

E. E. QUAINANCE.

PERMUTATION LOCK.

APPLICATION FILED NOV. 30, 1906. RENEWED AUG. 24, 1908.

917,133.

Patented Apr. 6, 1909.

3 SHEETS—SHEET 1.

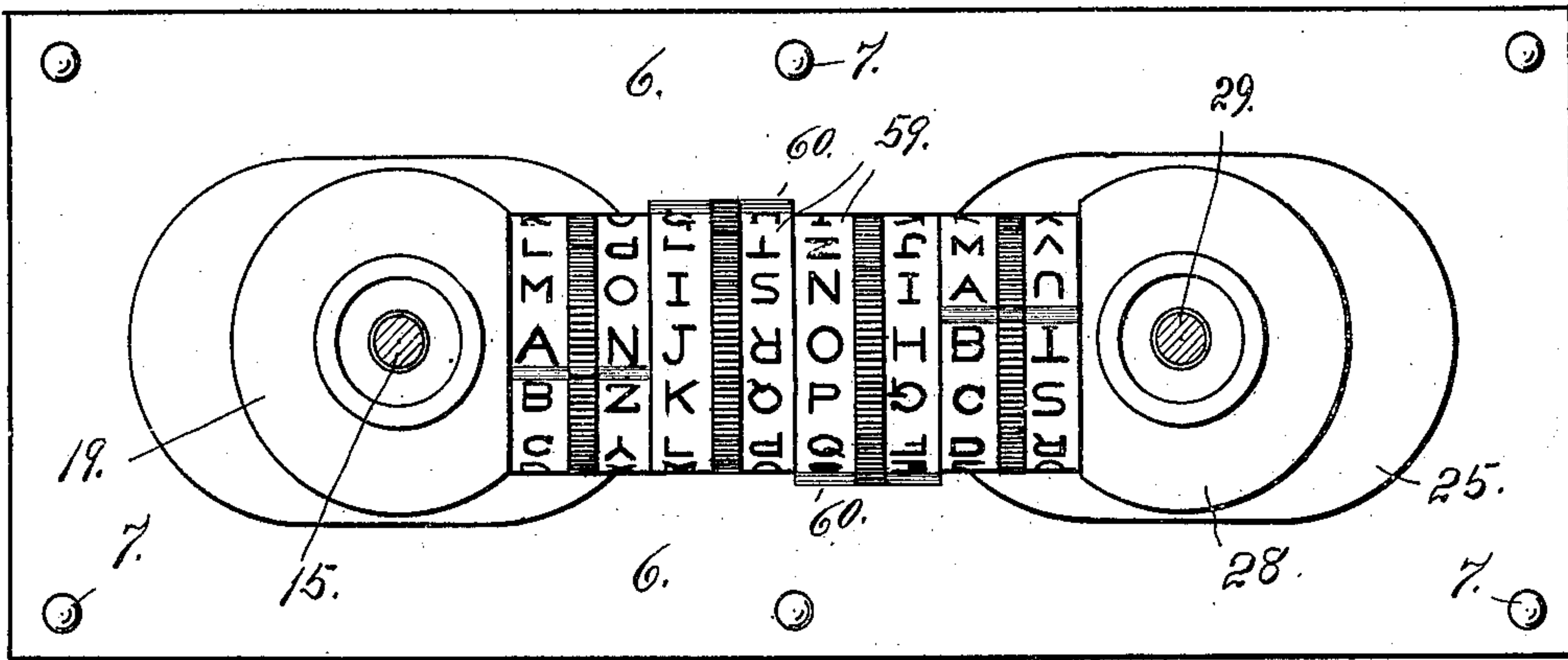


Fig. 1.

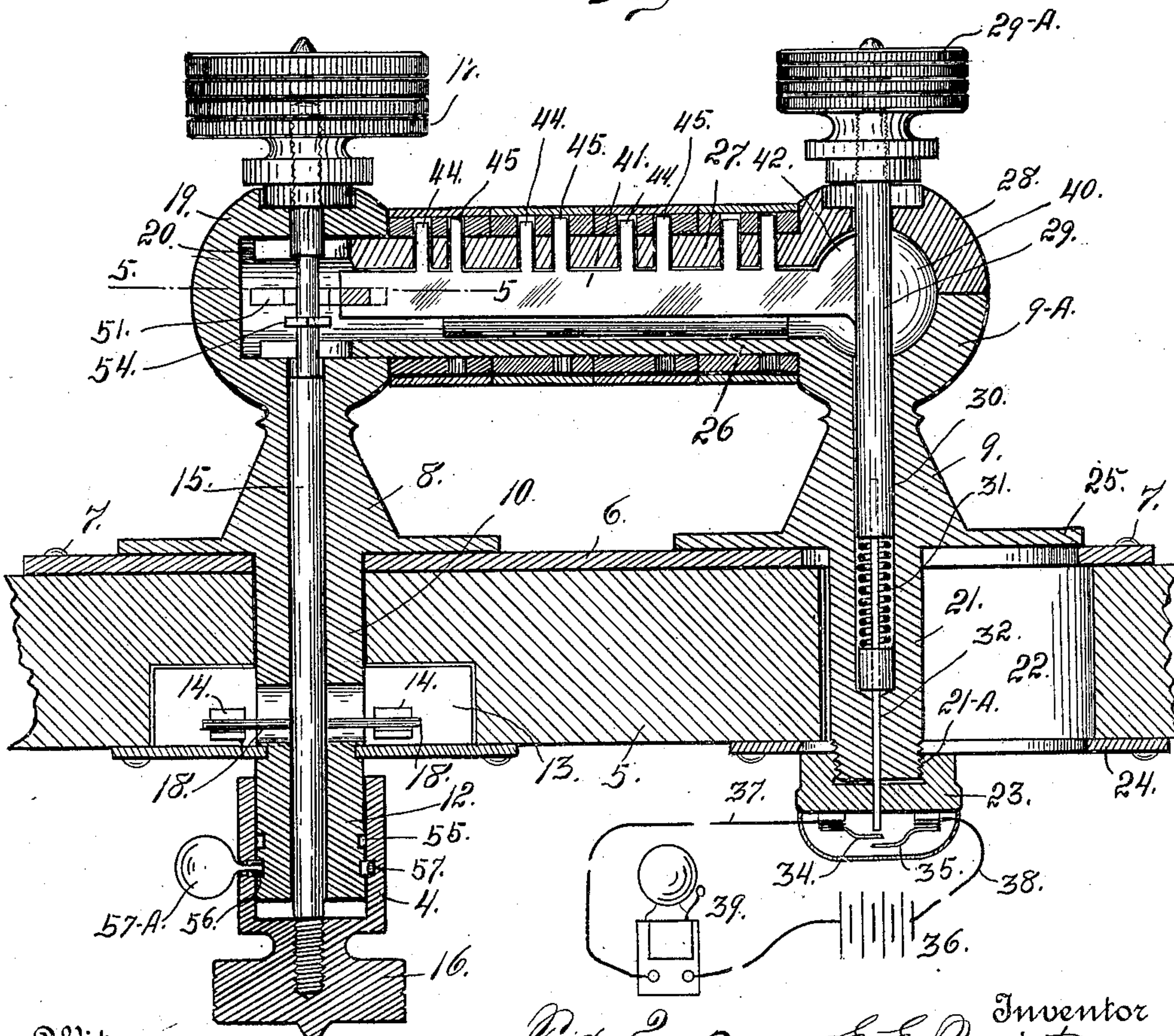


Fig. 2.

Witnesses  
Otto E. Hoddick  
Dena Nelson

Inventor  
E. E. Quainance.  
By A. R. B. Borden  
Attorney

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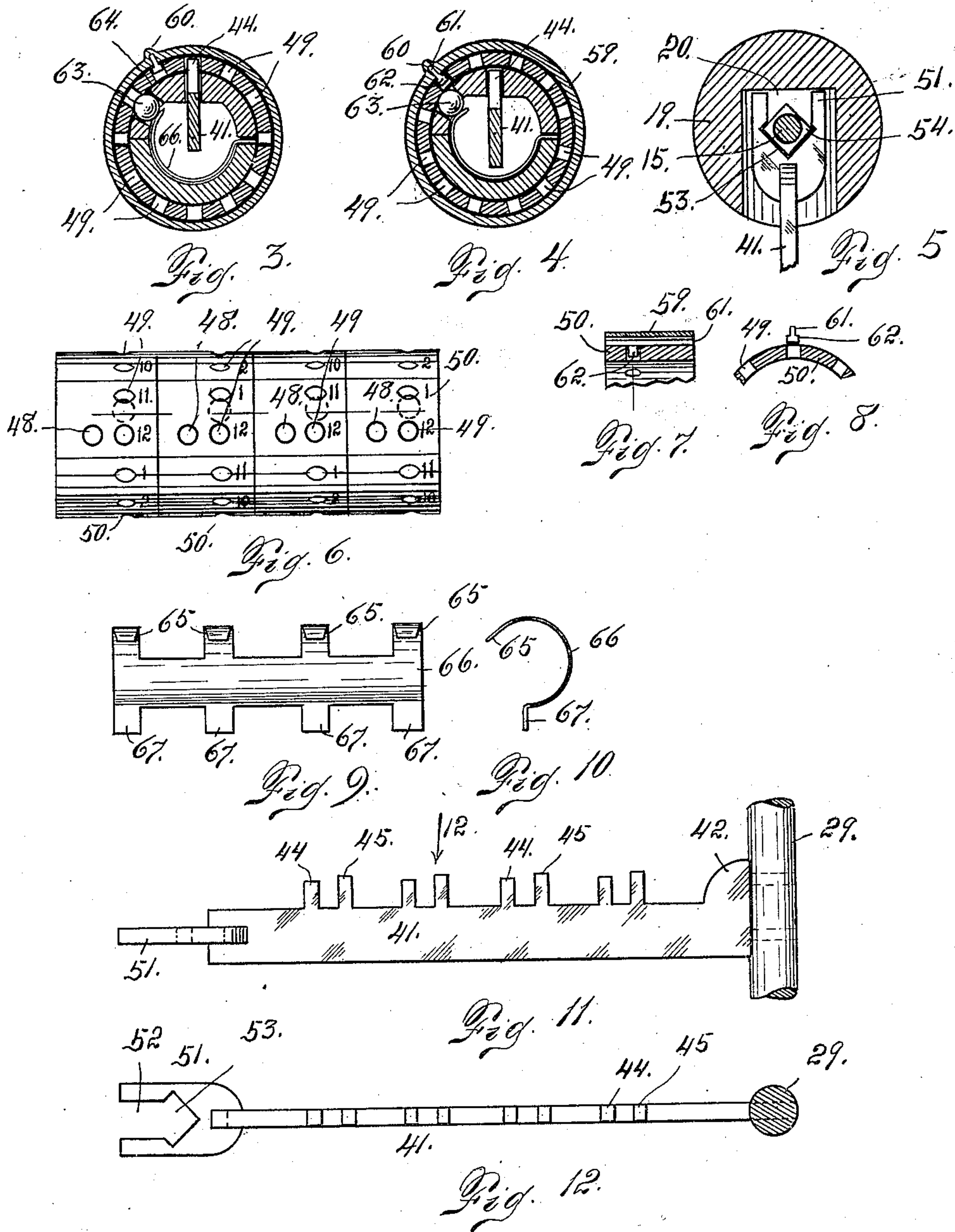
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Otto E. Hoddick.  
Dena Nelson.

E. E. Quaintance  
Inventor  
By *[Signature]*  
Attorney



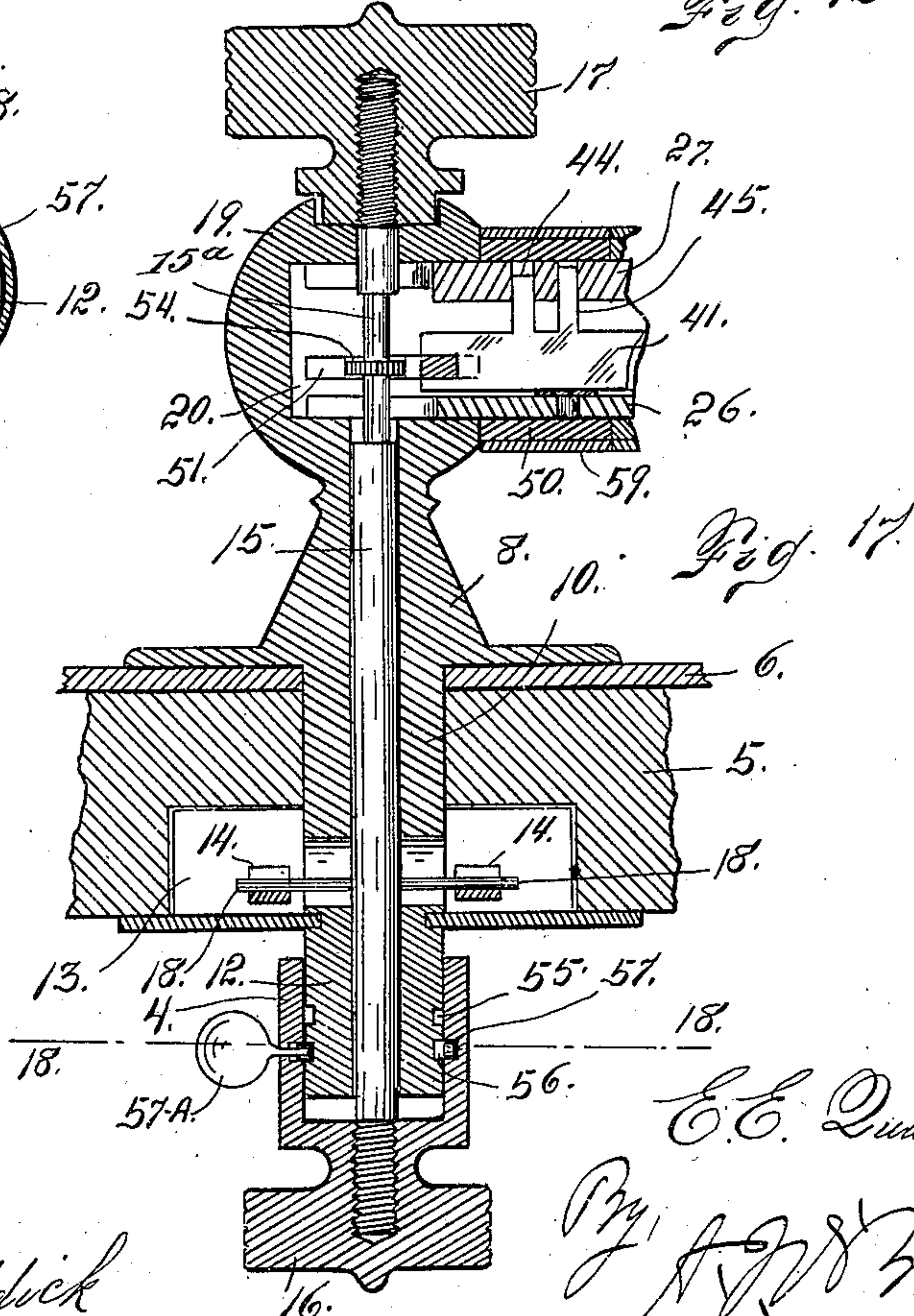
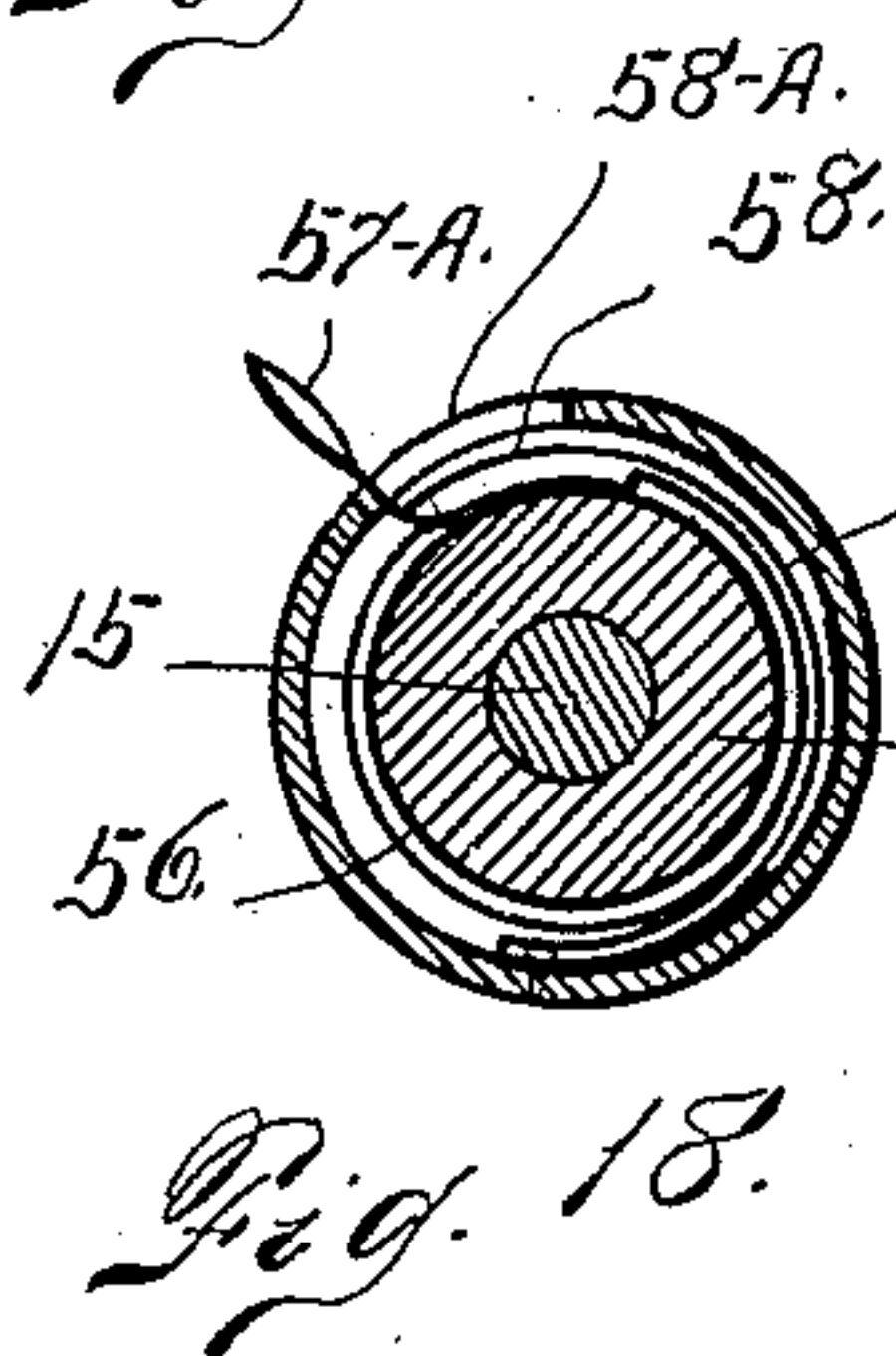
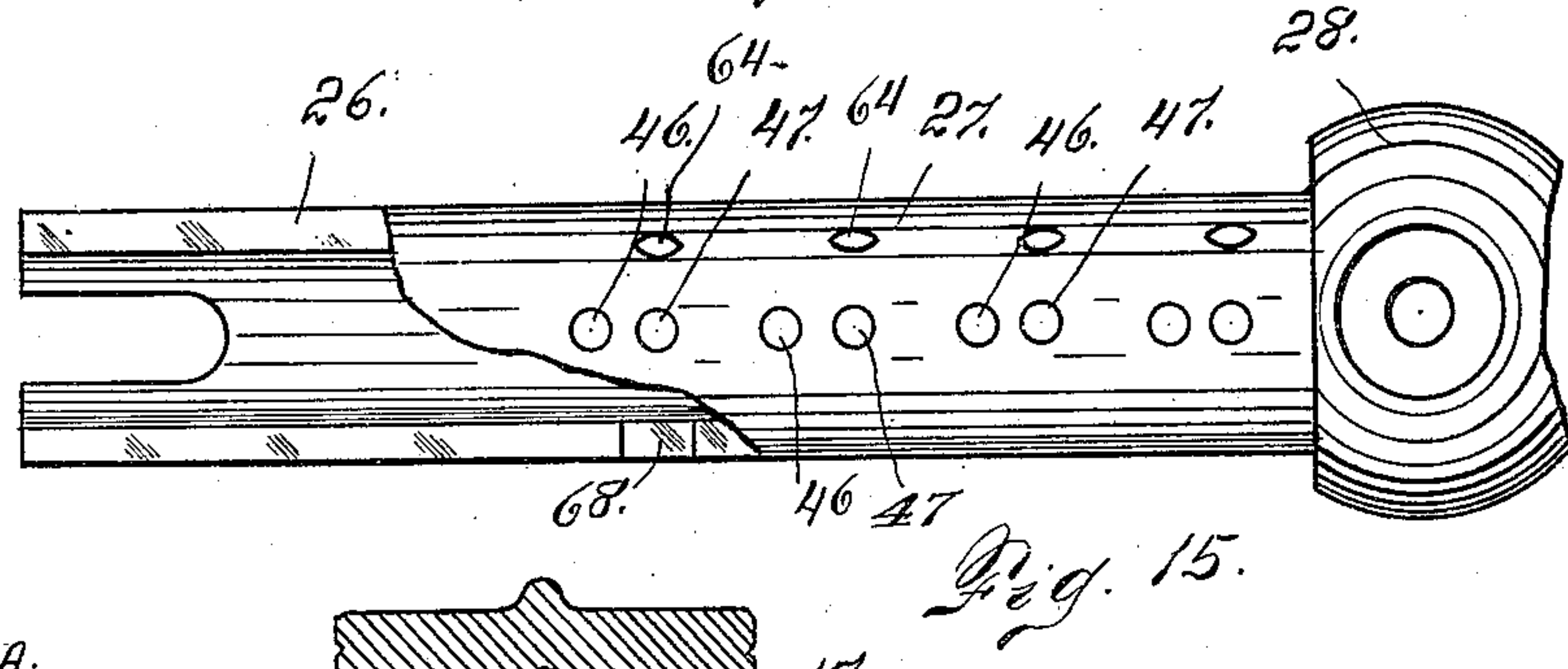
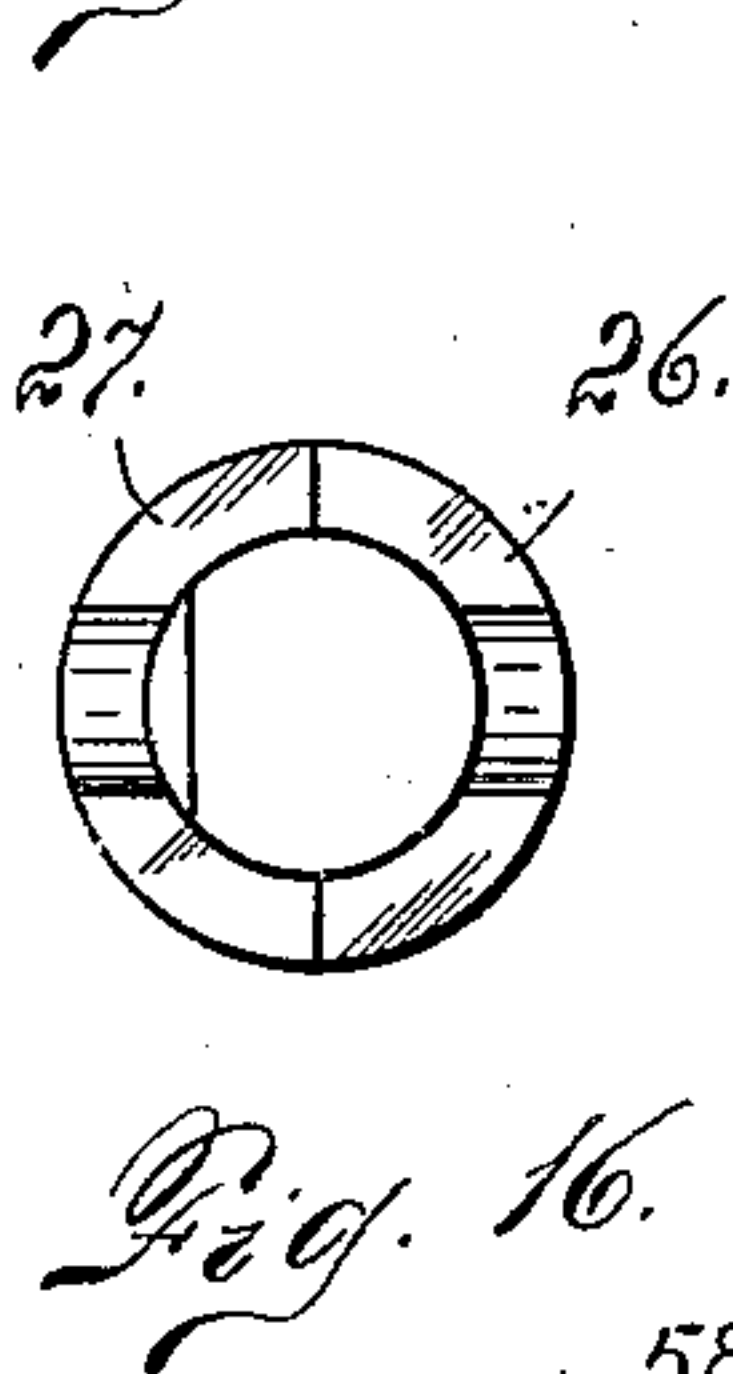
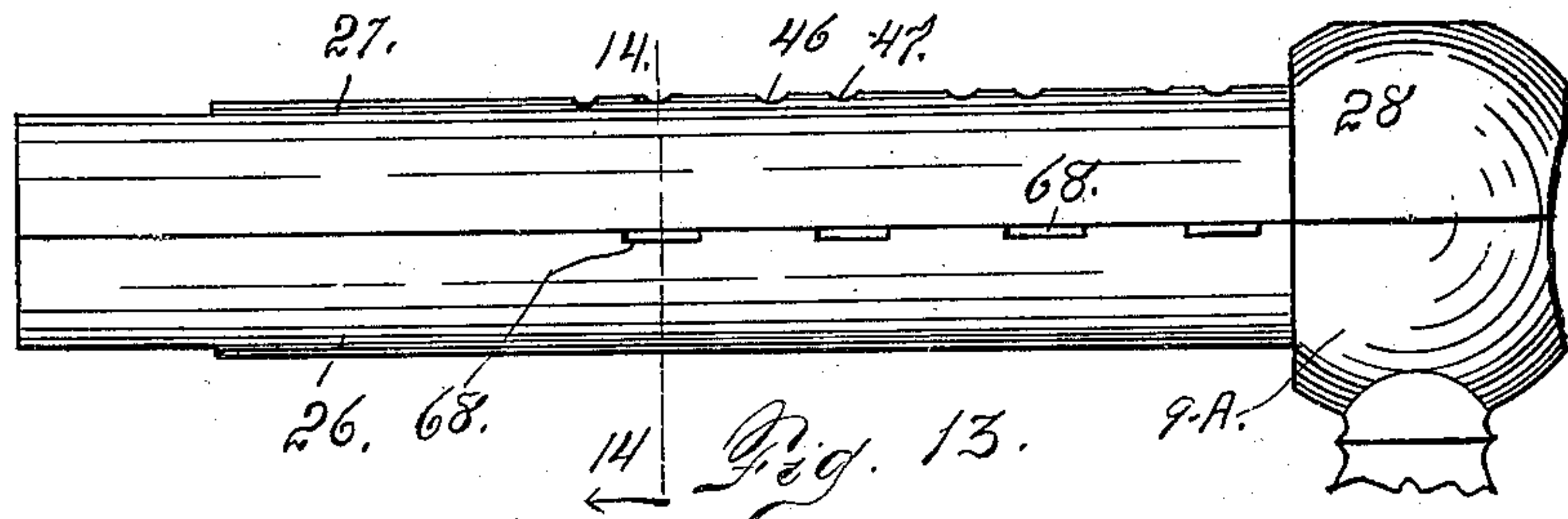
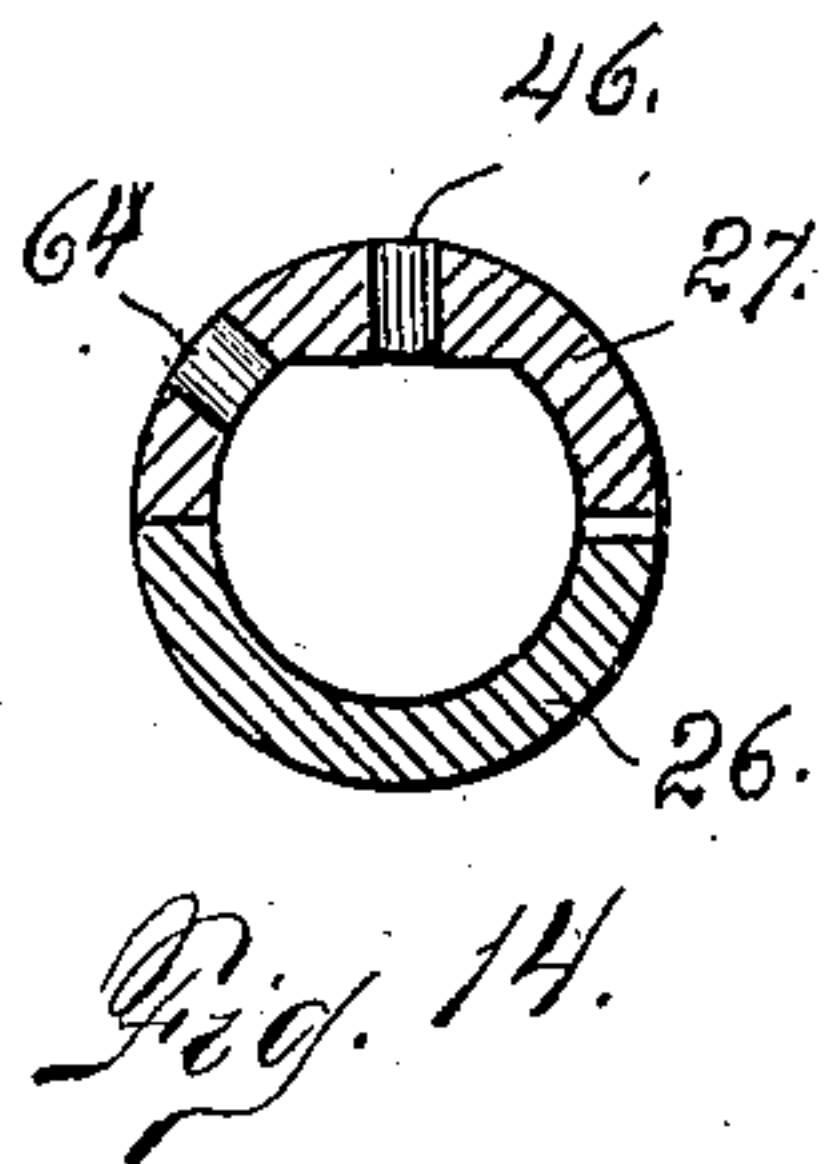
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3 SHEETS—SHEET 3.



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Otto E. Hoddick  
Dena Nelson.

E. E. Quainance  
Inventor  
By *[Signature]*  
Attorney



# UNITED STATES PATENT OFFICE.

ELSWORTH E. QUAINANCE, OF DENVER, COLORADO, ASSIGNOR TO THE PERMUTATION LOCK AND NOVELTY MANUFACTURING COMPANY, OF DENVER, COLORADO.

## PERMUTATION-LOCK.

No. 917,133.

Specification of Letters Patent.

Patented April 6, 1909.

Application filed November 30, 1906, Serial No. 345,581. Renewed August 24, 1908. Serial No. 450,054.

*To all whom it may concern:*

Be it known that I, ELSWORTH E. QUAINANCE, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Permutation-Locks; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in permutation locks of the class set forth in my previous patents numbered 785,834 and 817,388, respectively; and my application No. 300,843, filed Feb. 13th, 1906, allowed Sept. 27th, 1906.

My present invention relates to certain changes constituting improvements over the construction disclosed in the said application, all of which will now be described in detail reference being made to the accompanying drawing in which,

Figure 1 is a front view of my improved lock shown in connection with the escutcheon plate. Fig. 2 is a central vertical section taken through the lock, the spindles and their knobs, however, being shown in elevation. Figs. 3 and 4 are cross sections taken through the barrel or cylindrical portion of the lock, showing the parts in different relative positions. Fig. 5 is a section taken on the line 5—5 Fig. 2, the locking bar being shown in elevation and partly broken away. Fig. 6 is a detail view illustrating the tumblers assembled in the relation required to unlock the device. Fig. 7 is a fragmentary section taken through one of the tumblers shown in connection with its corresponding sleeve. Fig. 8 is a section taken at right angles to that shown in Fig. 7, showing the tumbler detached from the sleeve. In this view the device for connecting the sleeve and tumbler in operative relation is illustrated. Fig. 9 is a detail view illustrating a number of springs connected together and adapted to be located within the barrel of the lock. Fig. 10 is an end view of the construction shown in Fig. 9. Fig. 11 is a detail view of the locking bar with its spindle member partly broken away. Fig. 12 is a view of the same looking in the di-

rection of arrow 12 Fig. 11. Fig. 13 is a detail view of the barrel portion of the lock with the pedestal at one end thereof broken away. Fig. 14 is a cross section taken on the line 14—14 Fig. 13. Fig. 15 is a view looking at right angles to that shown in Fig. 13, one member of the barrel portion of the lock being partly broken away. Fig. 16 is an end view of the same. Fig. 17 is a fragmentary sectional view taken through the lock, showing the locking bar in a different relative position from that shown in Fig. 2. Fig. 18 is a cross section taken on the line 18—18 Fig. 17.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a door or other movable device to which my improved lock is applied. To the outside surface of the door is attached an escutcheon plate 6, said plate being secured in place by means of suitable fastening devices 7. To this escutcheon plate are applied two pedestals designated 8 and 9, respectively. The pedestal 8 is stationary and is provided with a shank 10 which passes through an opening formed in the door and is provided with a part 12 protruding from the inner surface of the door. A mortise 13 is formed in the door into which protrudes the yoke arms of a latch bolt (not shown). A spindle 15 passes entirely through the pedestal and is provided at its inner and outer extremities with knobs 16 and 17, respectively. This spindle is provided with radially projecting pins 18 adapted to engage the yoke arms of the latch bolt whereby the latter may be actuated when the spindle is turned. The exterior portion of the pedestal 8 is provided with an enlargement 19 having a recess 20 for a purpose hereinafter explained. The pedestal 9 is provided with a shank 21 seated in a slot 22 formed in the door. The inner extremity of the shank 21 is exteriorly threaded as shown at 21<sup>A</sup> and to this threaded extremity is screwed a small knob 23, which secures the pedestal in place. The inner surface of the door is also provided with an escutcheon plate 24 slotted to correspond with the slot in the door. The pedestal 9 is provided with a flange 25 of sufficient length to cover the slot 22, regardless of the adjustment of the pedestal within the slot. The outer extremity of the pedestal 9 is provided with an approximately semi-



spherical enlargement 9<sup>A</sup> formed integral with which is a semi-cylindrical hollow spindle member 26, which unites with a similar spindle member 27, to form a cylindrical or barrel-shaped spindle connecting the two pedestals of the device. The spindle member 27 is provided with an approximately semi-spherical enlargement 28, which unites with the similar enlargement 9<sup>A</sup> to form an approximately spherical part through which passes a spindle 29. This spindle 29 enters an opening 30 formed in the pedestal 9 and in which is located a coil spring 31 against which the inner extremity of the spindle bears. To the inner extremity of this spindle is attached a pin 32, which also passes through the small knob 23 and is adapted to press a contact 34 against a similar contact 35 whereby an electrical circuit is closed. The contacts 34 and 35 are connected with the opposite poles of the battery by means of conductors 37 and 38, respectively. These contact wires also lead to an alarm bell 39.

The spindle 29 is longitudinally movable within the pedestal 9, this movement being sufficient to close an alarm circuit composed of the members heretofore described. It must be understood that the alarm device may or may not be employed. By means of the alarm, the occupants of the house may be notified if a surreptitious attempt is made to open the lock.

The spherical member composed of the parts 9<sup>A</sup> and 28, is provided with an approximately spherical recess 40 into which extends the extremity 42 of a locking bar 41. The extremity 42 of this locking bar is made fast to the spindle 29 and the body portion of the bar passes through the hollow spindle members 26, 27. This locking bar is provided with a series of pins 44 and a corresponding number of somewhat longer pins 45. These pins 44 and 45, pass through openings 46 and 47, respectively, formed in the hollow spindle, and openings 48 and 49, respectively, formed in the rotatable tumblers 50. These tumblers 50 are applied to the hollow spindle and rotatable thereon, for the purpose of manipulating the lock. The pins 44 are all in alinement upon the locking bar 41 and when the tumblers are so adjusted that the corresponding openings 48 are in alinement with the said pins, the pins will enter the openings in the tumbler by virtue of the action of the spring 31 acting on the spindle 29. At the same time the pins 45, will also enter an alined series of openings 49.

The locking bar 41 together with the hollow spindle 26, 27, protrudes into the recess 20 formed in the part 19 of the pedestal 8. The portion of the locking bar which extends into the recess 20, consists of a yoke 51 provided with a slot 52 to allow the yoke

to straddle the reduced part 15<sup>A</sup> of the spindle 15. At the inner extremity of the slot 52, an angle-shaped recess 53 is formed in the yoke, the said recess being adapted to receive a device 54 of corresponding shape formed on the reduced part of the spindle. When the part 54 engages the recess 53, the door is locked, and the spindle 15 cannot be rotated. When, however, the tumblers 50 are rotated to allow the pins 44 of the locking bar to enter the corresponding openings of all the tumblers, the locking bar moves laterally within the hollow spindle and within the recess 20 of the pedestal part 19, sufficiently to disengage the yoke of the locking bar from the device 54 of the spindle. When this occurs the spindle 15 may be rotated and the latch bolt actuated as will be readily understood. Even when the locking bar is in the locking position within the hollow spindle, whereby the angular device 54 of the spindle is in engagement with the recess 53 of the locking bar yoke, the spindle 15 may be moved longitudinally, sufficiently to disengage the device 54 from the recess 53, thus permitting the spindle 15 to be turned for the purpose of actuating the latch bolt. For the purpose of maintaining the spindle 15 in either position of longitudinal adjustment, the inner extremity 12 of the pedestal 8 is provided with two circumferential grooves 55 and 56 adapted to be engaged by a spring catch 57 (see Fig. 18) having a reinforced part 58 adapted to enter either groove 55 or 56, according to the position of the spindle. The body of the spring catch is located in an interior circumferential recess formed in the sleeve 4 formed integral with the inner knob 16 and movable on the pedestal part 12. The spring catch 57 has an exteriorly protruding thumb piece 57<sup>A</sup> which passes through a slot 58<sup>A</sup> formed in the sleeve 4. This protruding thumb piece is utilized in adjusting the catch for the purpose of allowing the spindle to move longitudinally in the one direction or the other as desired.

Assuming now that the locking bar 41 is in the locking position as shown in Fig. 17, if it is desired to adjust the spindle 15, to allow the latter to be operated in the usual way for the purpose of throwing the latch bolt, as for instance during the day when it is not desired that the door should be locked, the thumb piece 57<sup>A</sup> is pressed outwardly sufficiently to detach the sleeve 4 from the pedestal part 12. Then by pressing outwardly on the knob 16, the spindle 15 is actuated longitudinally, sufficiently to throw its angular part 54 out of the recess 53 of the locking bar yoke. When this adjustment is made, the spring catch will be in alinement with the groove 55 of the part 12 and as soon as it is released, the catch will enter this groove and lock the spindle in the adjusted



position. The spindle may then be turned by the use of either knob 16 or 17 as may be desired, for the purpose of throwing the latch bolt. When, however, it is desired to return the spindle to the locked position, the spring catch is again thrown outwardly sufficiently to release it from the groove 55, after which the spindle is given a reverse longitudinal movement, returning the spring catch into position to enter the groove 56. By virtue of this arrangement the lock may be adjusted from the inside of the door, to permit the latch-actuating spindle to be turned freely, or locked against movement as may be desired. From the outside of the door, however, the lock can only be unlocked by manipulating the tumblers in the manner heretofore explained.

Attention is called to the fact that there is a series of openings 49 in each tumbler 50, the said openings extending circumferentially around the tumbler. In order to rotate any tumbler even when the device is in the locked position, it is necessary to first press inwardly on the knob 29<sup>A</sup> attached to the outer extremity of the spindle 29, sufficiently to depress the pins 45 whereby they are released from the tumbler openings 49. This slight depression of these pins, is not sufficient to disengage the locking bar from the angular part 54 of the spindle. By virtue of this arrangement, however, there is a click every time a tumbler is turned the distance between two openings 49, and an unauthorized person endeavoring to open the lock, would have nothing to inform him when the pin 44 entered its opening 48 which of course could not occur until the tumblers were all properly adjusted to open the lock. Hence the pins 45 together with the series of openings 49 formed in each tumbler, serve not only to prevent the tumblers from being moved accidentally, but also serve to mislead and confuse a person who might be attempting to surreptitiously open the lock.

As heretofore indicated each tumbler is provided with only one opening 48 adapted to receive a pin 44 of the locking bar. When these openings 48 of all the tumblers, are brought into alinement with the pins 44 of the locking bar, the spring 31 acting on the spindle 29, will carry the locking bar outwardly whereby the pins 44 protrude into the openings 48 simultaneously with the movement of the pins 45 into the openings 49 which are in alinement with the openings 48.

Each tumbler 50 is provided with an exteriorly located manipulating sleeve 59 which is provided with an exteriorly projecting bead 60 pressed out of the sleeve forming an interior groove adapted to receive a key 61 provided with an interiorly projecting lug 62, adapted to enter the outer

portion of a tumbler opening 49. This key is used in setting the combination and the projection 62 is dropped into an opening 49 located at any desired distance from the opening 49 which is in alinement with the opening 48. The openings 49 of each tumbler are numbered on the tumbler from 1 to 12 respectively, (see Fig. 6). As shown in the drawing the opening 49 numbered 12 is in alinement longitudinally with the opening 48 and it is evident that these two openings of each tumbler must be brought into alinement with the pins 44 and 45 of the locking bar before the lock can be unlocked. Hence in setting the combination the key 61 of each tumbler may be placed in an opening 49 at any desired distance from the opening designated 12 on the tumbler and the location of this key will also be the location of the ribs 60 of each sleeve. Hence when the combination is set, the user of the lock will know when the tumblers are adjusted for unlocking purposes, by the relative position of the ribs 60.

In order to enable the user of the lock to unlock it in the night or to enable a blind person to operate the same, I make provision whereby there is a clicking sound or audible indication, every time a tumbler is turned the distance between the openings 49. Hence a person who knows the combination will know how many clicks must occur before each tumbler is in the unlocking position. This clicking sound is caused by means of balls 63 located in recesses 64 formed in the hollow spindle in cross sectional alinement with the openings 49 of the tumblers. These balls are held in position within the openings 64 of the hollow spindle, by means of springs 65 located in the hollow of the spindle and acting on the respective balls, there being a ball 63 for each tumbler. The springs 65 are all mounted upon a curved plate 66 provided with a number of lips 67 occupying recesses 68 formed in the hollow spindle member 26 where it joins the member 27 on one side. When the two hollow spindle members are assembled the spring plate is held securely in place (see Figs. 3 and 4). The balls 63 are of such size that whenever an opening 49 is brought into register with an opening 64, a portion of the ball will be forced outwardly into the said opening by the action of its spring, thus producing a clicking sound. The balls 63 are considerably larger than the recesses 49 for obvious reasons.

From the foregoing description the use and operation of my improved lock will be readily understood. If we assume that the parts are in the unlocked position as shown in Fig. 2, if it is desired to lock the mechanism, the user will press inwardly on the knob 29<sup>A</sup>, whereby the locking bar 41 will be shifted within the hollow spindle suf-



ficiently to remove the pins 44 and 45, from the corresponding openings in the tumblers. Then by turning any tumbler, the mechanism will be locked. If one tumbler is  
 5 only turned one click of the ball 63 for instance, the user will note that upon reversing this tumbler or moving it in the opposite direction one click, the mechanism will be restored to the unlocked position.  
 10 It will thus be seen that the tumbler manipulation for locking the lock may be made as simple or as complicated as desired. Assuming that the mechanism is in the locking position, which means that the locking  
 15 bar is in such position with relation to the spindle 15 that the angular part 54 of the spindle is in engagement with the opening 53 of the locking bar yoke, if it is desired to leave the spindle 15 in position to rotate  
 20 so that the latch bolt may be shifted in the ordinary manner, it only becomes necessary to press outwardly on the thumb piece 57<sup>A</sup> of the spring 57, and push outwardly on the knob 16 until the spindle is shifted longitudinally sufficiently to bring the spring 57  
 25 into position to enter the groove 55. Then by releasing the thumb piece, the part 58 will enter the groove 55 and lock the spindle in the said position of longitudinal adjustment. This shifting of the spindle will  
 30 throw the angular part 54 out of engagement with the yoke opening 53, and leave the spindle free to turn as heretofore explained. In order to return the spindle to  
 35 the locking position, it will only be necessary to release the spring 57 from the groove 55 and reverse the longitudinal movement of the spindle.

Having thus described my invention, what  
 40 I claim is:

1. In a permutation lock, the combination with a hollow spindle, a locking bar transversely movable therein, permutation devices mounted on said spindle and coöperating  
 45 with said bar, and a rotatable spindle extending at right angles to the hollow spindle and having a part engaging the locking bar to prevent rotation of the spindle when said bar is in the locking position, the rotatable  
 50 spindle being longitudinally adjustable to disengage it from the locking bar to permit free rotation of the last named spindle when the locking bar and the permutation devices are in the locked position.

55 2. In a lock, the combination of a hollow spindle, a locking bar transversely movable therein, adjustable means coöperating with the locking bar for maintaining it in the locked position, the said bar being spring-  
 60 actuated whereby it has a tendency to move to the unlocked position, a rotatable spindle extending at right angles to the hollow spindle and having a part engaging the locking bar to prevent rotation of the spindle  
 65 when said bar is in the locking position, the

rotatable spindle being longitudinally adjustable to disengage it from the locking bar to permit free rotation when the locking bar is in the locked position, and means for holding the rotatable spindle in either  
 70 position of adjustment.

3. In a lock, the combination of a hollow spindle, a locking bar transversely movable therein, means mounted on the hollow spindle and coöperating with the said bar, said  
 75 means being adjustable to maintain said bar in the locked position or allow it to move to the unlocked position, a rotatable spindle extending at right angles to the hollow spindle but having a part engaging the  
 80 locking bar to prevent rotation of the spindle when said bar is in the locking position, the rotatable spindle being longitudinally adjustable to disengage it from the locking bar to permit free rotation, a pedestal  
 85 through which the rotatable spindle passes, a knob connected with the spindle at one extremity and having a sleeve slidable exteriorly on the pedestal, a spring catch mounted on the sleeve, the pedestal being  
 90 provided with two grooves adapted to receive the said catch which is readily accessible for adjusting purposes.

4. The combination of a hollow spindle, permutation devices mounted thereon, a  
 95 locking bar movable transversely therein and coöperating with the permutation devices, a rotatable spindle passing through the hollow spindle at right angles thereto and constructed and arranged to be locked  
 100 against rotation by the locking bar when the latter is in the locking position, the rotatable spindle being longitudinally adjustable to disengage it from the locking bar, substantially as described.  
 105

5. In a lock, the combination of a hollow spindle, a locking bar located therein, tumblers mounted to rotate on the hollow spindle and coöperating with the locking bar, click balls mounted in openings formed in  
 110 the hollow spindle, springs for pressing the said balls outwardly, the said tumblers being provided with openings located in the cross sectional plane of the balls, whereby as the tumblers are rotated, the balls are  
 115 forced partly into the holes as the latter come into line with the balls for the purpose set forth.

6. In a permutation lock, the combination with a suitable support, of tumblers mounted to rotate on said support, a locking bar movable in the said support and coöperating with the tumblers, a sleeve applied to each tumbler, each tumbler having a number of orifices arranged circumferentially  
 120 therearound, and a key provided with a projection adapted to enter one of said orifices, the body of the key protruding beyond the tumbler, and the sleeve having an exterior bead and a coincident interior groove  
 130



adapted to receive the protruding portion of the tumbler key for the purpose set forth.

7. In a lock, the combination of a hollow spindle, a locking bar transversely movable  
5 in said spindle, tumblers mounted in the spindle, the said spindle having pins and the tumblers having openings which the said pins are adapted to enter, a second  
10 hollow spindle extending at right angles to the spindle and rigidly connected with the locking bar, the locking bar spindle being longitudinally movable to shift the locking bar within the hollow spindle, to cause the pins of the bar to engage or dis-

engage the openings of the tumblers, an 15 electrical circuit, and an alarm device located therein, the locking bar spindle being provided with a part adapted to close the alarm circuit as the locking bar spindle is moved longitudinally, substantially as de- 20 scribed.

In testimony whereof I affix my signature in presence of two witnesses.

ELSWORTH E. QUAINANCE.

Witnesses:

DENA NELSON,  
A. J. O'BRIEN.