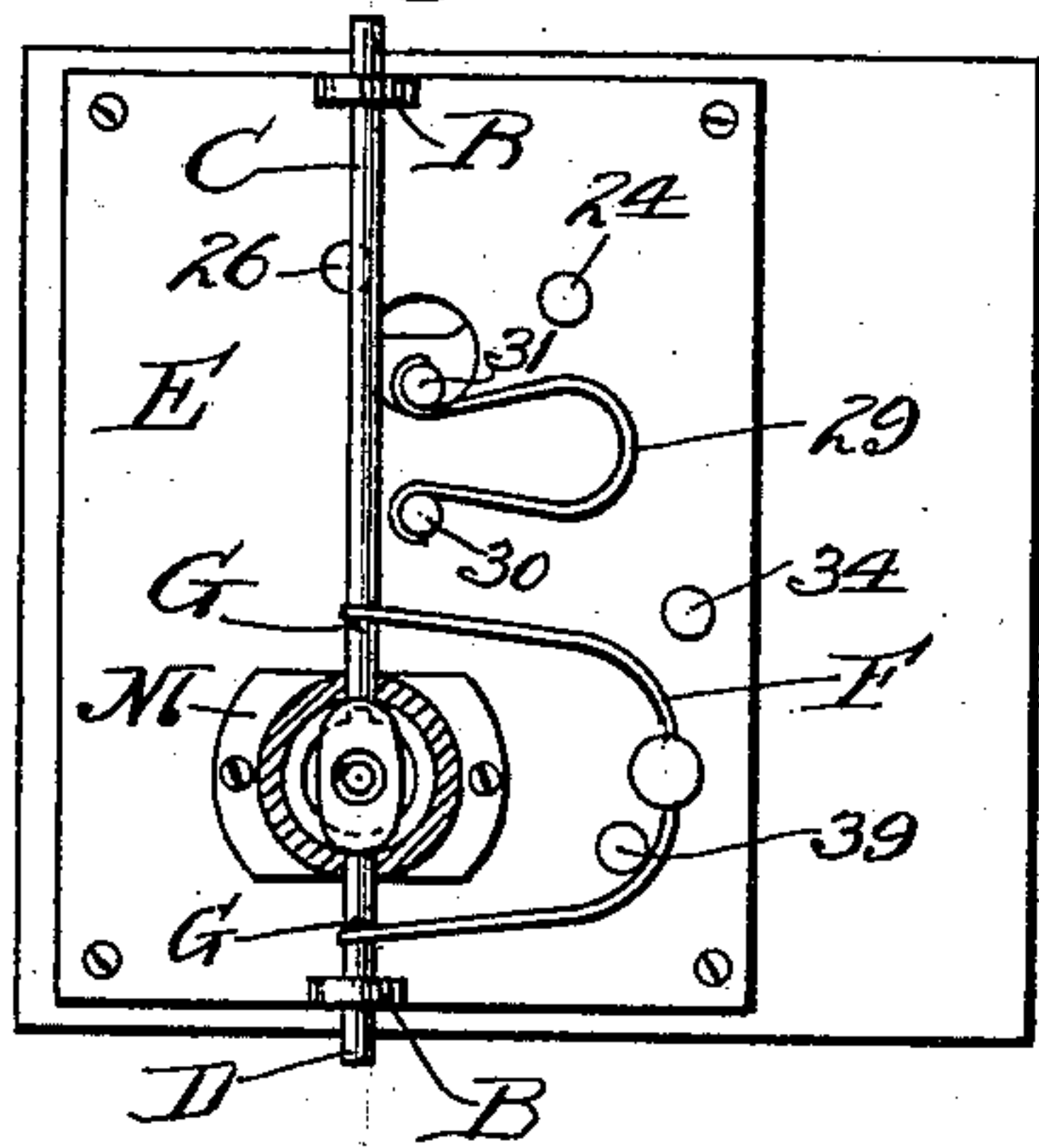
*Fig. 2.*



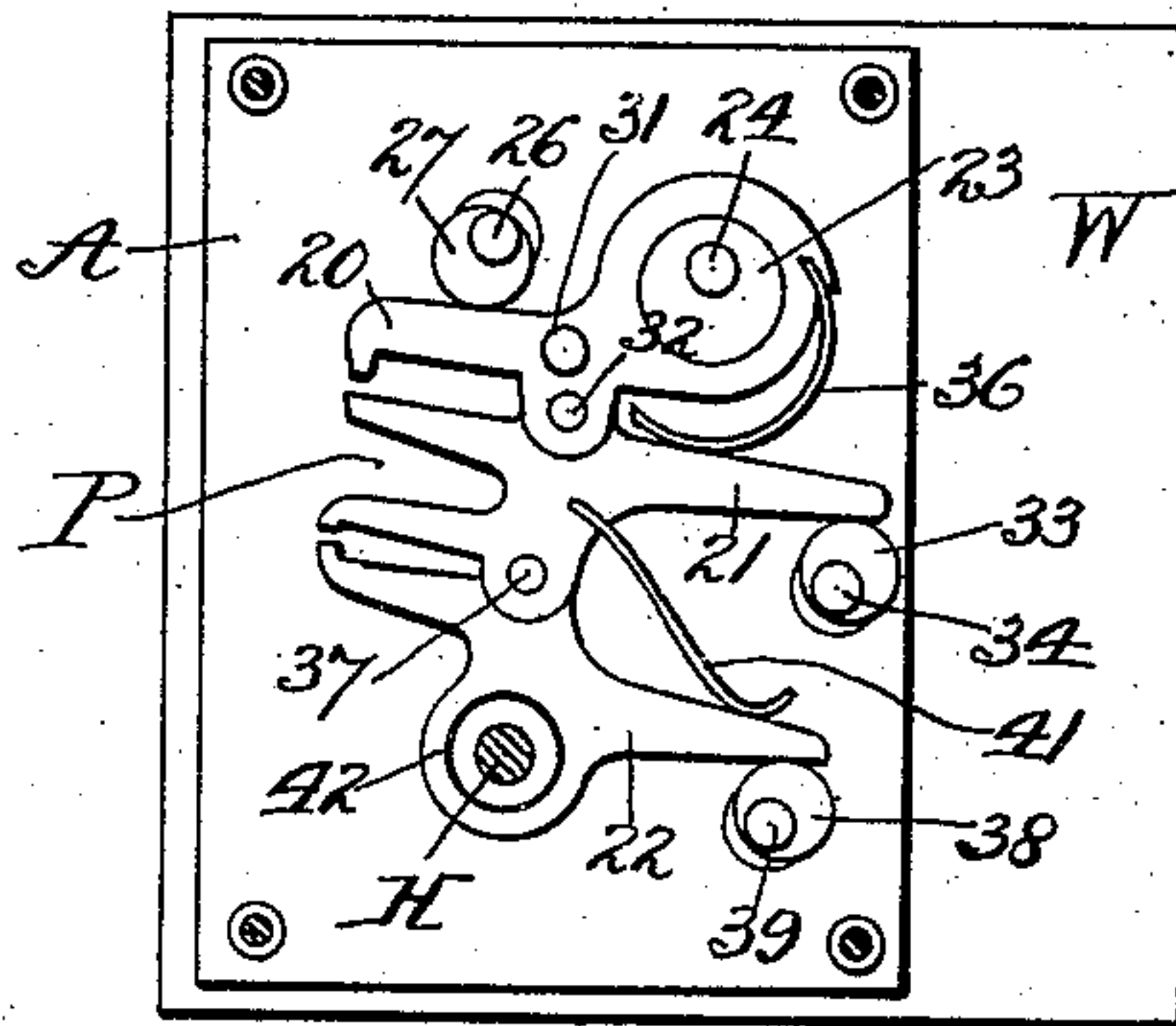
*Fig. 11.*



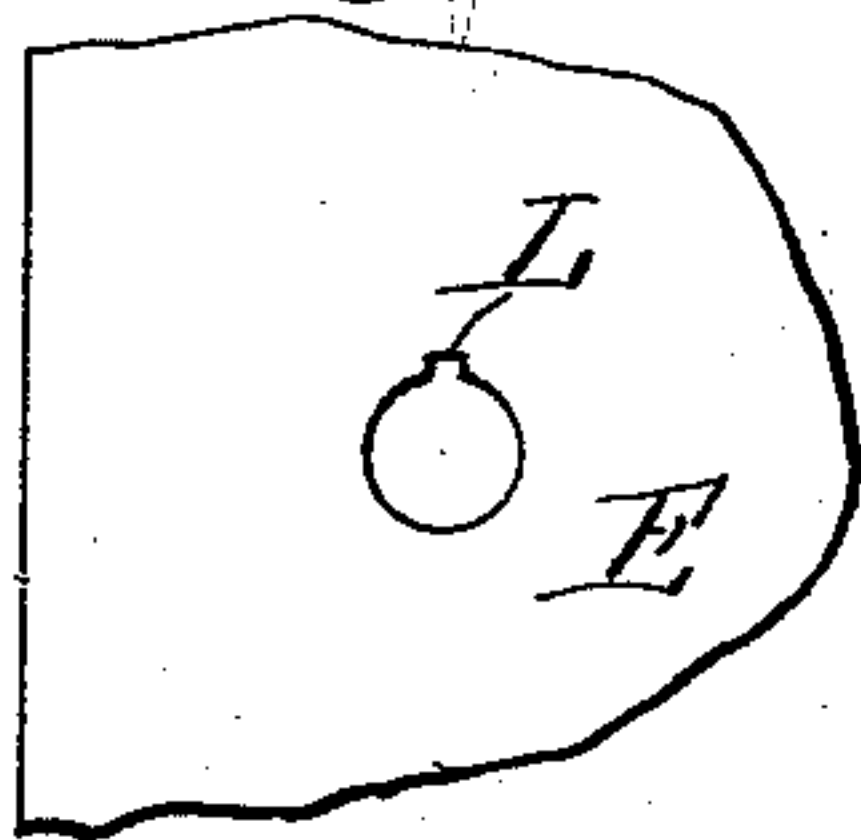
*Fig. 3.*



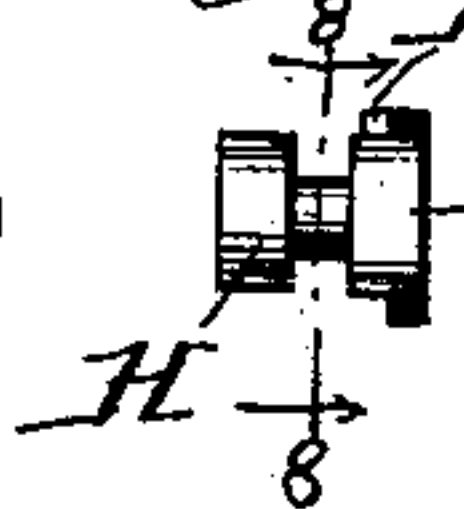
*Fig. 4.*



*Fig. 6.*



*Fig. 7.*



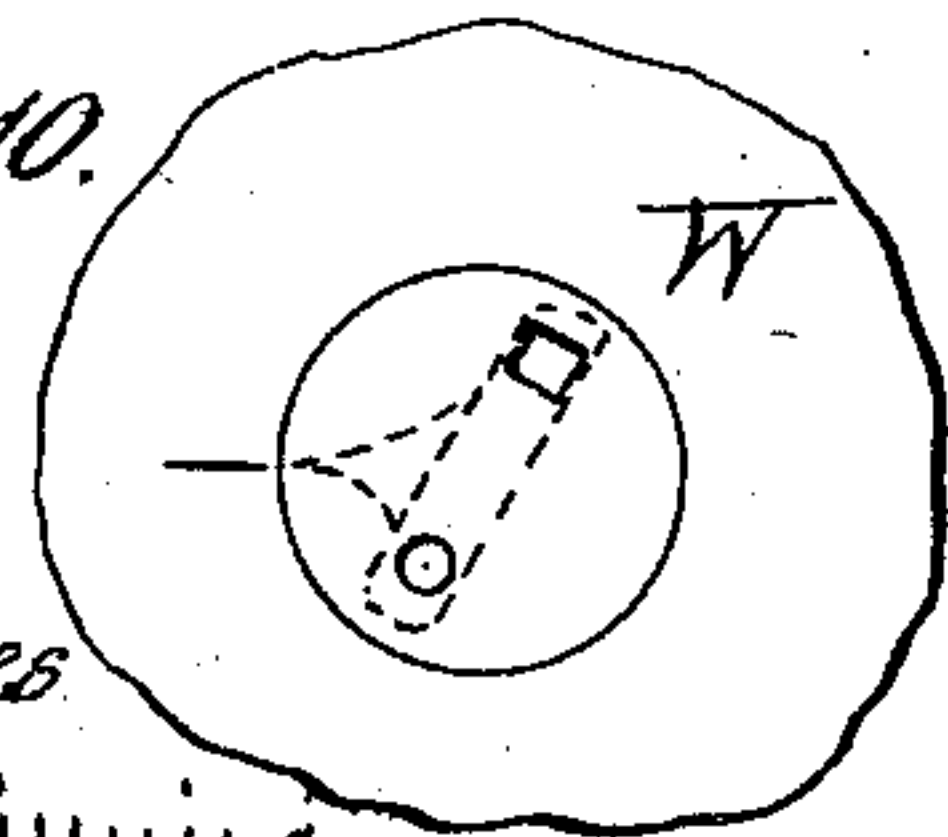
*Fig. 8.*



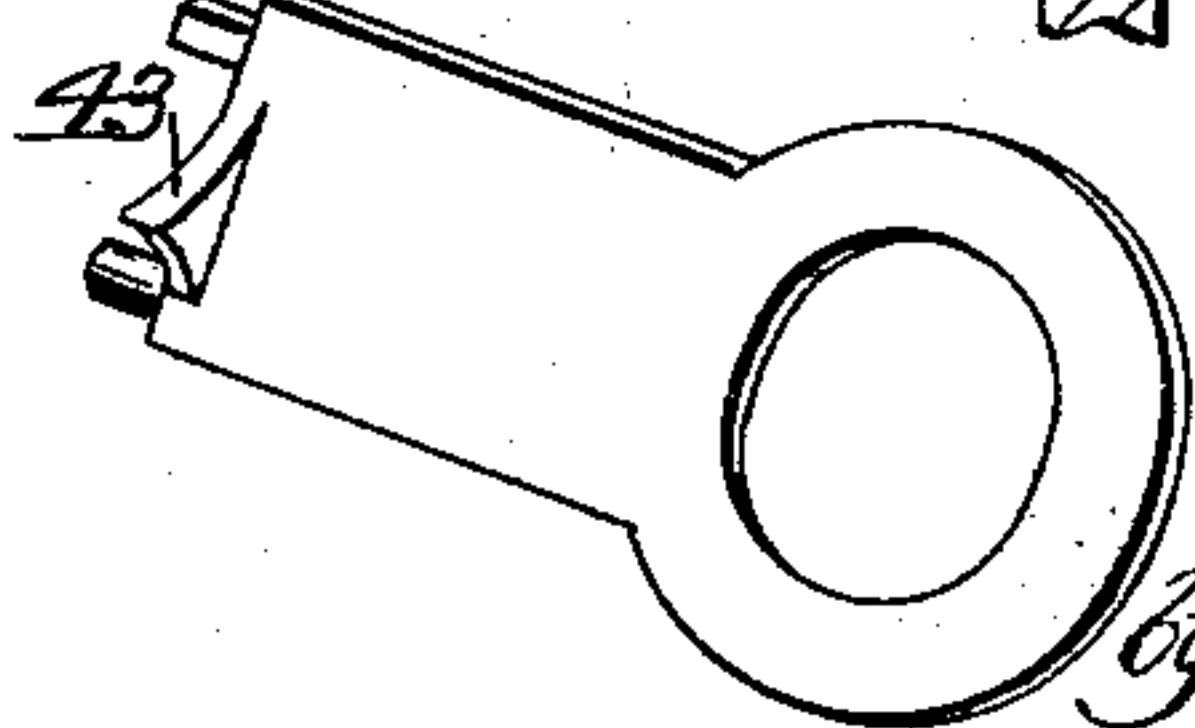
*Fig. 5.*



*Fig. 10.*



*Fig. 9.*



Witnesses  
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Inventor  
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by  
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# UNITED STATES PATENT OFFICE.

ELISHA GRAY, OF HIGHLAND PARK, ILLINOIS.

## LOCK.

SPECIFICATION forming part of Letters Patent No. 572,633, dated December 8, 1896.

Application filed November 8, 1895. Serial No. 568,263. (No model.)

*To all whom it may concern:*

Be it known that I, ELISHA GRAY, a citizen of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented a new and useful Lock, of which the following is a specification.

This invention relates to locks of the class known as "combination-locks."

The object of the invention is to provide a construction which is cheap, exceedingly simple, and thoroughly efficient.

A further object is to provide a lock which is silent or noiseless in its operation.

Further objects of the invention will more fully hereinafter appear.

The invention consists, substantially, in the construction, combination, location, and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings and finally more specifically pointed out in the appended claims.

Referring to the accompanying drawings and to the various views and reference-signs appearing thereon, Figure 1 is a view of the obverse face of a door, cover, or other closure with my improved lock applied thereto. Fig. 2 is a view of the reverse face of such door, cover, or other closure with my lock applied thereto. Fig. 3 is a view of the reverse face of my improved lock, parts being shown in section, the bolt being shown in projected position. Fig. 4 is a view illustrating the compound lever and the cams acting thereon. Fig. 5 is a broken sectional view taken on the line 5 5, Fig. 1. Fig. 6 is a detail showing the seat for the plunger-head. Fig. 7 is a detail view, in side elevation, of the plunger. Fig. 8 is a sectional view of the same on the line 8 8, Fig. 7. Fig. 9 is a detail view of a modified form of key adapted for employment in connection with my invention. Fig. 10 is a detail view illustrating the action of the form of key shown in Fig. 9. Fig. 11 is a view of a modified form of key adapted for use in connection with my invention.

The same reference-sign is employed to designate the same part wherever it occurs throughout the drawings.

Reference-sign W designates the door, cover, or other inclosure to which my improved lock is applied.

A and E designate plates of any suitable size and form, adapted to be bolted together and arranged to support and form bearings for the several operating parts of the lock. Upon plate E are formed the guides B B, through which the bolts C D are arranged to pass, and arranged upon the adjacent framework of the structure to which the lock is applied are the cooperating guides R R, adapted to receive the ends of the bolts when they are projected into locking position. The bolts are normally held in their retracted position.

In the particular embodiment of my invention, to which, however, I do not desire to be limited, I mount a belt or U-shaped spring F upon plate E at a point centrally the length of said spring and arrange the ends of said spring to engage lugs G, formed on or carried by the bolts C D, respectively, said spring normally acting to hold the bolts in their retracted or unlocked position.

The bolts may be projected in any suitable way against the action of spring F. In the particular form shown I provide a plunger H and coincidentally perforate the plates A and E and the door-closure W to receive said plunger, one end of said plunger being arranged to project through to the obverse face of closure W and is constructed and adapted to be engaged by a suitably-formed key whereby under suitable conditions it may be rocked or rotated in its bearings.

Mounted upon the opposite end of plunger H is a plunger-head J, having an elongated or oval-shaped outline and which is arranged to be projected into the space between the adjacent or meeting ends of bolts C D, whereby when said plunger and head are rotated the bolts C D are projected against the action of spring F into locking position or into position to be received in or through guides R upon the adjacent structure. Plunger-head J is provided with a rib or projection K, adapted, when said plunger H is rotated to a proper position, to be received in a groove L, formed in the edge of the perforation in plate E, through which the plunger and its head are arranged to pass, as clearly shown, to lock said plunger and head against rotation, as will more fully hereinafter appear.

A casing or shield M may be arranged upon



plate E to inclose and form a bearing for a coiled spring N, arranged to act upon plunger-head J to normally hold said plunger-head in position for the rib or projection K thereon to be seated in the groove L. By pushing the plunger H endwise against the action of the spring N the projection or rib K is forced out of its groove L, thereby permitting the plunger H and its head J to be rotated. When the plunger-head J is suitably rotated, the side flanges thereof engage the adjacent or meeting ends of the bolts C D and force said bolts apart endwise, thereby projecting the other ends of said bolts into the guides or sockets R R. By reversing or continuing the rotation of plunger-head J the flat sides or portions of the elongated plunger-head are brought between the meeting ends of the bolts C D, thereby permitting the spring F to retract or withdraw the outer ends of the bolts from the guides or sockets R R. The arrangement of the parts and the relative arrangement of rib or projection K and its seat L are such that when said rib or projection is received in seat or groove L to lock the head J against rotation the head occupies a position to hold bolts C D in projected or locked relation. By projecting or pushing plunger H endwise to effect a disengagement of rib or projection and its seat L the plunger and head may be freely rotated until the rib or projection is again brought into register with seat L, when spring N will cause it to be seated therein, the plunger being held in the position to which it has moved endwise to effect the disengagement referred to and being prevented from returning to its normal position until the rib or projection and its seat again register with each other.

I will now describe the construction and arrangement by which the plunger H is locked against endwise movement thereof necessary to effect the disengagement, above referred to, of rib or projection K from seat or groove L.

Reference P designates a compound lever composed of three parts 20, 21, and 22, said compound lever being mounted in the space between plates A and E. The part 20 of this compound lever is provided with a circular perforation arranged to receive a circular disk 23, eccentrically mounted upon a stud 24, having bearings in plates A and E and provided with face or end 25, arranged to project through to the obverse face of the door or closure to which the lock is applied, said face or end 25 being suitably formed to receive a key whereby it may be rotated, and also provided with any suitable mark which may be brought into register with the required graduation marked upon the surrounding surface of the closure W to form part of the combination hereinafter to be more fully described. By inserting a key in the face or end 25 and suitably rotating said face and stud 24 the disk 23 is rotated, and on account of its eccentric mounting the system of levers comprising the compound lever P is

moved. Upon a pin or stud 26, suitably journaled in plates A and E, is mounted a disk 27, eccentric with respect to said stud, and I arrange said disk to engage an arm of the portion 20 of compound lever P, whereby the position of said compound lever may be altered or modified by suitably rotating stud 26. Said stud is provided with an end plate or face 28, similar in all respects to plate 25 and forming part of the combination system. (See Fig. 1.) The portion 20 of the compound lever may be held spring-pressed against the surface of eccentric disk 27 in any suitable manner, as by means of a spring 29, arranged to engage lugs 30 and 31, formed on plate E and portion 20 of the compound lever, respectively.

The portion 21 of the system of combined levers is pivotally mounted upon portion 20, as at 32, and an arm of said portion 21 is arranged to be engaged by an eccentric disk 33, mounted upon a stud 34, journaled in said plates A and E and carrying a face or end plate 35, similar in all respects to plates 28 and 25 and forming a part of the general combination system. By suitably rotating face or end plate 35 the position of portion 21 with reference to portion 20 may be modified or changed at will, while at the same time the portion 21 will partake of the movements of portion 20 and be correspondingly altered or changed when eccentric disks 27 or 23 are rotated. Said portion 21 may be spring-pressed into engagement with eccentric 33 in any suitable manner, as by means of a spring 36. Pivoted to portion 21, as at 37, to partake of the movements thereof is the portion 22 of the compound lever, and an arm of said portion 22 is adapted to be engaged by an eccentric disk 38, mounted upon a stud 39, suitably journaled in plates A and E and carrying a face or end plate 40, similar in all respects to plates 35, 28, and 25 and forming part of the combination system. By suitably rotating said plate 40 the position of portion 22 of the compound lever may be altered or varied with reference to portion 21 and the other portions of the compound lever. Any suitable spring 41 may be employed to press portion 22 into engagement with eccentric disk 38.

In order that the several sections or portions of the compound lever P may partake of the movement of the primary portion 20 thereof and at the same time have movement independently thereof, it is necessary that spring 29 be of sufficient strength to overcome the combined action of all the succeeding springs 36 41, and so on, of the other sections of the compound-lever system, and that each spring 36 41 be of sufficient strength to overcome the combined strength of the succeeding springs of the system, as will be readily understood.

The portion 22 of the compound lever is provided with a perforation 42, through which the plunger H is arranged to pass, the ar-



rangement being such that said perforation  
 is brought into proper position to permit the  
 plunger to be projected endwise therethrough  
 only when the several eccentrics 23, 27, 33,  
 5 and 38 occupy a certain position. This posi-  
 tion of said eccentrics is indicated by the re-  
 spective readings of the face or end plates  
 40, 35, 28, and 25, which constitute the com-  
 bination of the lock. Of course it will be  
 10 understood that by increasing or diminishing  
 the number of sections or portions of the  
 compound lever or of the eccentrics the num-  
 ber of combinations or permutations which  
 it is possible to make will be correspondingly  
 15 increased or diminished. It will be seen from  
 the foregoing description, taken in connection  
 with the drawings, that it is impossible for  
 the plunger H to be moved endwise until the  
 perforation 42 is in exact register therewith,  
 20 and that a displacement of any one or more  
 of the eccentrics effects such a displacement  
 of said perforation as to carry the same out  
 of such proper register or alinement.

One defect of combination-locks of prior  
 25 constructions was the employment of tum-  
 blers which were moved to the required point  
 by the face or dial plates. The movement of  
 these tumblers created a noise by which ex-  
 pert safe-breakers could be guided even with-  
 30 out knowledge of the proper combination of  
 the lock. In my construction the operation  
 of the parts is entirely noiseless and silent.  
 There are no seats or pockets to indicate by  
 sound or otherwise the proper position of the  
 35 eccentrics, and therefore it is absolutely nec-  
 essary to know the correct combination be-  
 fore it is possible to effect an opening of the  
 lock.

In the form of combination shown in Fig.  
 40 1 the face or dial plates 40, 35, 28, and 25, and  
 also the end plate of plunger H, are provided  
 with a pair of diametrically-arranged sockets  
 adapted to receive nibs or projections on the  
 end of the key in order to effect a rotation  
 45 thereof until the marks carried by said face  
 or dial plates are brought to the required point  
 or graduation. Instead of providing marks  
 on the dials or face-plates I may construct  
 the key with a pointer 43, as shown in Fig. 9,  
 50 or, instead of a fixed pointer, with a disk or  
 other movable or adjustable part suitably  
 marked. By moving or adjusting this part or  
 pointer the combination may be correspond-  
 ingly altered.

55 In order to make the proper combination,  
 and, if desired, in order to indicate the proper  
 position of the key, one of the nibs or projec-  
 tions thereon may be squared and the other  
 round, as shown, and the sockets in the dial  
 60 or face plates correspondingly shaped. Of  
 course any other device or arrangement may  
 be resorted to in order to reduce the pos-  
 sibility of the combination being conveyed  
 unintentionally to unauthorized persons.  
 65 For instance, the plates or dials may be pro-  
 vided with a single screw-threaded or a coun-  
 tersunk squared or other suitably-formed

socket, and the nib on the end of the key  
 may be correspondingly threaded or shaped,  
 the depth of the socket and the length of the 70  
 threaded nib or projection on the key being  
 just sufficient for the shoulder upon the key  
 to abut against the face of the dial-plate to  
 lock the key at the required point to effect a  
 rotation of the plate, as seen in Fig. 11, where 75  
 the key is provided with a disk or pointer ro-  
 tarily adjustable in any suitable manner,  
 which disk or pointer may be suitably grad-  
 uated, and the combination may be made up  
 by any desired relative position of said disk 80  
 and the dial-plates, as, for instance, the "5"  
 mark on the key-disk should register with  
 the "10" mark surrounding dial-plate 40, the  
 "10" mark on the key-disk with the "15"  
 mark on dial-plate 35, and so on, as will be 85  
 readily understood. In this manner a differ-  
 ent combination could be effected for each  
 key, and an opening combination of the lock  
 might be known by several individuals and  
 still it would be impossible for either to ef- 90  
 fect an opening of the lock without his own  
 key. In the same manner the combinations  
 may be varied or changed almost indefinitely  
 by increasing the number of eccentric plates  
 acting upon one or the other of the portions 95  
 of the compound lever.

It will be seen from the foregoing descrip-  
 tion that a lock constructed in accordance  
 with my invention is exceedingly simple in  
 construction. There are few parts to get out 100  
 of order. They are easily and cheaply manu-  
 factured, and they may be applied with equal  
 facility to any structure requiring a lock.

Having now stated the object and nature  
 of my invention, and having shown and de- 105  
 scribed one form of apparatus embodying  
 the same, and having described the construc-  
 tion thereof and pointed out the function and  
 mode of operation thereof, I desire it to be  
 distinctly understood that I do not limit my- 110  
 self to the exact construction, size, propor-  
 tions, arrangement, or relative location of  
 parts shown and described, as many varia-  
 tions therefrom would readily suggest them-  
 selves to persons skilled in the art and still 115  
 fall within the spirit and scope of my inven-  
 tion; but

What I do claim as new and of my own in-  
 vention, and desire to secure by Letters Pat- 120  
 ent of the United States, is—

1. In a lock, a bolt, means for operating  
 the same, and means for locking or releasing  
 said bolt-operating means comprising a lever,  
 and an eccentrically-mounted disk, said disk  
 being arranged to constantly bear against said 125  
 lever and adapted, when moved, to vary the  
 position of said lever; as and for the purpose  
 set forth.

2. In a lock, a bolt, means for operating  
 the same, and means for locking or releasing 130  
 said bolt-operating means, and an eccentric-  
 ally-mounted rotary disk arranged to con-  
 stantly bear against said locking and releas-  
 ing means, and adapted when rotated to vary



the position thereof; as and for the purpose set forth.

3. In a lock, a bolt, means for operating the same, a lever arranged to lock or release said bolt-operating means, and independently-mounted eccentrics arranged to act at different points on said lever, as and for the purpose set forth.

4. In a lock, a bolt, means for operating the same, a lever arranged to lock or release said bolt-operating means, independently-mounted eccentrics arranged to act on said lever, and means for constantly maintaining said lever in engagement with said eccentrics, as and for the purpose set forth.

5. In a lock, a bolt, means for operating the same, a compound lever, arranged to lock or release said bolt-operating means and an eccentric arranged to vary the position of said compound lever whereby it is moved into locking or releasing positions, as and for the purpose set forth.

6. In a lock, a bolt, means for operating the same, a compound lever, arranged to lock or release said bolt-operating means and eccentrics arranged to act upon said lever at different points to move the same into locking or releasing position, as and for the purpose set forth.

7. In a lock, a bolt, means for operating the same, a compound lever arranged to lock or release said bolt-operating means, eccentrics arranged to act upon said lever at different points to move the same into locking or releasing position and means for maintaining said lever in engagement with said eccentrics as and for the purpose set forth.

8. In a lock, a bolt, means for operating the same, a compound lever arranged to lock or release said bolt-operating means, eccentrics arranged to act upon said lever at different points to move the same into locking or releasing position and springs arranged to yieldingly maintain said lever in engagement with said eccentrics, as and for the purpose set forth.

9. In a lock, a bolt, means for operating the same, means for locking or releasing said bolt-operating means, an eccentrically-mounted disk arranged to constantly bear against, and when rotated, to move said locking or releasing means into or out of locking or releasing position, and means carried by said disk for indicating the releasing position of said locking and releasing means; as and for the purpose set forth.

10. In a lock, a bolt, means for operating the same, a lever arranged to lock or release said bolt-operating means, an eccentrically-mounted disk arranged to peripherally engage said lever, and adapted to move the same into and out of locking or releasing positions, and means carried by said disk for indicating the releasing position of said lever; as and for the purpose set forth.

11. In a lock, a bolt, means for operating

the same, a compound lever, arranged to lock or release said bolt-operating means, an eccentric arranged to move said lever into or out of locking or releasing positions, and means for indicating the position of said eccentric corresponding to the releasing position of said lever, as and for the purpose set forth.

12. In a lock, a bolt, a plunger adapted to operate said bolt, a perforated lever through which said plunger is arranged to pass and means for moving said lever whereby said perforation is brought into or out of register with said plunger, as and for the purpose set forth.

13. In a lock, a bolt, a rotatable plunger arranged to operate said bolt, means for holding said plunger out of operative position comprising a lever, and an eccentric for varying the position of said lever, as and for the purpose set forth.

14. In a lock, a bolt, a plunger for operating the same, a lever arranged to engage said plunger and maintain the same in position to hold said bolt in projected or locked position, and an eccentrically-mounted disk, arranged to control the positions of said lever; as and for the purpose set forth.

15. In a lock, a bolt, a plunger, for operating said bolt provided with a rib or projection, a spline-groove adapted to receive said rib or projection when said plunger is in position to project said bolt, and means normally tending to seat said projection, as and for the purpose set forth.

16. In a lock, a bolt, a plunger for operating the same provided with a rib or projection, a grooved seat adapted to receive said rib or projection when said plunger is moved endwise whereby said plunger is held against rotation, and means for locking said plunger against endwise movement, as and for the purpose set forth.

17. In a lock, a bolt, an operating-plunger therefor, means for holding said plunger in position to maintain said bolt projected, comprising a lever and an eccentric for varying the position of the same, as and for the purpose set forth.

18. In a lock, a bolt, a plunger actuated by the rotation thereof to project said bolt into locking position, said plunger being movable endwise into position to be rotated, means normally tending to hold said plunger out of rotative position, a lever arranged to lock said plunger against endwise movement, and means for varying the position of said lever; as and for the purpose set forth.

19. In a lock, a bolt, an endwise-movable plunger adapted to rotate to operate said lock, means for locking said plunger against rotation, a spring arranged to oppose the endwise movement of said plunger and normally holding said plunger out of rotative position and means for locking said plunger against endwise movement comprising a le-



ver, and means for controlling the position of said lever, as and for the purpose set forth.

20. In a lock, a bolt, a plunger adapted to be moved endwise into and out of position to  
5 operate said bolt, a perforated compound lever, said plunger arranged to pass through said perforation and means for moving said compound lever whereby said perforation is brought into and out of position to permit the

endwise movement of said plunger, as and 10 for the purpose set forth.

In witness whereof I have hereunto set my hand this 4th day of November, 1895.

ELISHA GRAY.

Witnesses:

M. I. CAVANAGH,  
S. E. DARBY.