

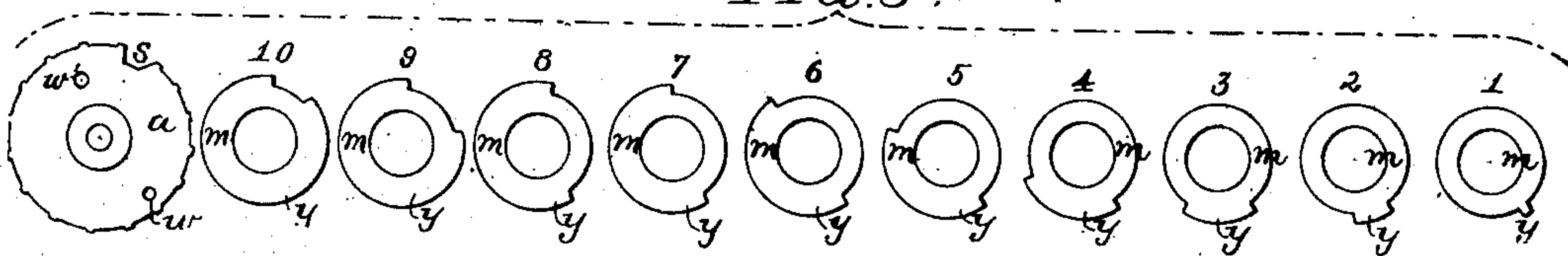
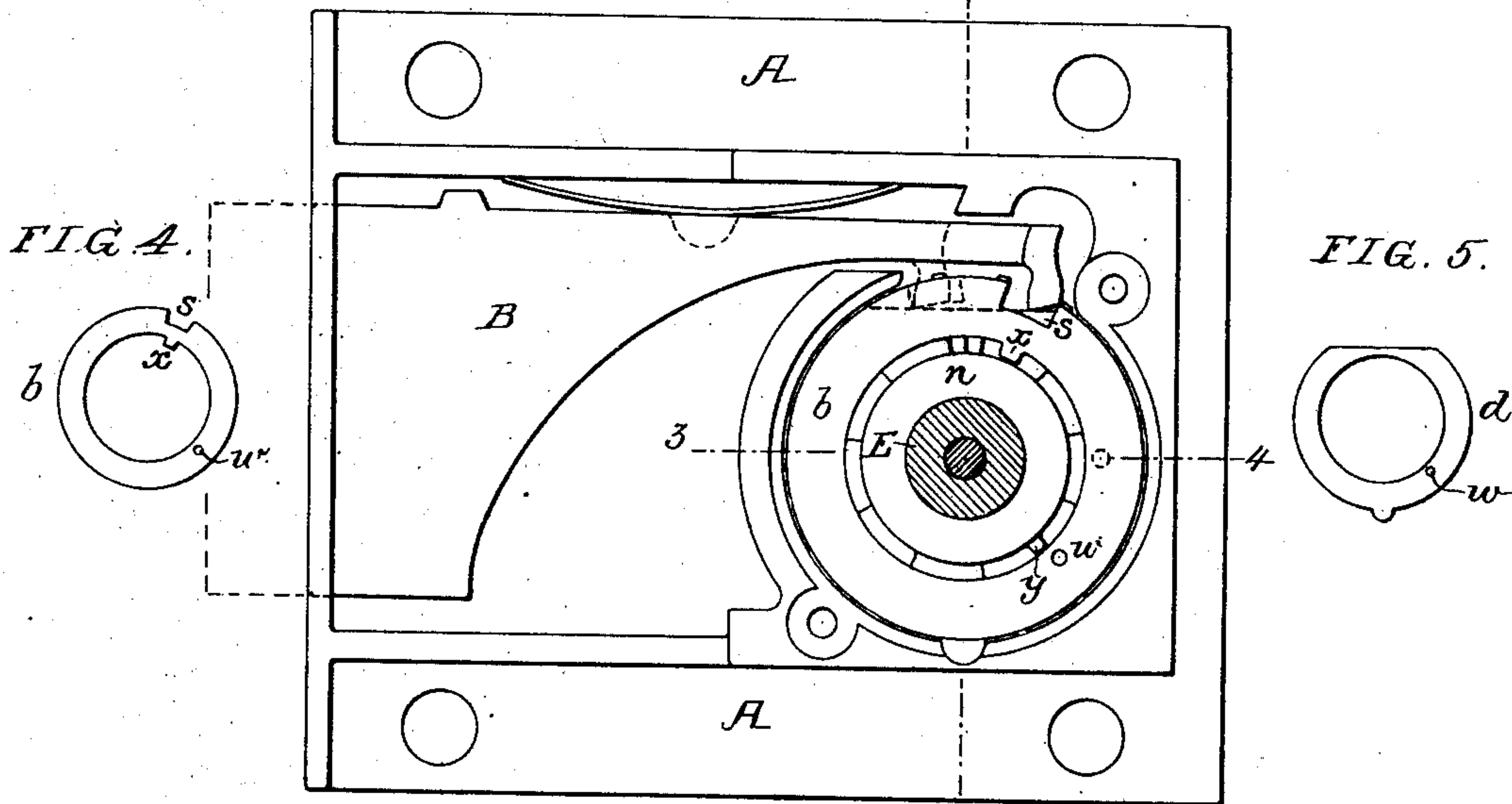
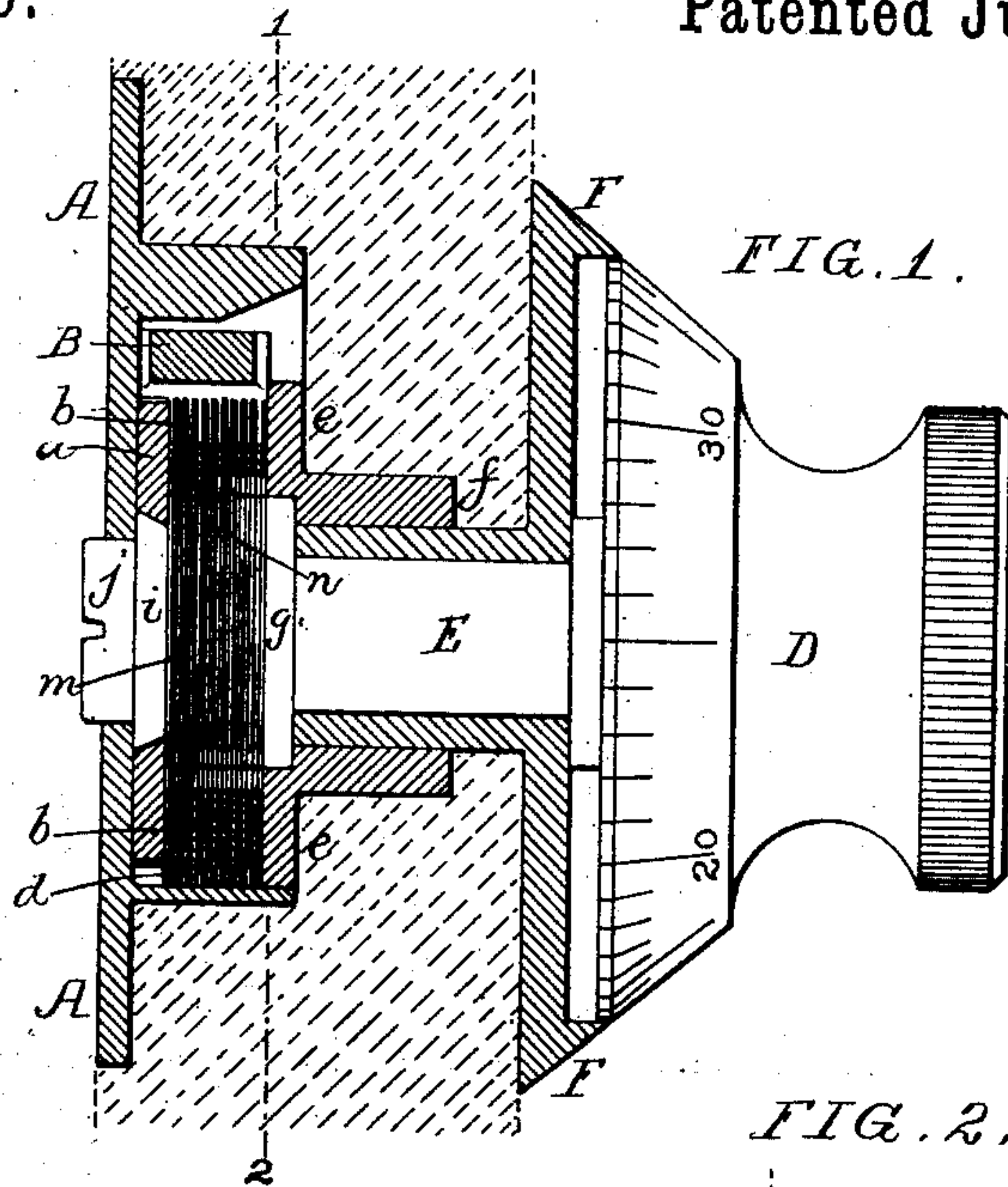
(Model.)

2 Sheets—Sheet 1.

D. K. MILLER.
PERMUTATION LOCK.

No. 244,760.

Patented July 26, 1881.



WITNESSES:
James F. Tobin
Harry Smith

INVENTOR:
Daniel K. Miller
by his attorneys
Howson and Son

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FIG. 7.

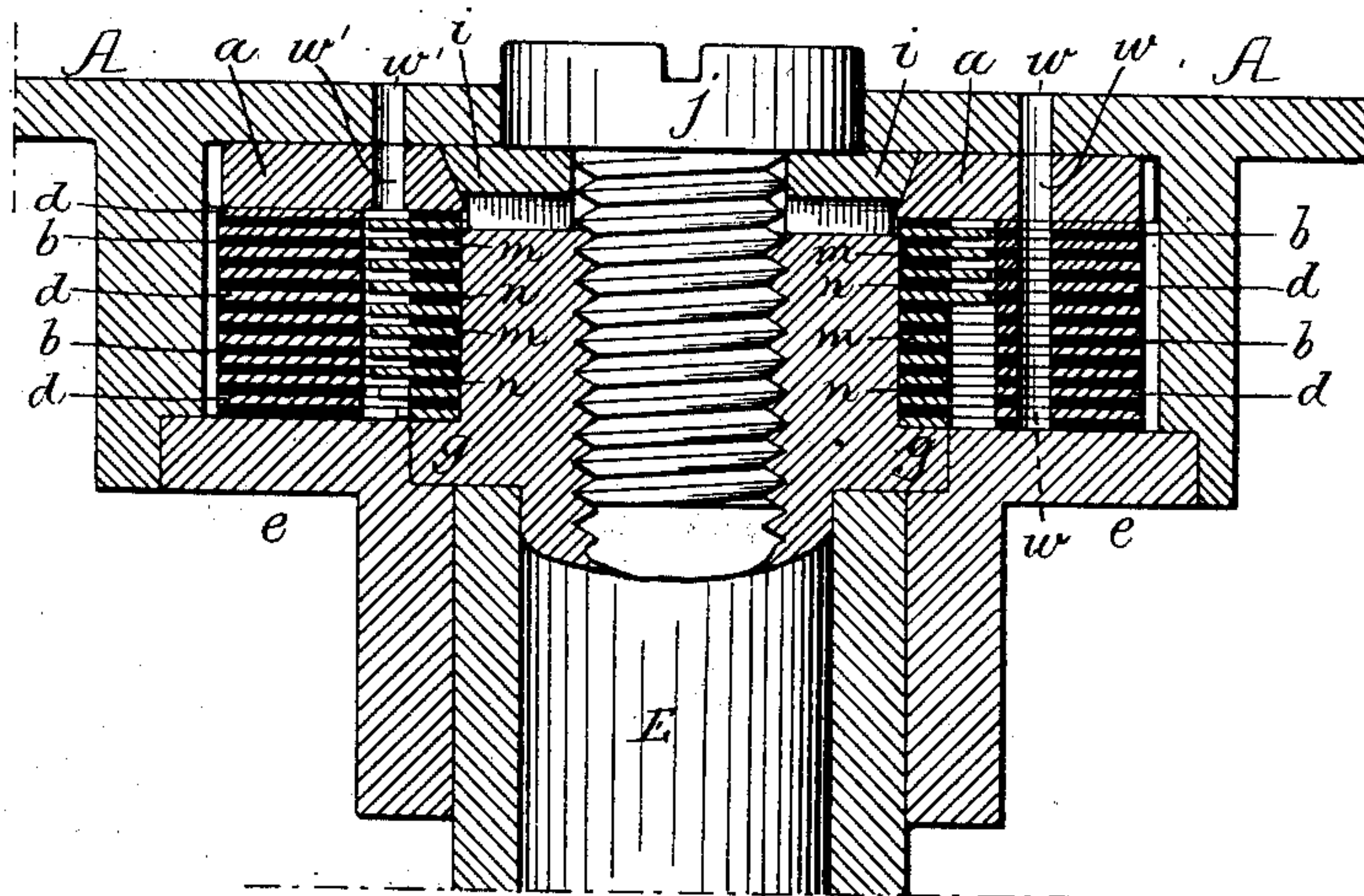
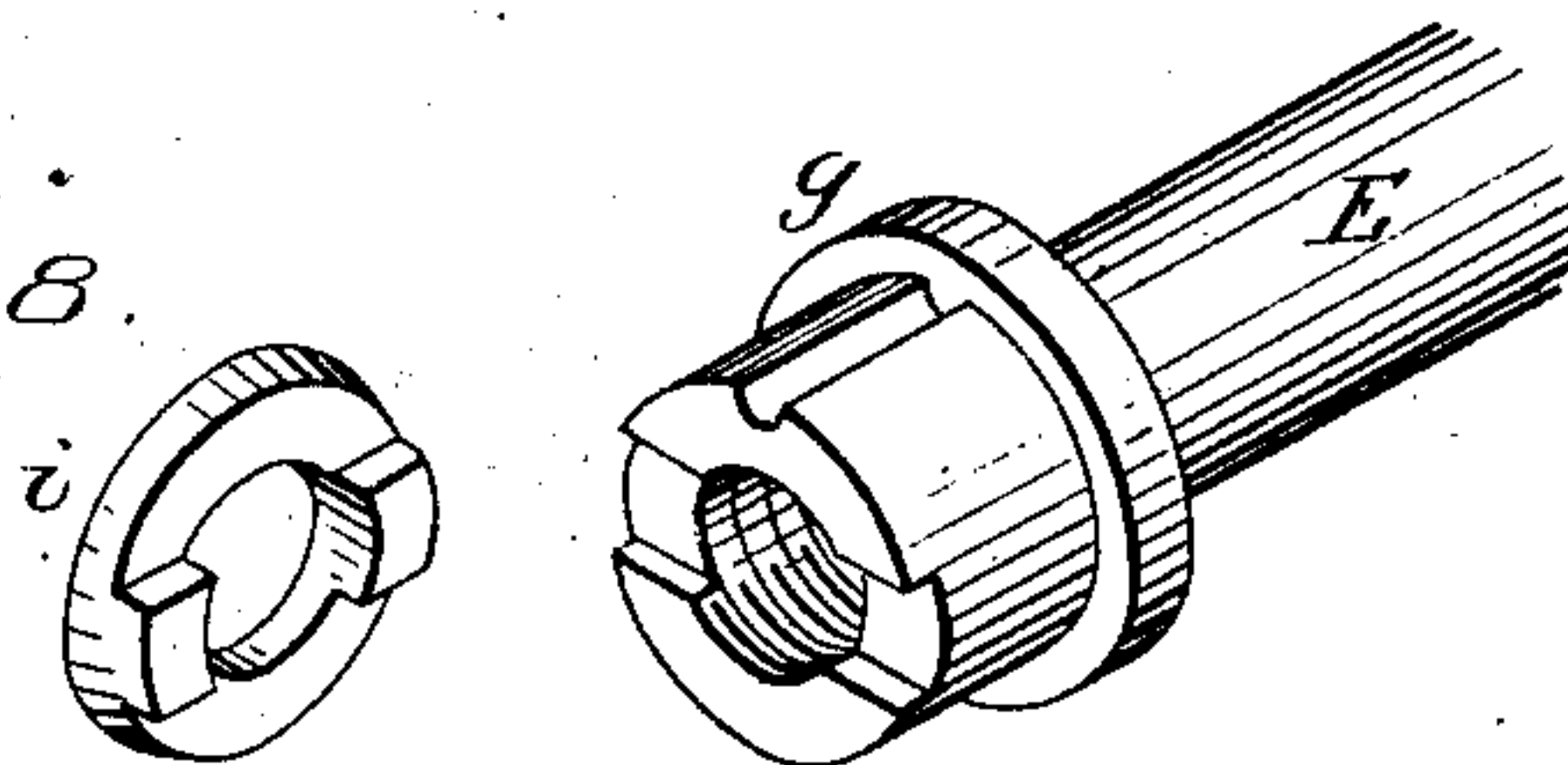


FIG. 9

FIG. 8.



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UNITED STATES PATENT OFFICE.

DANIEL K. MILLER, OF PHILADELPHIA, PENNSYLVANIA.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 244,760, dated July 26, 1881.

Application filed November 8, 1880. (Model.)

To all whom it may concern:

Be it known that I, DANIEL K. MILLER, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain
5 Improvements in Combination-Locks, of which the following is a specification.

The object of my invention is to so construct a combination-lock as to greatly increase the number of possible combinations without interfering with the security of the lock or unduly increasing the size or cost of the latter. These objects I attain in the manner which I will now proceed to describe, reference being had to the accompanying drawings, in which—

15 Figure 1, Sheet 1, is a view, partly in section and partly in elevation, of my improved combination-lock; Fig. 2, a section on the line 1 2; Fig. 3, a view, on a reduced scale, of the disk and drivers forming part of the lock; 20 Fig. 4, a view of one of the tumblers; Fig. 5, a view of one of the washers for the tumblers; Fig. 6, a view of one of the washers for the drivers; Fig. 7, Sheet 2, a sectional plan view on the line 3 4, Fig. 2, on a still larger scale than said figure, and with the tumblers in the position shown by dotted lines; and Figs. 8 and 9, perspective views of parts of the lock mechanism.

30 A is the casing of the lock, which is secured to the inner side of the door, and is constructed as usual, for the reception and guidance of the bolt B, said casing having a circular recess for receiving a disk, *a*, and a number of annular tumblers, *b*, with intervening washers *d*. The 35 tumblers are free to turn in the recess, and are retained in position therein by a cap, *e*, which closes the end of the said recess, the washers *d*, however, being prevented from turning by the engagement of a lug on each of said washers with a recess in the lock-case. (See Fig. 2.)

40 D is the knob, graduated as usual, and having a spindle, E, which is adapted to a bearing in a sleeve, *f*, forming part of the rim-plate F of the lock, the latter being secured to the 45 outer face of the door in proper position in respect to the lock-case. The spindle E has a collar, *g*, adapted to a recess in the cap *e*, and the inner end of said spindle carries the disk *a*, which has a central tapering opening adapted for the reception of a tapering ring, *i*, lugs 50 on the latter being adapted to recesses in the spindle, as shown in Figs. 8 and 9, so that,

when the parts are in their proper positions the ring *i* can have no rotary movement independently of said spindle.

55 The proper frictional contact between the ring *i* and disk *a* is effected by means of a screw, *j*, the head of which bears on the ring, and the threaded stem of which is adapted to an internal-threaded opening in the spindle E. 60

Between the collar *g* of the spindle and the disk *a* are confined a series of drivers, *m*, and washers *n*, corresponding in number and location with the tumblers *b* and washers *d*. The washers *n* have lugs which engage with a recess in the spindle, and are thereby prevented from rotating independently of said spindle; 65 but the drivers *m* are secured to the spindle by being clamped between the collar *g* and the disk *a*, said drivers being at liberty to turn 70 independently of the spindle when the screw *j* is loosened, so as to relieve the drivers from the clamping action of the disk. Each of the tumblers *b* has in the outer edge a notch, *s*, for the reception of the hooked end of the 75 shank of the bolt; and on the inner edge of each tumbler is a lug, *x*, adapted to be acted upon by a lug, *y*, on the driver corresponding to said tumbler. The lugs *x* of all of the tumblers are alike, but the lugs *y* of each driver 80 *m* differs in size from the lugs of the other drivers, as shown in Fig. 3. The washers *d* are cut away at the top, as shown in Fig. 5, in order to permit the entrance of the hooked end of the shank of the bolt into the notches *s* of 85 the tumblers. The disk *a* is also provided with a notch, *s*, one edge of which is inclined for the purpose of elevating the end of the shank until its hook is clear of the notches of the tumblers; and on the periphery of the disk *a* 90 are formed a number of ribs, which, as said disk is rotated, cause a constant elevation and depression of the end of the shank, for a purpose set forth in my Patent No. 176,876, dated May 2, 1876. In fact, my present lock, so far 95 as regards the construction of the bolt and the actuation of the same by the disk *a*, is similar to the lock described in said patent, and these features form no part of my present invention.

100 In each of the tumblers *b* and washers *d* and in the disk *a* and case A is formed an opening, *w*, these openings, under the circumstances described hereinafter, being brought into line with each other, as shown in Fig. 7, so that a pin

may be inserted in the openings, in order to prevent the rotation of the disk and tumblers. Openings w' are also formed in the case A and disk a , these openings being at such a distance from the center of the knob-spindle that when they are brought into line a pin passed through them and projected into the lock will form an abutment for the lugs of the drivers m , for a purpose described hereinafter.

10 The modes of setting or changing the combination are as follows: Supposing that the tumblers have been adjusted so as to bring the notches s of the same into line with each other and with the notch s of the disk a , the hooked end of the bolt-shank resting in the notches, but the bolt not being retracted, (see dotted lines, Fig. 2,) the openings w of the tumblers b and disk a are then in line with the opening w of the lock-case A and washers d , so that a pin may be inserted to hold the disk and tumblers in the positions to which they have been adjusted. The binding-screw j is then loosened, so as to relieve the disk a and drivers m from pressure to such an extent that while said drivers will turn with the knob-spindle when no obstruction is presented to such movement, they are free to turn independently of the spindle when they meet with such an obstruction. The knob is then turned in one direction—say, to the right—until the lugs y of all of the drivers are brought into contact with the lugs x of the tumblers, when the direction of movement is reversed and the knob turned partly around to the left, in order to set the driver 1, the direction of movement being then again reversed and the knob turned to the right to set the driver 2, then again to the left to set the driver 3, and so on until all or as many of the drivers are set as may be desired, the numbers on the knob-dial which correspond with the zero-mark on the dial-plate at the successive changes of movement forming the combination. The drivers which are not adjusted by the movement of the knob, but are allowed to retain their original positions in respect to the tumblers, will, in the operation of the lock, act as a single tumbler. When the drivers have been properly set the screw j is tightened, so as to secure the drivers in position, and the pin is then withdrawn from the openings w in order to free the disk a and tumblers b , whereby, on a proper turning of the knob, the hooked end of the bolt will be raised so as to be free from the notches s , and the lugs x of the tumblers b will be acted upon by the lugs y of the drivers, so as to carry the notches s of the tumblers out of line with each other and necessitate a manipulation of the knob in accordance with the proper combination in order to again bring said notches into line and permit the operation of the bolt.

When it is desired to set or change a combination after the bolt has been projected and the tumblers turned so as to carry their notches s out of line, and when, owing to an error in noting the combination or other cause, the tumblers cannot be properly set, the knob is

first turned a full turn to the left and then further turned until a pin can be inserted through the openings w' of the case A and disk a , and projected into the lock. The screw j is then loosened and the knob turned to the right until the lugs y of all of the drivers m strike said pin and are brought into line thereby, the screw j being then tightened and the pin removed, when a further turning of the knob will, owing to the action of the lugs y of the drivers on the lugs x of the tumblers, effect the bringing into line of the notches s of the latter, a pin being then inserted into the openings w , the screw j loosened, and the setting of the combination proceeded with as before described.

It will be seen that by graduating the lugs y of the drivers, using an independent driver for each tumbler, and securing the drivers to the knob-spindle so as to permit the adjustment of said drivers on the spindle, a great number of changes in the combination are possible, and the number of tumblers adjusted in setting the combination, as above set forth, may be as few or as many as desired, so that the character of the combination may be simple or complex, as circumstances may demand.

The use of a large number of tumblers and drivers is permitted without unduly increasing the size of the lock, owing to the fact that said tumblers and drivers are made of thin plates of sheet metal, with the projecting lugs formed on the edges thereof, and hence no wider than the plates themselves, the drivers, moreover, being contained entirely within the central openings of the annular tumblers.

The conical ring i , whereby pressure is imparted to the disk a , presents an extended frictional surface, and insures a firmer clamping of said disk than could be obtained with a flat ring—a point of some importance, as the slipping of the disk a on the knob-spindle in the operation of the lock must be effectually guarded against.

I have shown and described lugs x of uniform size on the tumblers, and lugs y graduated in size on the drivers; but this order may be reversed, if desired, without affecting the operation of the lock.

I claim as my invention—

1. The combination of the bolt and knob-spindle of the lock, the notched tumblers b , having lugs x , and the drivers m , having lugs y , one set of lugs being uniform and the other set graduated in size, and the drivers being secured to the spindle and free to turn thereon independently of each other in setting the combination, all substantially as set forth.

2. The combination of the bolt and knob-spindle of the lock, the notched tumblers b , and the drivers m , secured to the spindle and free to turn thereon independently of each other in setting the combination, said tumblers and drivers having lugs on their edges, one set of said lugs being uniform and the other set graduated in size, as described.

3. The combination of the bolt, the knob-

spindle, the independent drivers, adjustable on the spindle, as described, the tumblers having openings *w*, and the lock-case and washers having like openings, whereby the tumblers 5 can be held by a retaining-pin while the drivers are being adjusted in setting or changing the combination, as set forth.

4. The combination of the bolt, the knob-spindle, the tumblers, the independent drivers, 10 adjustable on the spindle, as described, and the lock-case *A* and disk *a*, each having an opening, *w'*, whereby the drivers can be set in line independently of the tumblers by means of a pin introduced into the lock, as specified.

5. The combination of the knob-spindle, the 15 tumblers, the drivers, and washers, and the disk *a*, loose on the spindle, the tapered ring *i*, adapted to a tapered opening in the disk and incapable of turning independently of the spindle, and the pressure-screw *j*, as set forth. 20

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

D. K. MILLER.

Witnesses:

JAMES F. TOBIN,
HARRY SMITH.