

3 Sheets-Sheet 1,

W. F. Kistler,

Safe Lock.

No 66,502.

Patented July 9, 1867.

Fig 1

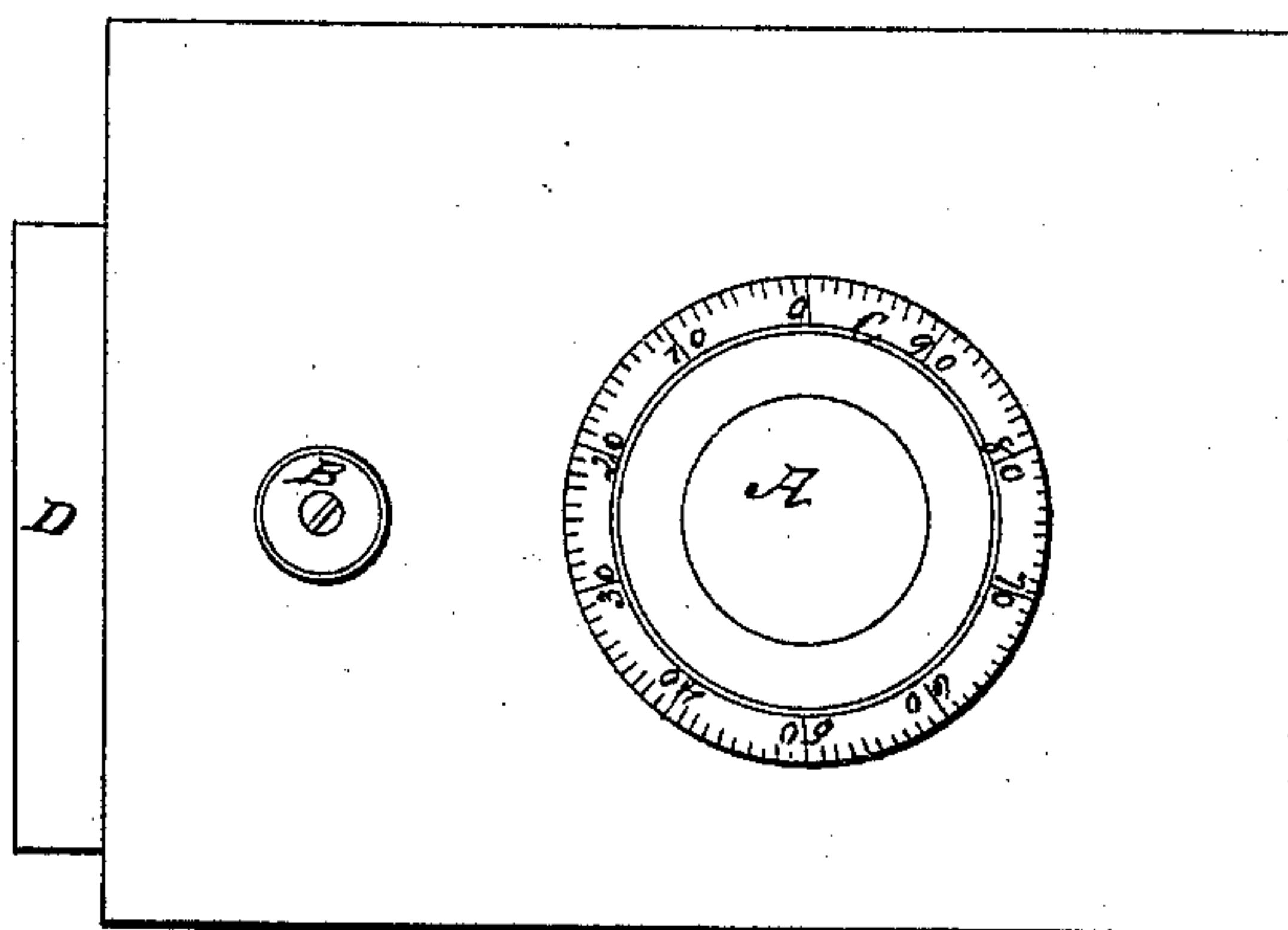


Fig 2

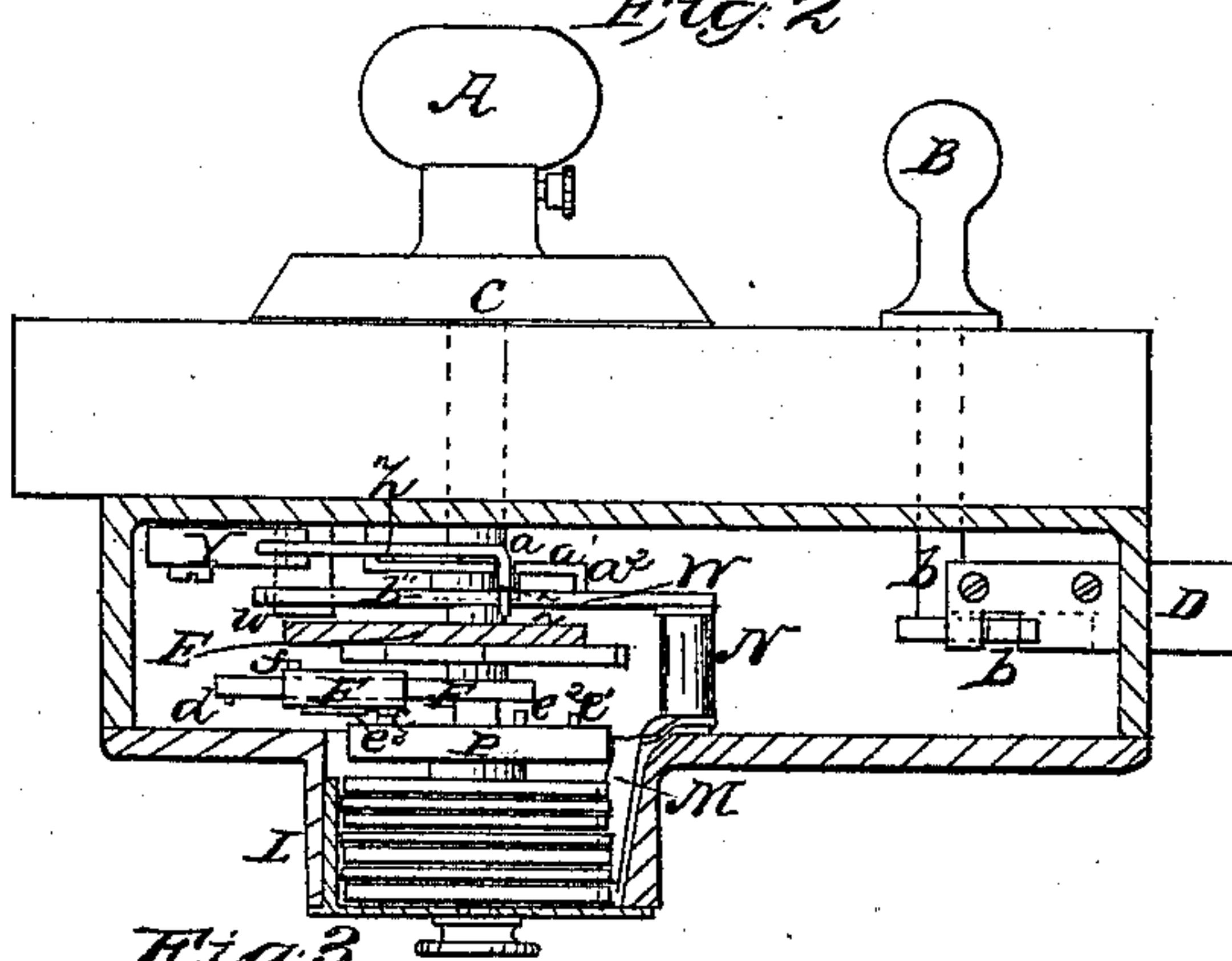
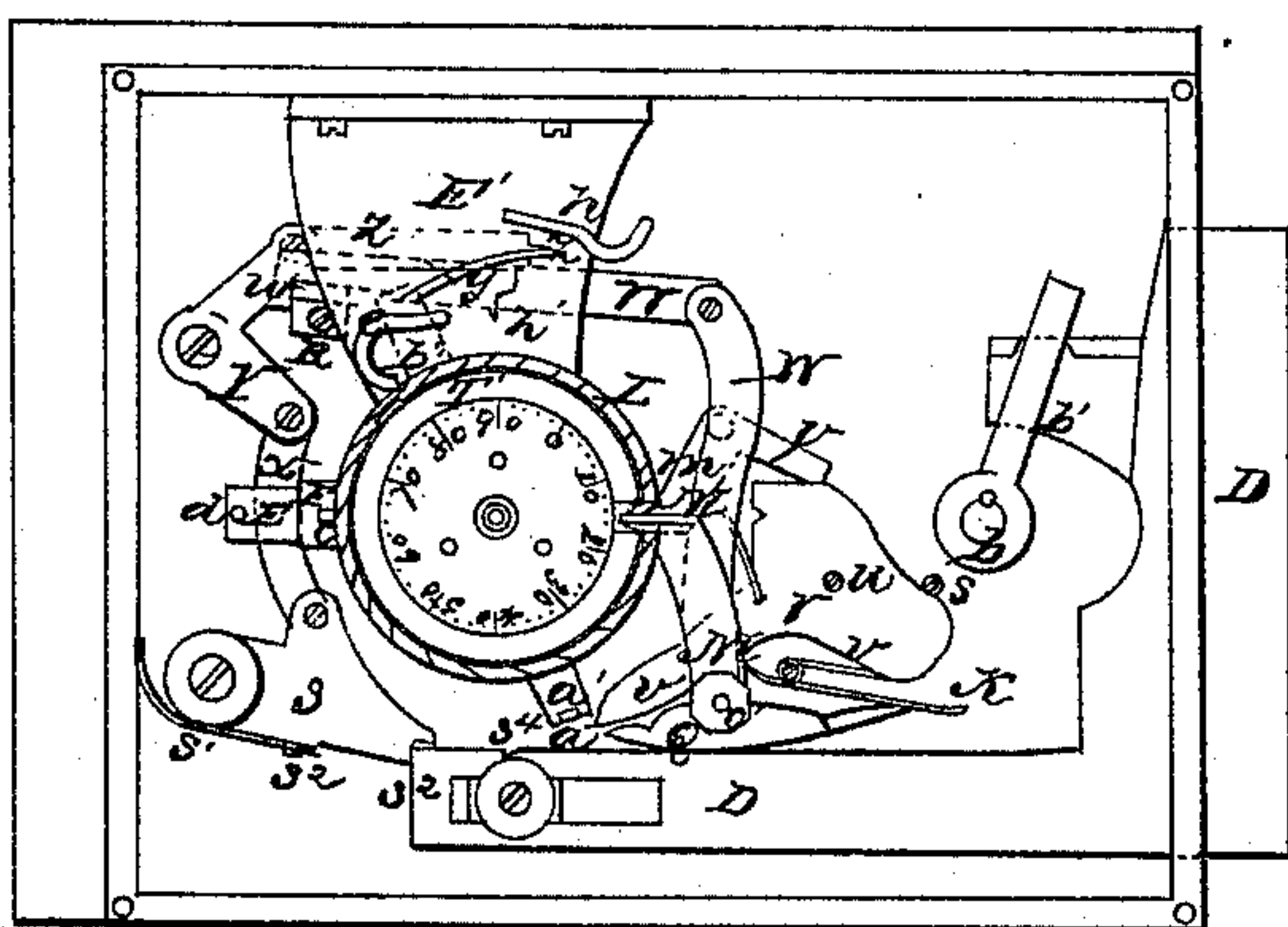


Fig 3



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N<sup>o</sup> 66,502.

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Fig. 4

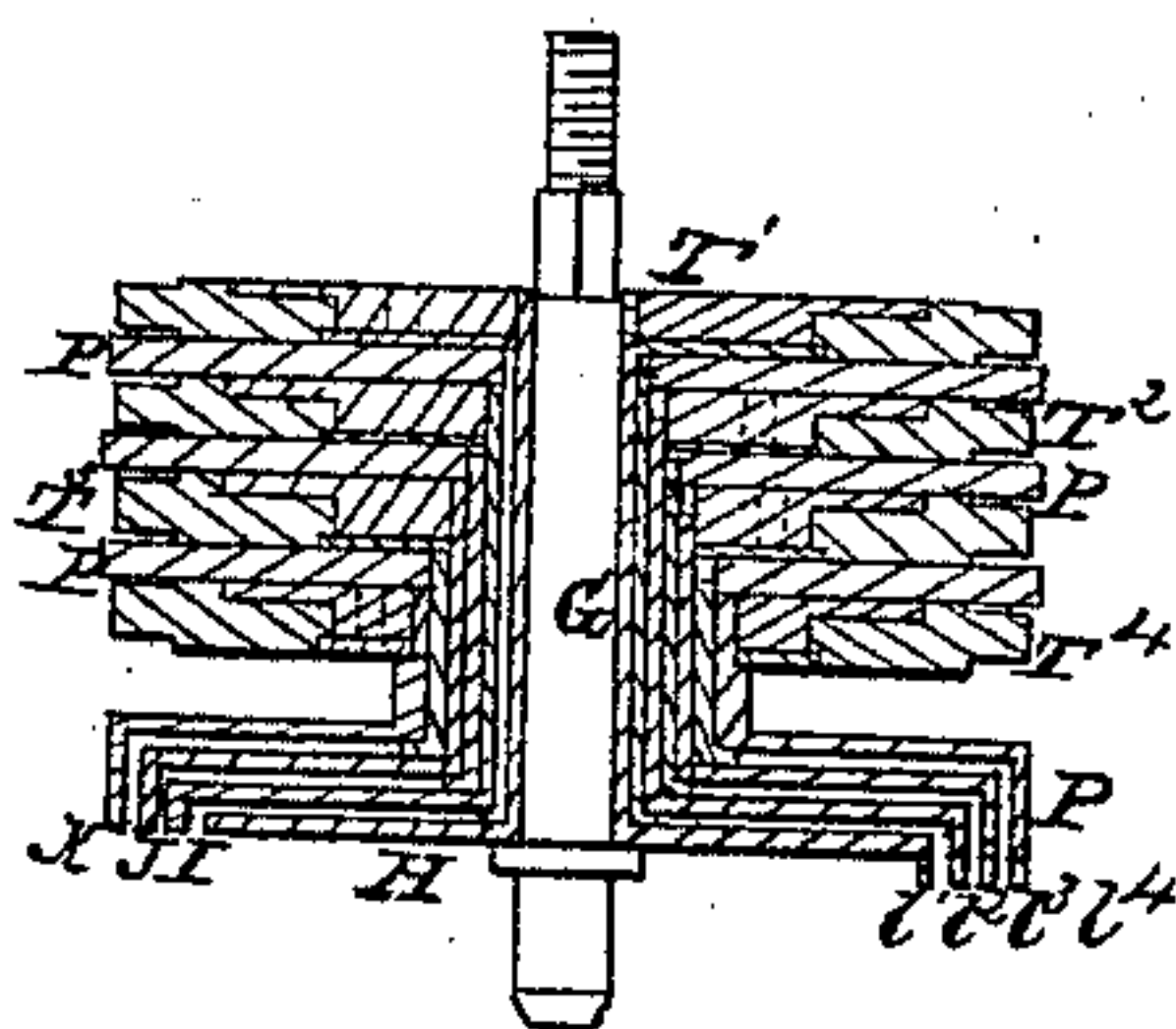


Fig. 5

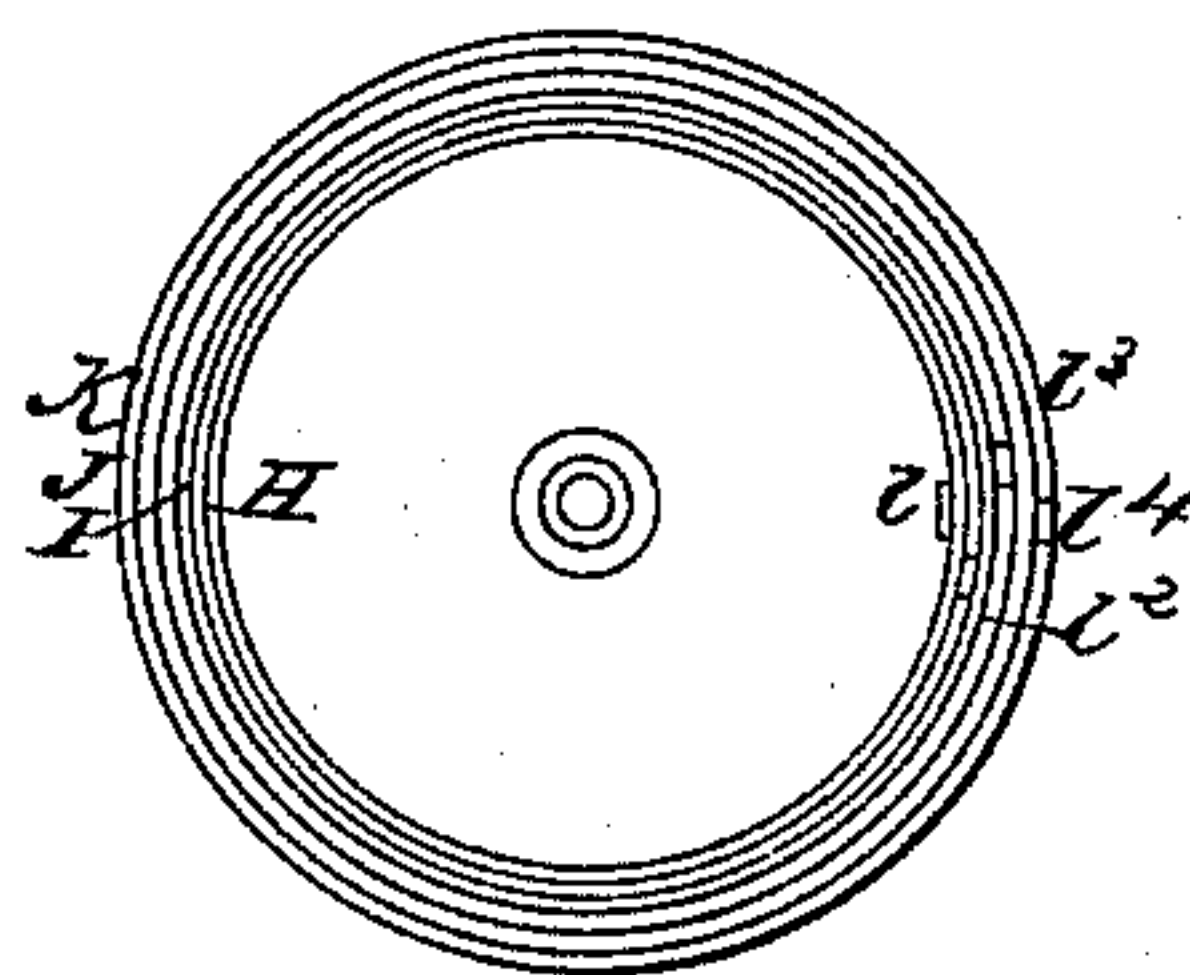


Fig. 6

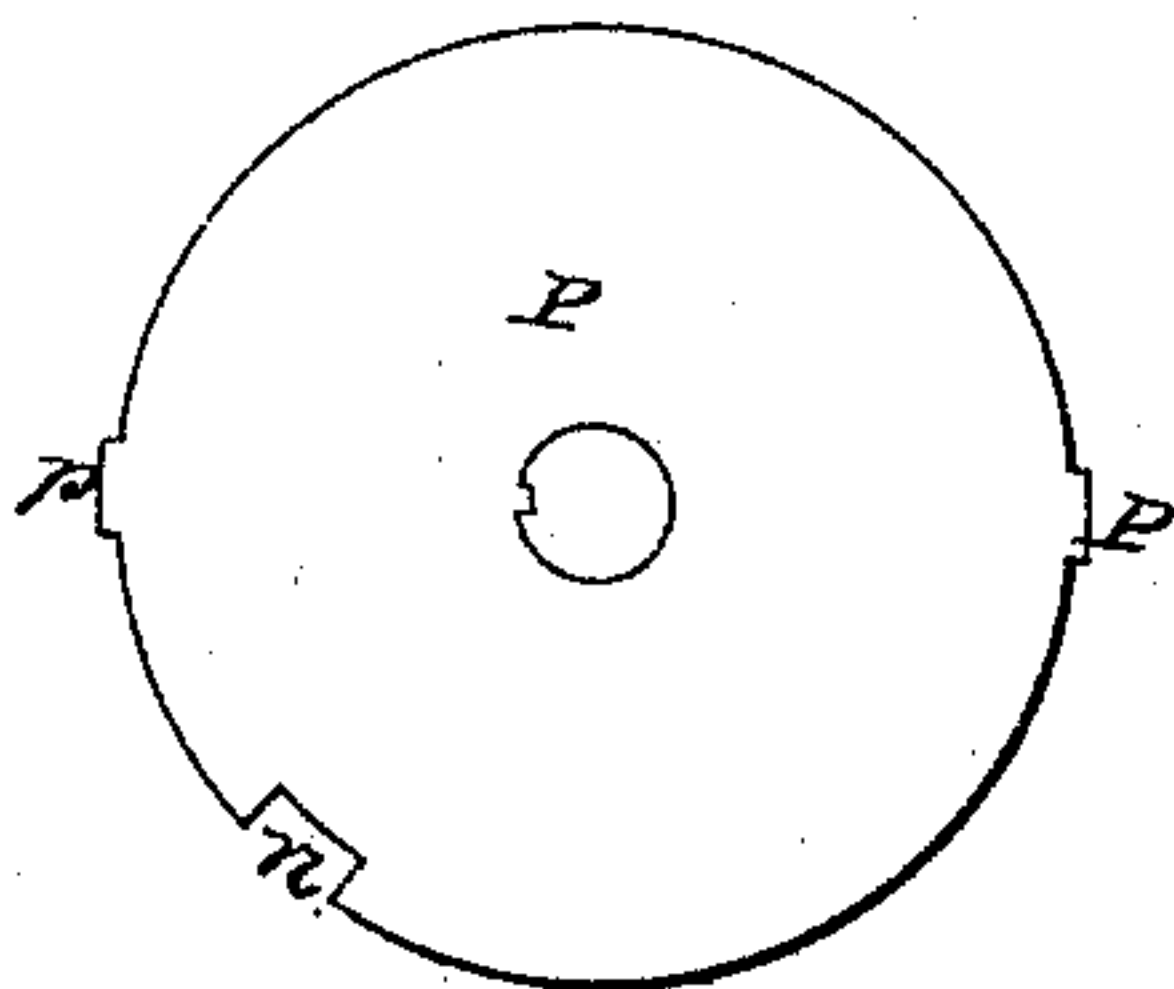
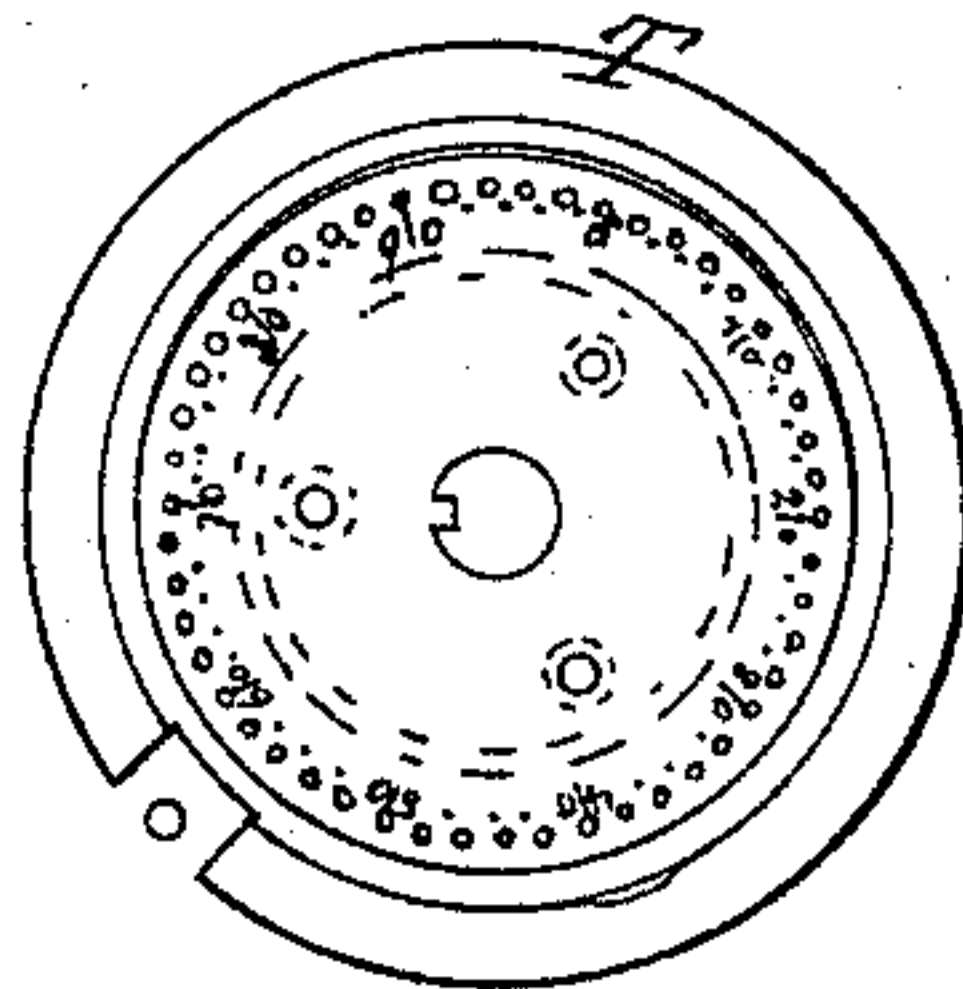


Fig. 7



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# United States Patent Office.

WILLOUGHBY F. KISTLER, OF CHICAGO, ILLINOIS.

*Letters Patent No. 66,502, dated July 9, 1867.*

## IMPROVEMENT IN PERMUTATION LOCKS.

*The Schedule referred to in these Letters Patent and making part of the same.*

### TO ALL WHOM IT MAY CONCERN:

Be it known that I, WILLOUGHBY F. KISTLER, of Chicago, in the county of Cook, and State of Illinois, have invented a new and useful Improvement in Safe-Locks; and I do hereby declare and make known that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and the figures and letters marked thereon, which form part of this specification.

To enable those skilled in the art to understand how to construct and use my invention, I will proceed to describe the same with particularity, making reference in so doing to the aforesaid drawings, in which—

Figure 1 represents a front exterior view of my lock.

Figure 2 is a plan section of the same, taken at the line *x* in fig. 3.

Figure 3 is an interior view thereof, seen from the rear.

Figure 4 is a central sectional view of the tumblers, and their attachments and appendages.

Figure 5 is an end view of the parts represented in fig. 4, seen from the front.

Figure 6 is a detached view of one of the partitions between the tumblers, and

Figure 7 is a detached view of one of the tumblers; and

Figures 8 and 9 exhibit the action of the mechanism for operating the locking-dog.

Similar letters of reference in the several figures denote the same parts of my invention.

A represents a knob projecting through the door of the safe, being secured upon a spindle, *a*, and provided with a disk-plate, C, marked into spaces around its circumference from one up to one hundred, as indicated in fig. 1. The said disk C revolves with the knob A, moving closely against the safe-door, as shown in fig. 2. The inner end of the spindle *a* is supported in a plate, E', firmly attached to the interior of the lock-case, as shown, so as to hold said spindle firmly in position as it revolves. Upon said spindle *a* is secured, in some suitable manner, an arm, E, which revolves with the spindle, and is provided with a case or slide, F, arranged in such a manner as to remain in any position upon the said arm, unless removed by the application of some force. Upon the front side of said slide F is a pin, *f*, which is operated upon as hereinafter described by certain stationary cams, marked *e g h*, upon the plate E', as shown in fig. 3. Upon the rear or back side of said slide F is a rib marked *c*, which, as the spindle *a* is revolved, operates upon certain projections marked *l' l'' l''' l''''*, as hereinafter described, and so operates upon and moves the tumblers T<sup>1</sup> T<sup>2</sup> T<sup>3</sup> T<sup>4</sup>, as hereinafter specified. The said tumblers are so arranged and constructed as to operate and be operated upon entirely independent of each other, so that one tumbler may be moved around as many times as desired without in the slightest degree moving or affecting the remaining tumblers. In fig. 4 are clearly shown the plan and arrangement of the independent tumblers, while in fig. 7 the face of one of said tumblers is shown, and in fig. 6 is represented a separate view of one of the partitions P, arranged between the tumblers to prevent the friction of one accidentally moving the others. In said fig. 4 G represents a shaft, one end of which is supported in or at the end of the spindle *a*, while the other end passes through the rear of the case, fitting into a square hole so as to prevent its revolving, it serving as an axle upon which the tumblers revolve, as hereinafter set forth, the said axle G being a continuation in the line of the axis of the spindle *a*. L represents a cylindrical case enclosing the tumblers, as seen in figs. 2 and 3, being provided upon one side with a longitudinal slot, *m*, as seen in fig. 3. The tumblers are arranged upon the axle G by connecting each tumbler with a tubular driver, concentric with the axle and with each other, and extending said drivers to the front of the series and presenting them all to the action of the rib *c* upon the slide F, before described. Thus the tumbler T<sup>4</sup> is adjusted upon the exterior driver marked K, being secured thereto so as to revolve with it in any suitable manner. A partition, P, is then placed upon tumbler T<sup>4</sup>, and a tubular partition, arranged next interior to the driver K, is secured to said partition-plate P. Then inside and upon said partition is placed and arranged tumbler T<sup>3</sup> and its driver J, as shown; then another partition, then another tumbler and its driver I, and so on until the entire series is arranged. It will be seen from an examination of figs. 3 and 6 that the partitions P are provided with lugs *p p*, which enter corresponding recesses in the stationary case L, which are so arranged as to locate the slots or notches *n* in the circumference thereof, at the aforesaid slot *m*, in the side of the case L. By this arrangement it is readily seen that the partitions are held immovable and prevented from turning, leaving the notches *n* permanently at the said slot *m*, and at the same time they constitute a



continuous stationary separation between each tumbler and its driver, and each adjacent tumbler and its driver. The entire series of tumblers, drivers, and partitions is then placed upon the axle B, the tumbler, marked  $T^1$ , or number one, being at the rear of the lock, as shown. Thus the axle B and all the partitions are kept stationary, leaving the tumblers and their drivers free to revolve independently of each other, each tumbler, however, revolving with its appropriate driver. It will be seen from examining fig. 7 that each tumbler is spaced off in the same manner as the disk C upon the exterior of the safe-door, and by observing fig. 4 it will be seen that the part of the tumbler so spaced is movable within an annular plate, when desired, being secured immovably thereto, however, when in use, by means of screws or in any other suitable manner. Said tumblers are also provided with notches  $o$  in their circumferences, and when said notches are all in a line with the aforesaid slot  $m$ , the lock is in condition to permit the withdrawal of the bolt to unlock the safe, but at all other times it is impossible to unlock the same.

The mode of setting and manipulating the lock is as follows: Each tumbler has some arbitrary number chosen, as 20 for  $T^1$ , 30 for  $T^2$ , 40 for  $T^3$ , and 50 for  $T^4$ , and said numbers are so adjusted within the annular ring forming the perimeter of the tumblers at such a point with respect to the slot  $o$ , which may be indicated by a mark upon the said exterior ring, that when the knob A is revolved so as to bring the corresponding number upon the revolving disk C at a certain fixed point upon the exterior of the safe door, then the projection  $c$  upon the slide F, arranged upon the arm E, will have, by striking upon the projection  $l$  on the driver of the supposed tumbler, moved said tumbler so as to bring the notch  $o$  in said tumbler exactly opposite said slot  $m$  in the case L, and when all of the tumblers shall have been moved in a similar manner, having reference to the respective numbers for which they are set, the safe may readily be unlocked, which, however, can only be accomplished by operating upon each of the projections  $l^1 l^2 l^3 l^4$ , separately and independently, as will be hereinafter more fully described. By arranging the tumblers all with their respective notches  $o$  at the slot  $m$ , the dog M is allowed to move forward within the recess thus formed, which causes the arm W to move along until the catch  $w$  drops down behind a stop, R, which holds it in said position and allows the arm Z to drop far enough, so that as the spindle revolves a lip upon the end of an arm,  $b''$ , upon said spindle, strikes upon a shoulder,  $Z'$ , upon said arm Z, which is attached to a bent lever, Y, to which an arm, X, connects a dog, S, and by moving said arm Z back raises up the dog S, bringing the same above the rear end of the bolt D, when by a slight rotating movement of the knob B the bolt may be withdrawn and the safe unlocked. After the tumblers have been adjusted to bring the notches  $o$  at the slot  $m$ , by turning the knob A to the right until the aforesaid projection on the end of arm  $b''$  strikes upon a click, V, which operates to raise an arm,  $U'$ , upon the pivoted block U, so that when said arm  $b''$  passes the click V a spring,  $v$ , throws said arm  $U'$  down upon the end of an arm, Q, which arm and the dog M and arm W are all rigidly attached upon a collar, N, which turns upon a pin or shaft  $O'$  so that the blow upon the arm Q aforesaid operates to throw the dog M into the recess formed by the tumblers, and also to raise the dog S from the bolt as aforesaid. A pin,  $s$ , prevents the spring  $v$  from throwing the arm Q down too far by stopping the descent of the arm  $U'$ , and as the revolution of the arm  $b''$  always gives the blow above described, whether the notches  $o$  in the tumblers are all at the slot  $m$  or not; should said dog be thrown against a tumbler when not so arranged, a spring, K, immediately throws the dog M back so as to disconnect the dog from the circumference of the tumbler and thus prevent any indications which are detected by the use of micrometers in ordinary locks, and thus render it impossible to pick a lock of this description.

In manipulating the lock for the purpose of adjusting the tumblers to unlock the safe, it is obvious that if the rib  $c$ , which acts upon the drivers and their projections, were stationary in such a position as to hit all of said projections  $l^1 l^2 l^3 l^4$ , all of said tumblers would of necessity be moved simultaneously, in which case it would be utterly impossible to unlock the safe. But if after all of the points should be moved simultaneously until tumbler  $T^1$ , marked with the lowest number, should present its notch at the slot  $m$ , and the slide F should then be moved out on its arm far enough so that the rib  $c$  would strike only the three outer points  $l^2 l^3 l^4$ , and should then move on until  $T^2$ , marked with the next higher number, should be brought to the required position, when said slide should be again adjusted so as to leave  $T^2$  and move on with the two higher tumblers until  $T^3$  should be properly adjusted, and should then be adjusted so as to leave  $T^3$  and carry  $T^4$  to its desired position, and then be moved again so that the shaft  $a$  might revolve until the arm W should be moved as aforesaid, then said tumblers might each be adjusted independently of the other, and to effect this exchange from one to another is the object of the pin  $f$  upon the slide F and the stationary cams  $e g h$ . The said arm E is provided with a pin,  $d$ , near its end, to prevent the slide from dropping off when said arm points downward. A spring,  $S^1$ , serves to hold the dog S down to its work when not raised as aforesaid, and when said bolt D is moved back the projection  $S^2$  upon the dog locks over the notch  $S^4$  upon the bolt and secures it from moving out, while  $S^3$  on the dog prevents its further recession. The click V is so arranged that when the knob A is turned to the left the said click yields to the arm  $b''$  and does not move the block U or arm  $U'$ . The spring K, which throws the dog M back from the tumblers, may be attached upon the block U or directly to the case of the lock. The arm Z is kept above the reach of the arm  $b''$  by means of a lateral stop or pin,  $z$ , which rests upon the top of the arm W, so that the arm Z cannot fall until the arm W drops down, as hereinbefore described, which can only occur when the tumblers have been all arranged with the notches  $o$  at the slot  $m$ .

Assuming the tumblers to be set at the numbers hereinbefore mentioned, to wit, 20, 30, 40, and 50, commencing with  $T^1$  for the lowest number, I will explain the manipulation of the knob A, which is necessary to unlock the safe or lock. Commencing with the knob, when the mark  $o$  is at the line over the centre of the disk C, one complete revolution to the right is made, which motion is continued on until 20. The number to which tumbler  $T^1$  is set is on the said line. This brings the notch in said tumbler  $T^1$  opposite or at the slot  $m$ . The point of starting is assumed at  $o$ , because the slide F is at that point low enough or near enough to the shaft



$\alpha$  to move all the tumblers at once, and the slide cannot be moved so as to leave any of the points  $T^1 T^2 T^3$  until all shall have been carried to the point above named, which adjusts the tumbler  $T^1$  as aforesaid. The knob A is then turned back to the left until the point 94 (ninety-four) on the disk C is at the fixed line over the centre. The effect of this movement is to move the pin  $f$  on the slide far enough up on cam  $g$  to raise the rib  $c$  away from projection  $l^1$ , so that in the movement next to be described the position of tumbler  $T^1$  will not be changed. The knob A is then turned to the right until number 30 on the disk C is at the aforesaid line, which movement carries points  $T^2 T^3$  around simultaneously and brings tumbler  $T^2$  with its notch at the slot  $m$ . Said knob A is then turned back towards the left until 92 (ninety-two) on the disk C is at the line, which movement, by a like action of the cam  $g$  upon the slide F adjusts the rib  $c$  so that on turning said knob A around towards the right until the number 40 on the disk C is on the said line, the point  $T^2$  is left, and the position of tumbler  $T^2$  is unchanged, while points  $T^3$  are moved on and the tumbler  $T^3$  adjusted with its notch at the slot  $m$ , as desired. The knob A is then turned back to the left until number 90 on the disk C is at the line, which in like manner adjusts the slide F so that in moving forward to the right the tumbler  $T^3$  is left, and by moving on until 50 on the disk is at the line, tumbler  $T^1$  is adjusted with its slot at  $m$ , and all of the tumblers are properly adjusted. By moving said knob back to 88 another exchange or adjustment of the slide is in like manner effected, so that the subsequent movement will not disturb any of the said tumblers, when by turning said knob around to the right until arm  $b''$  operates upon the click V, as aforesaid, which throws the dog M into the recess formed by the tumblers, and drops the arm W down over the stop R, and lets the arm Z fall and bring the catch  $z'$  in reach of the arm  $b''$ , as hereinbefore fully described. The revolution of the knob A is then continued in the same direction until said arm  $b''$  comes to the aforesaid stop  $z'$  upon the arm Z, when the pressure is carefully applied until the dog S is raised, when, by turning the knob B before the arm  $b''$  passes the catch  $z'$  aforesaid to allow the dog S to drop, the bolt is readily thrown back and the door is unlocked, when the dog S drops upon the bolt, the stop  $S^2$  locking over the shoulder  $S^1$  and securing the bolt in said last-mentioned position.

To lock the safe, turn the knob A to the left past 60, but not as far as 50. The effect of this is to revolve the arm  $\alpha'$  until a projection upon its end  $\alpha''$  lifts up the arm W and moves it back so that the hook  $w$  rests upon the stop R. The said knob is then turned back to the right to 88, which causes the arm  $b''$  to move the click V and block U, by means of which the spring K presses upon the rear or heel of arm Q, and thereby still further moves the hook  $w$  back from the end of the stop, and also throws the dog M away from the tumblers, and which also moves the slide F so that the subsequent movement will displace one or more of the tumblers; when revolving said knob to the left past 50 displaces the tumblers and the safe is locked. If the knob had been turned past 50 in the first instance, before the dog M had been moved out from the recess in said tumblers, the tumblers would have been pressed upon said dog so forcibly as to bind the same and prevent its being moved out by the spring K as aforesaid, in which case an opening could be made in the rear of the lock-case to allow said dog to be removed.

All the above-described manipulation for locking the safe is done after the dog S has been raised by the arm  $b''$  and the bolt D moved out into its place in the socket in the side of the door opening. By a varied system of manipulation the safe may be unlocked when the tumblers are marked interchangeably, as  $T^1$  may be set for 30, and  $T^2$  for 20, and so on, in which case, however, the difficulty in unlocking is much greater, a mode of operation which is rendered possible only by the peculiar independent arrangement of the tumblers herein described, whereby each may be operated entirely independent of all others.

Having described the construction, nature, and operation of my invention, I will now specify what I claim, and desire to secure by Letters Patent:

1. I claim the arrangement of a movable slide, F, of the arm E of the knob-spindle for operating the tumblers, substantially as and for the purposes described.
2. I claim, in combination with said movable slide F, the arrangement of a cam,  $g$ , so as to operate said slide, substantially as specified.
3. I claim the arrangement of the auxiliary cams  $e$   $h$ , in combination with said cam  $g$ , to bring the pin  $f$  at the proper position when it reaches the cam  $g$ , causing it to operate as set forth.
4. I claim the combination of the tumblers and their drivers with said slide F and spindle  $\alpha$ , arranged and operating in the manner described.
5. I claim the combination of the dog M, block-lever U U' click V, and arm  $b''$ , arranged so as to operate in the manner and for the purposes set forth.
6. I claim, in combination with the last foregoing, the arms W and lip  $w$ , and the stop R, arranged substantially in the manner and operating substantially as described.
7. I claim, in combination with said arm W, the arm Z and its connections with the dog S, arranged and operating in the manner and for the purposes specified.
8. I claim the combination of the arm  $b''$  with the arm Z, provided with a shoulder,  $Z'$ , and the connections Y X, or the equivalent, for the purpose of raising up the dog S from the bolt D, substantially as specified and set forth.
9. I claim, in combination with the arm W, the arrangement of an arm,  $\alpha'$ , upon the spindle  $\alpha$ , so as to operate in the manner and for the purposes described.

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