

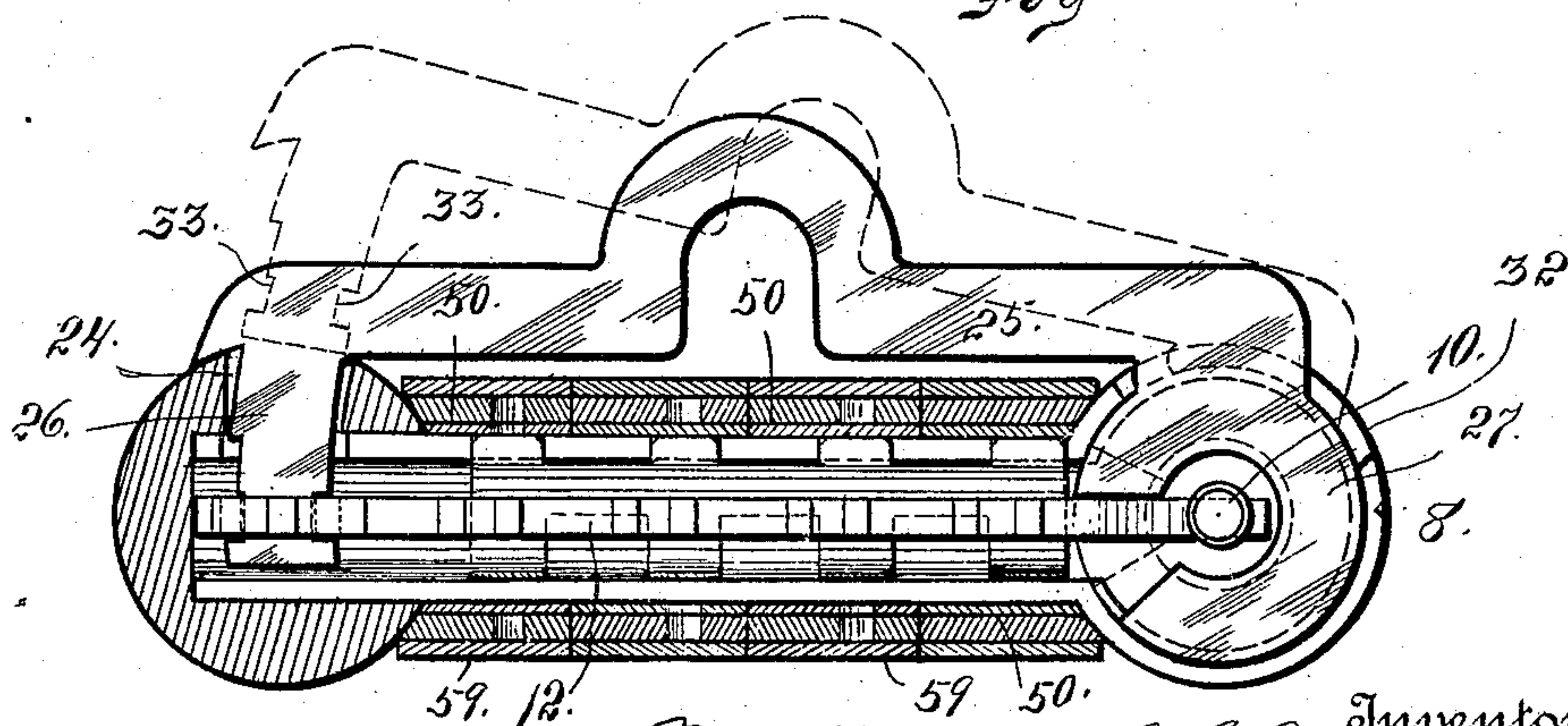
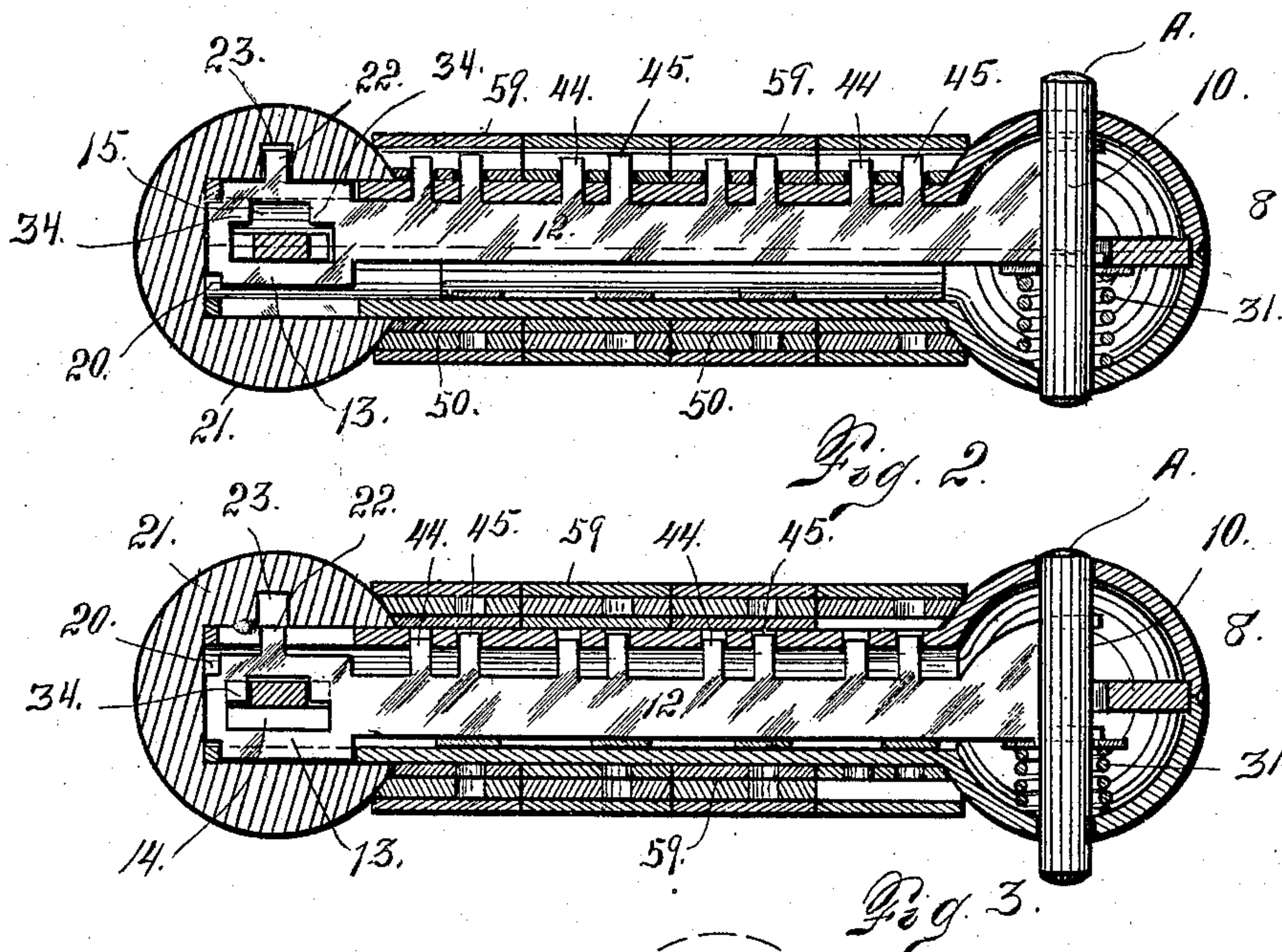
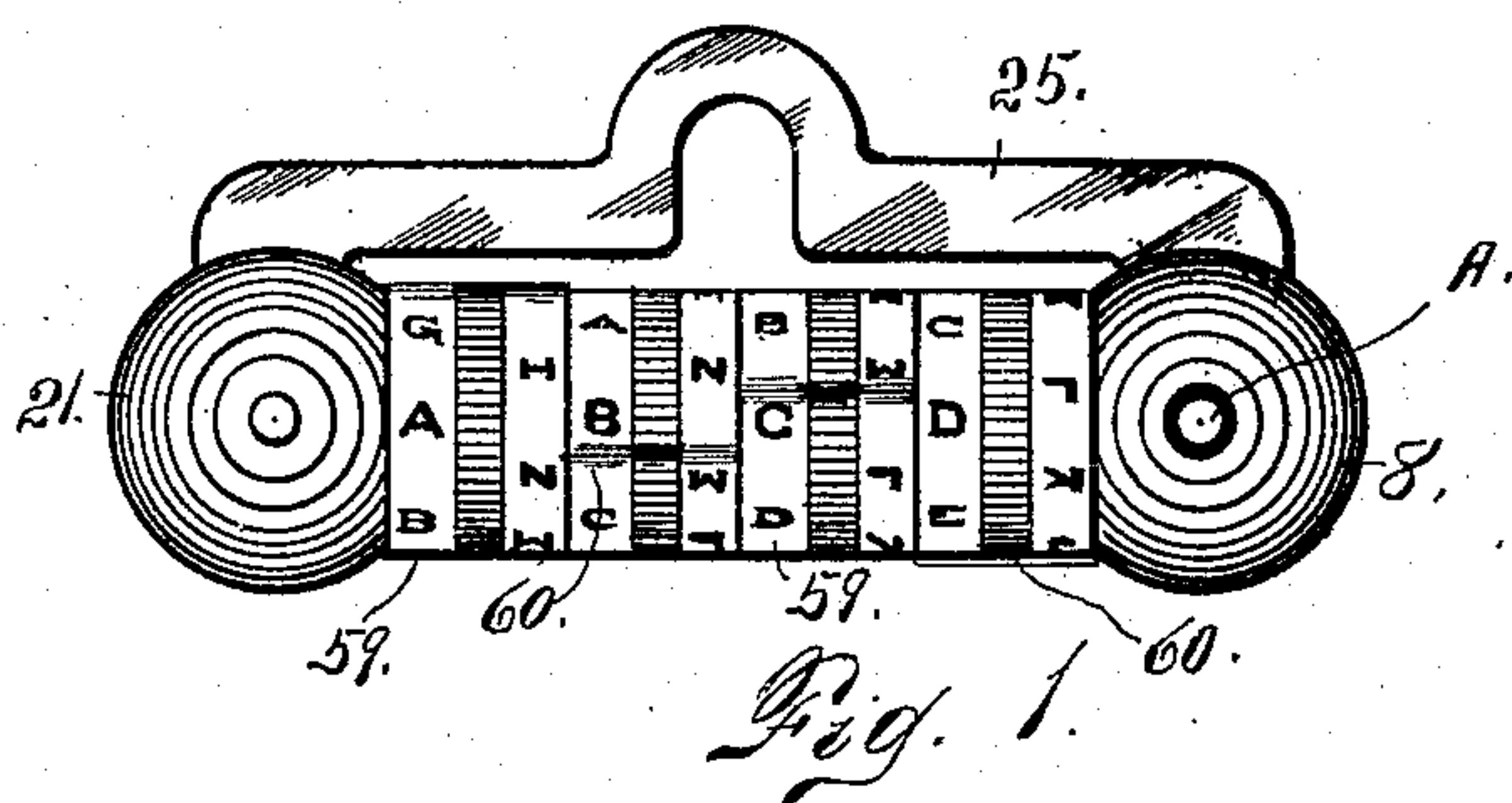
No. 891,439.

PATENTED JUNE 23, 1908.

E. E. QUAINANCE.  
PERMUTATION LOCK.

APPLICATION FILED DEC. 24, 1906.

2 SHEETS—SHEET 1.



Witnesses  
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Fig. 4.

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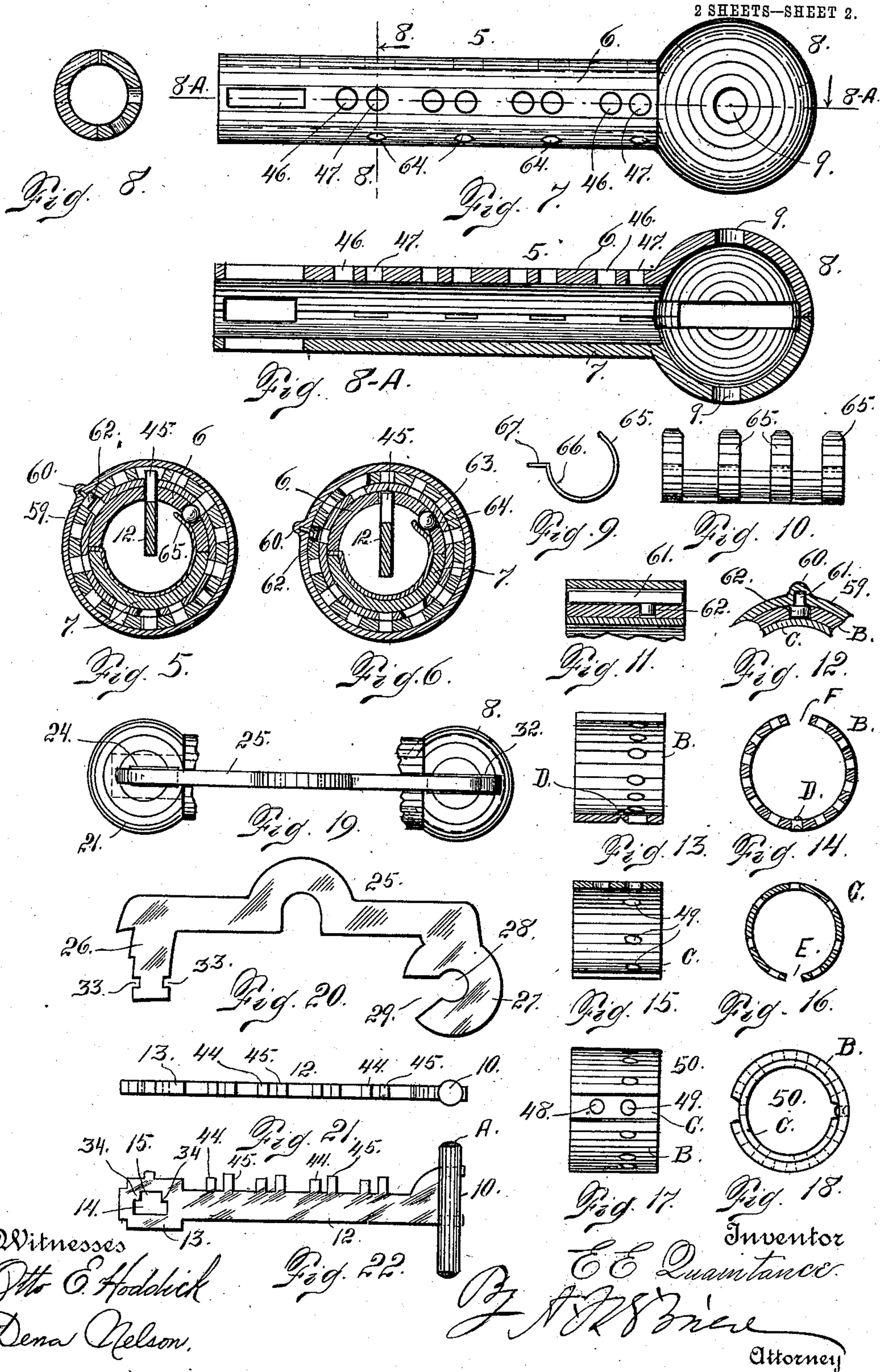
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# UNITED STATES PATENT OFFICE.

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## PERMUTATION-LOCK.

No. 891,439.

Specification of Letters Patent.

Patented June 23, 1908.

Application filed December 24, 1906. Serial No. 349,217.

*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 general nature set forth in my previous patents numbered 785,834 and 817,388 and dated March 28th, 1905 and April 10th, 1906; and applications numbered 300,843 and 345,581, filed Feb. 13th, 1906 and Nov. 30th, 1906, respectively.

My present invention covers certain novel features of construction, all of which will be fully understood by reference to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is an elevation of my improved lock. Fig. 2 is a longitudinal section of the device showing the locking bar in the unlocked position or in position to release the shackle, and the parts on the larger scale. Fig. 3 is a similar view showing the mechanism in the locked position or in position to prevent the withdrawal of the shackle. Fig. 4 is a section taken at right angles to Figs. 2 and 3, showing the shackle in full lines in the closed position and in dotted lines in the open position. In this view one member of the hollow spindle is removed, the plane of the section being between the two members of the spindle. Fig. 5 is a cross section taken through the lock showing the mechanism in the unlocked position. Fig. 6 is a similar view showing the mechanism in the locked position. Fig. 7 is a detail view of the hollow spindle. Fig. 8 is a cross section of the same on the line 8—8 Fig. 7. Fig. 8<sup>A</sup> is a section taken on the line 8<sup>A</sup> Fig. 7. Figs. 9 and 10 are end and side views respectively, of the click spring device. Fig. 11 is a section taken through one of the tumblers and the outer shell, cutting the same parallel with the axis of the spindle, and in line with the

tongue which connects the shell with the tumbler. Fig. 12 is a cross section of the same. Figs. 13 and 14 are longitudinal and cross sections respectively, of one of the tumbler members. Figs. 15 and 16 are corresponding views of the other tumbler member. Figs. 17 and 18 are side and end elevations respectively, of one of the tumblers showing the two members in the assembled relation. Fig. 19 is an elevation of the lock looking in the direction of the shackle which is shown in the closed position, the spindle and the devices mounted thereon being partly broken away between the lock extremities. Fig. 20 is a side elevation of the shackle shown in detail. Fig. 21 is an edge view of the locking bar. Fig. 22 is a side elevation of the same.

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

Let the numeral 5 designate a hollow spindle composed of two members 6 and 7 each of which is provided with a hollow semi-spherical part, the two parts forming together an approximately spherical knob or enlargement 8 provided on opposite sides with openings 9 adapted to receive the opposite extremities of a rod 10 to which is made fast a bar 12 which extends longitudinally through the hollow of the spindle body and is provided with an enlarged extremity 13 provided with an opening 14 having an extension 15. This 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 member 6 of the hollow spindle and openings 48 and 49, respectively, formed in the rotatable tumbler 50. These tumblers 50 are applied to the hollow spindle and are rotatable thereon for the purpose of manipulating the lock. The pins 44 are all in alinement upon the locking bar 12 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 a spring 31 located within the hollow knob of the spindle, surrounding the rod 10 and acting on the locking bar 12. The locking bar 12 together with the hollow spindle 5, protrudes into a recess 20 formed in a knob or enlargement 21 applied to the



extremity of the hollow spindle opposite the hollow knob or enlargement 8 in which the pin 10 is located. The knob 21 is held in place on the hollow spindle by a projection 22 of the locking bar which enters a recess 23 formed in the knob, and communicating with the main recess 20. The locking bar being normally actuated by the spring 31, is held in such position that its projection 22 engages the recess 23 of the knob 21 and retains the latter in place. This knob 21 is provided with a lateral opening 24 communicating with the recess 20, and forming a passageway for a projection 26 formed on one extremity of the shackle 25, the opposite extremity 27 of the shackle being journaled upon the central part of the rod 10. This extremity 27 is provided with a central opening 28 where it engages the rod 10. This opening 28 communicates with a sector-shaped opening 29, which forms a passage to allow the rod 10 to enter the central opening 28 of the shackle extremity. The hollow knob or enlargement 8 is provided with an opening 32 through which the pivoted extremity of the shackle protrudes and which allows the latter sufficient movement for the proper performance of its function.

The extremity 26 of the shackle is recessed on opposite sides as shown at 33. This extremity of the shackle enters the opening 14 of the locking bar and also the recess 20 of the knob 21. Now if it is desired to lock the shackle in place, the operator will push upon the extremity A of the rod 10, whereby the said rod and locking bar are forced against the spring 31, and the parts 34 of the locking bar on opposite sides of the recess 15, are made to engage the recesses 33 of the shackle. Then by turning one or more tumblers so as to bring the opening 48 out of alinement with a corresponding pin 44 of the bar, the shackle will be retained in the locked position, and can only be removed by restoring the adjusted tumbler or tumblers to their normal position or into such position that the openings 48 and 49 of all the tumblers are in alinement with each other and also with the pins 44 and 45 of the locking bar.

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 extremity A of the rod 10, sufficiently to depress the pins 45 whereby they are released from the tumbler openings 49.

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

locking bar and the rod 10, will move the locking bar within the hollow spindle to the position shown in Fig. 2 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 for convenience of manufacture is formed of two members B and C, the member C being fitted within the member B, the member B being provided with an interior projection D, adapted to enter a slot E formed in the member C, parallel with the axis of the spindle. When the tumblers are assembled on the hollow spindle, as they are close together there is no opportunity for the spindle members to become separated. The tumbler members B and C are provided with registering openings extending around the tumbler to receive a pin 45 of the locking bar. As shown in the drawing the tumbler member B is provided with a slot F where the openings 48 and the alined opening 49 of the tumbler member C are located. This has nothing to do with the operation of the device and is simply for convenience of manufacture. The tumbler member B has a greater number of openings than the tumbler member C, for a purpose hereinafter explained.

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. Hence the necessity for a greater number of openings in the tumbler member B than in the member C. This construction gives a greater range of adjustment in setting the combination with reference to letters or other characters formed exteriorly upon the tumbler (see Fig. 1). The key 61 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 designated on the tumbler by letters.

In order to enable the user of the lock to unlock it in the night and 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 of the inner tumbler member. Hence a person who knows the combination will know how many clicks must occur before the tumbler is in the unlocked 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 open-



ings 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 formed in one of the hollow spindle members where it joins the other member. When the two hollow spindle members are assembled the spring plate is held securely in place. 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 would 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 device will be readily understood. When it is desired to unlock the lock, the tumblers must be so manipulated as to allow the locking bar to assume the position shown in Fig. 2 under the influence of the spring 31. The shackle may then be turned upon the rod 10, and its extremity 26 removed from the locking bar and the knob 21 as indicated by dotted lines in Fig. 4. In locking the lock, however, it is only necessary to press the extremity 26 of the shackle into place within the locking bar of the knob 21, press inwardly upon the extremity A of the rod 10 whereby the tumblers are released and allowed to turn, and then turn one or more of the tumblers, to such a position as to throw its opening 48 out of line with its corresponding locking bar pin 44. The locking bar will then be retained in the locking position or in such position as to retain the shackle in the locking position, until the tumblers have been readjusted as will be readily understood.

Having thus described my invention, what I claim is:

1. In a permutation lock, the combination of a hollow spindle having an enlargement at one extremity, a locking bar transversely movable within the spindle, a shackle journaled in the enlargement of said spindle at one extremity of the locking bar, its opposite extremity being constructed to engage the opposite extremity of the locking bar, and permutation devices mounted on the spindle for controlling the movement of the locking bar, substantially as described.

2. In a permutation lock, the combination of a hollow spindle, a locking bar transversely movable in the spindle, the spindle being provided with an enlargement at one extremity, a rod connected with the locking bar extremity and having one extremity protruding from the enlarged extremity of the spindle,

the rod and locking bar being spring-actuated, a shackle having one extremity journaled on the said rod, its opposite extremity cooperating with the locking bar, and permutation devices mounted on the spindle for controlling the movement of the locking bar, substantially as described.

3. A permutation lock comprising a hollow spindle having a knob or enlargement at each extremity, a locking bar transversely movable in the spindle and protruding into the said knobs which are recessed for that purpose, a rod connected with one extremity of the locking bar and protruding from one knob of the spindle to permit movement of the bar from the outside of the knob, a shackle journaled on the rod extremity of the locking bar while its opposite extremity is adapted to interlock with the locking bar, and permutation devices revolubly mounted on the spindle between the knobs for controlling the movement of the locking bar, substantially as described.

4. In a permutation lock, the combination of a hollow spindle having knobs or enlargements at both extremities, a locking bar transversely movable in the spindle and having its extremities protruding into chambers formed in the knobs of the spindle, one of the knobs having an opening, a rod rigidly connected with the locking bar and protruding from the opening to permit exterior manipulation of the locking bar, a spring acting on the locking bar, a shackle journaled on the rod at one extremity, its opposite extremity being constructed to cooperate with the locking bar, and permutation devices mounted on the spindle between the said knobs, substantially as described.

5. In a permutation lock, the combination of a hollow spindle, a locking bar transversely movable in the spindle, the latter being provided with hollow extremities into which the extremities of the locking bar protrude, a rod connected with one extremity of the locking bar, the rod having one extremity protruding through an opening formed in the corresponding spindle extremity, a spring acting on the bar whereby it has a normal tendency to move in one direction, a shackle journaled on the rod extremity of the locking bar, while its opposite extremity is adapted to enter the corresponding extremity of the spindle, the spindle and shackle being shaped to interlock, and permutation devices mounted to rotate on the spindle between its extremities, for controlling the movement of the locking bar, substantially as described.

6. A permutation lock comprising a hollow spindle, a locking bar transversely movable in the spindle, a shackle having one extremity journaled at one end of the locking bar while its opposite extremity is adapted to interlock with the corresponding extremity

of the bar, permutation devices mounted to rotate on the spindle for controlling the movement of the locking bar therein, the said devices each consisting of a body member and a  
5 removable sleeve or shell member, the body member of each device being provided with openings adapted to receive pins formed on the locking bar which pins also protrude

through openings formed in the hollow spindle, substantially as described.

10

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

ELSWORTH E. QUAINANCE

Witnesses:

DENA NELSON,

OTTO E. HODDICK.