

(Model.)

J. H. HUNTER.
PERMUTATION PADLOCK.

No. 467,506.

Patented Jan. 26, 1892.

Fig. 1

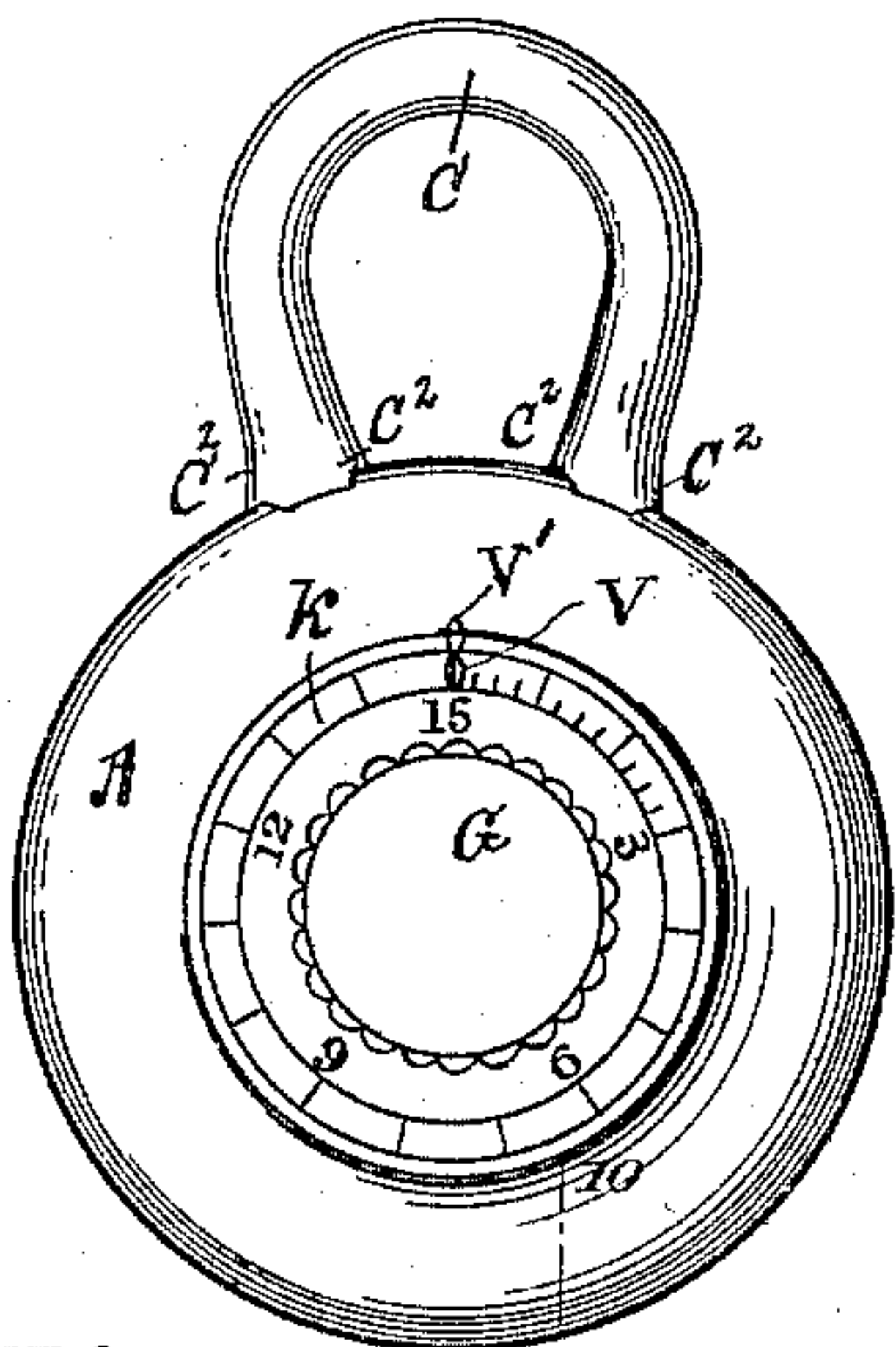


Fig. 2.

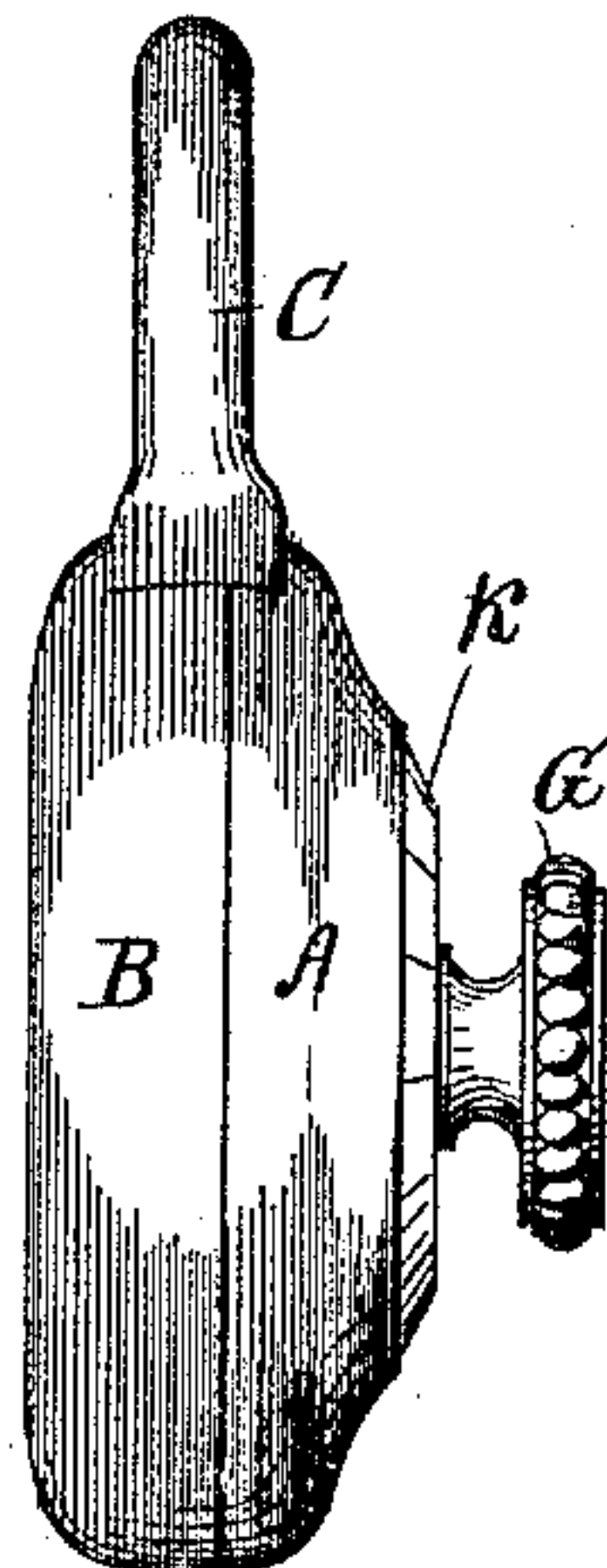


Fig. 3.

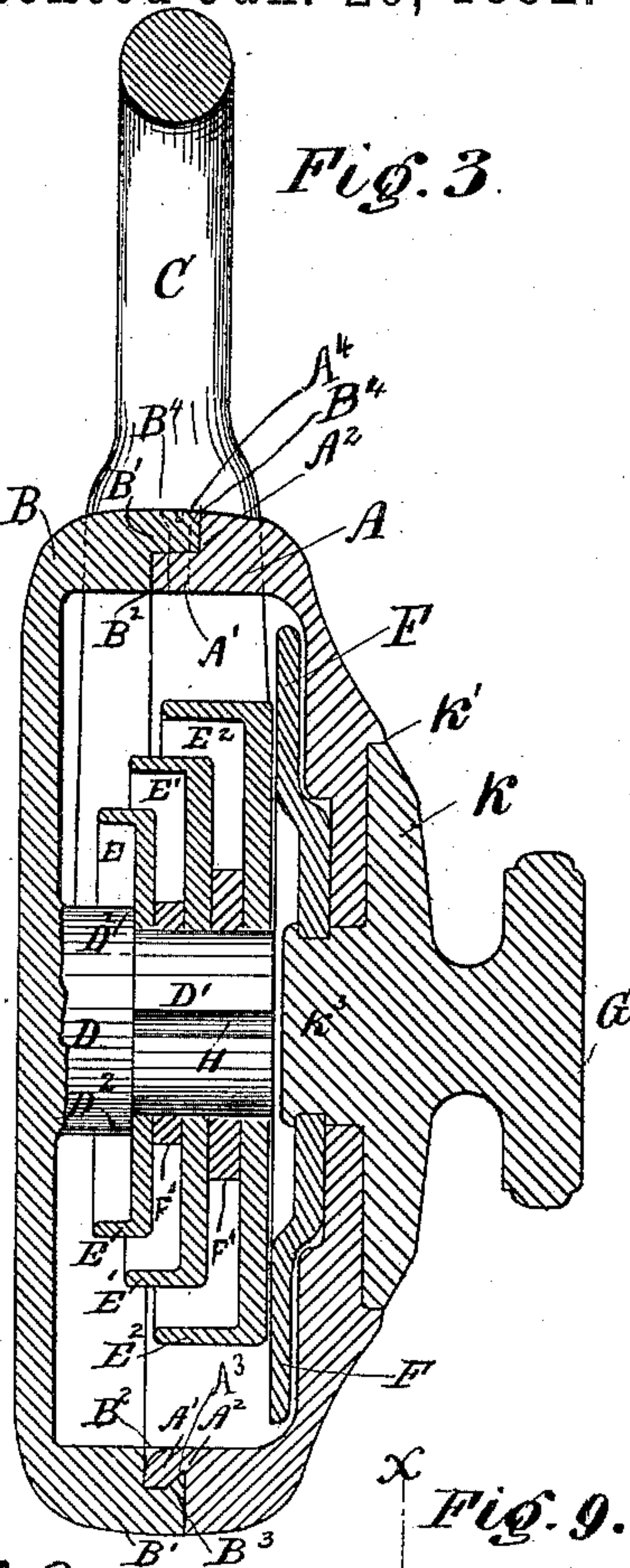


Fig. 4.

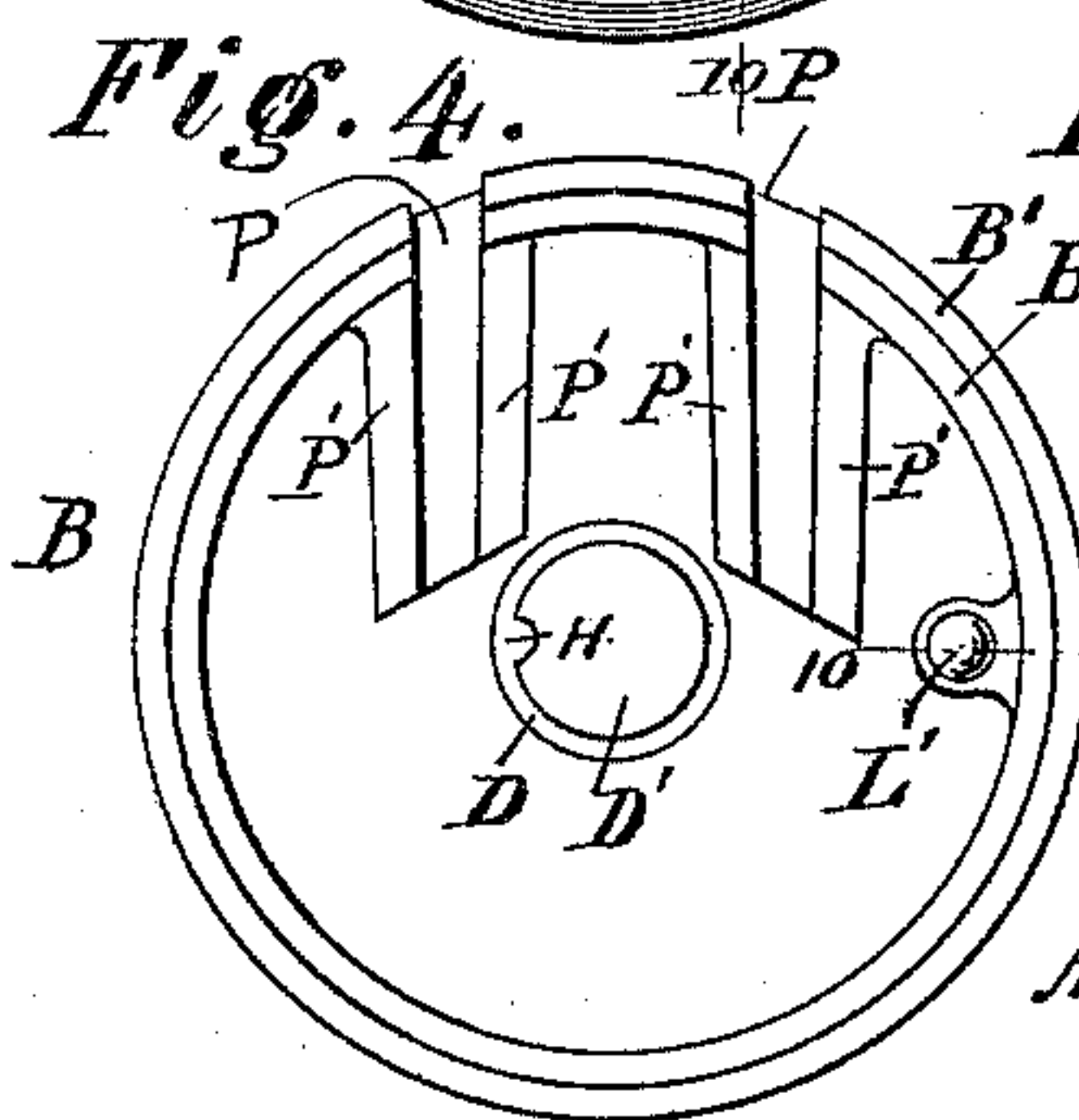


Fig. 5.

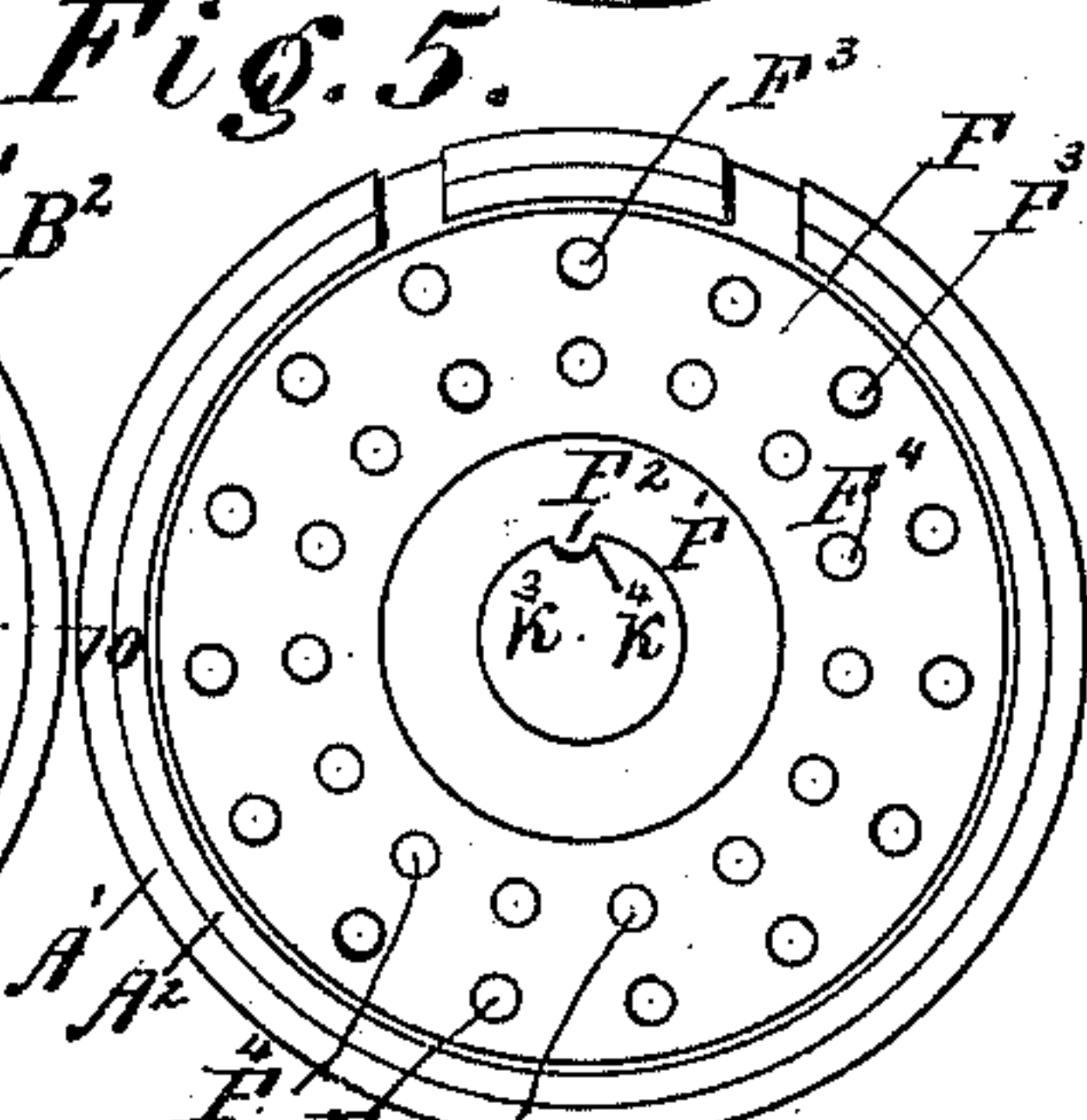


Fig. 6.

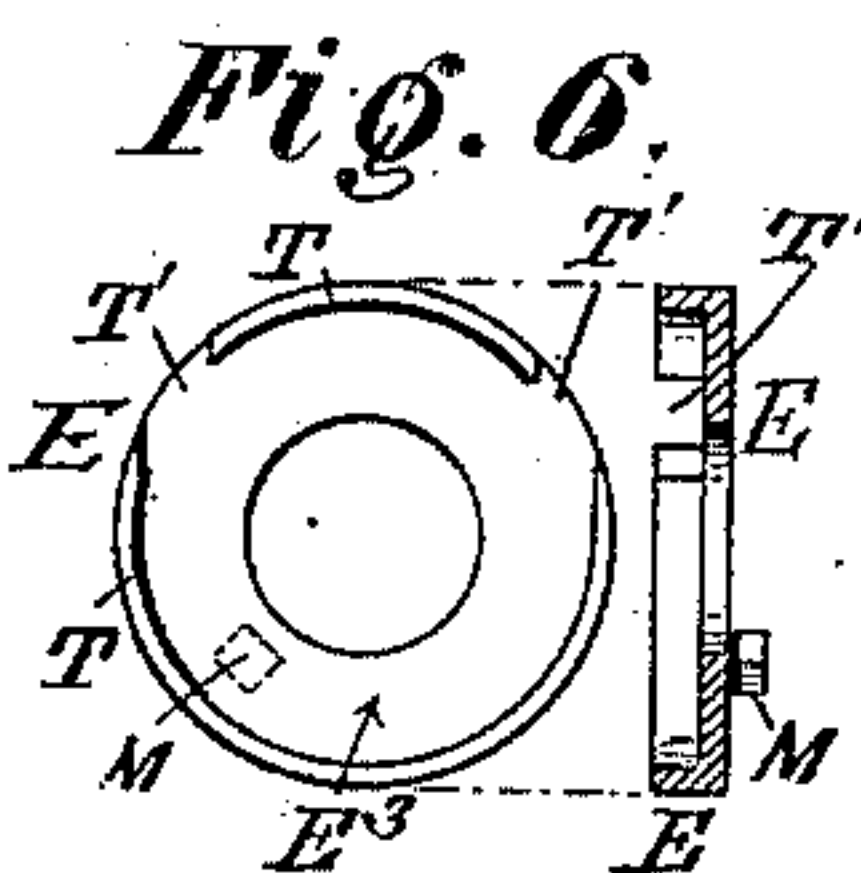


Fig. 7.

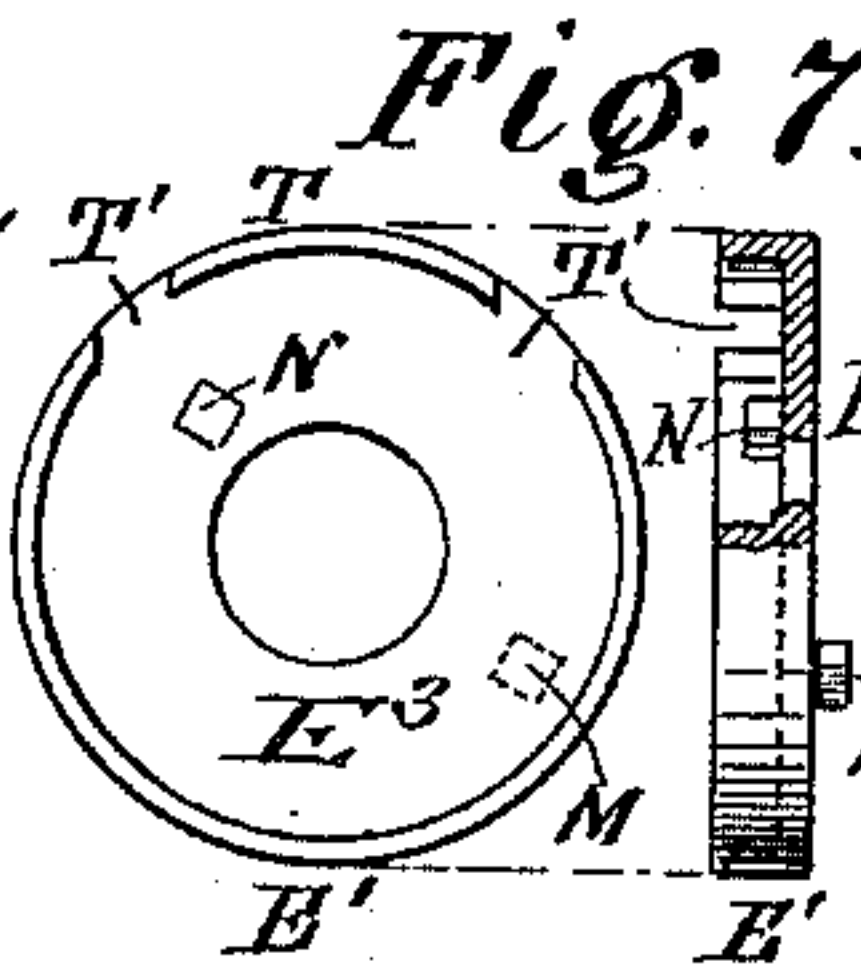


Fig. 8.

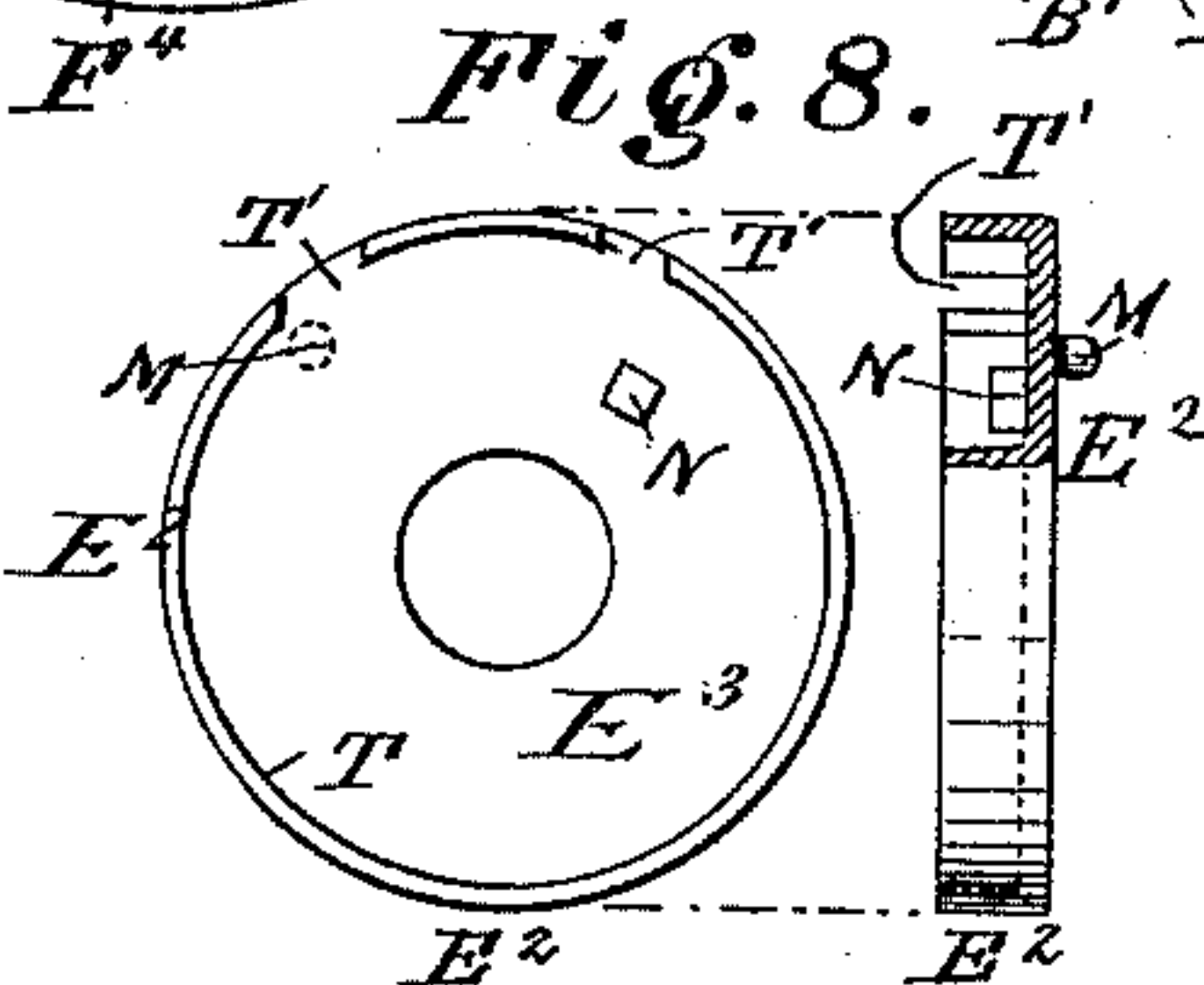


Fig. 9.

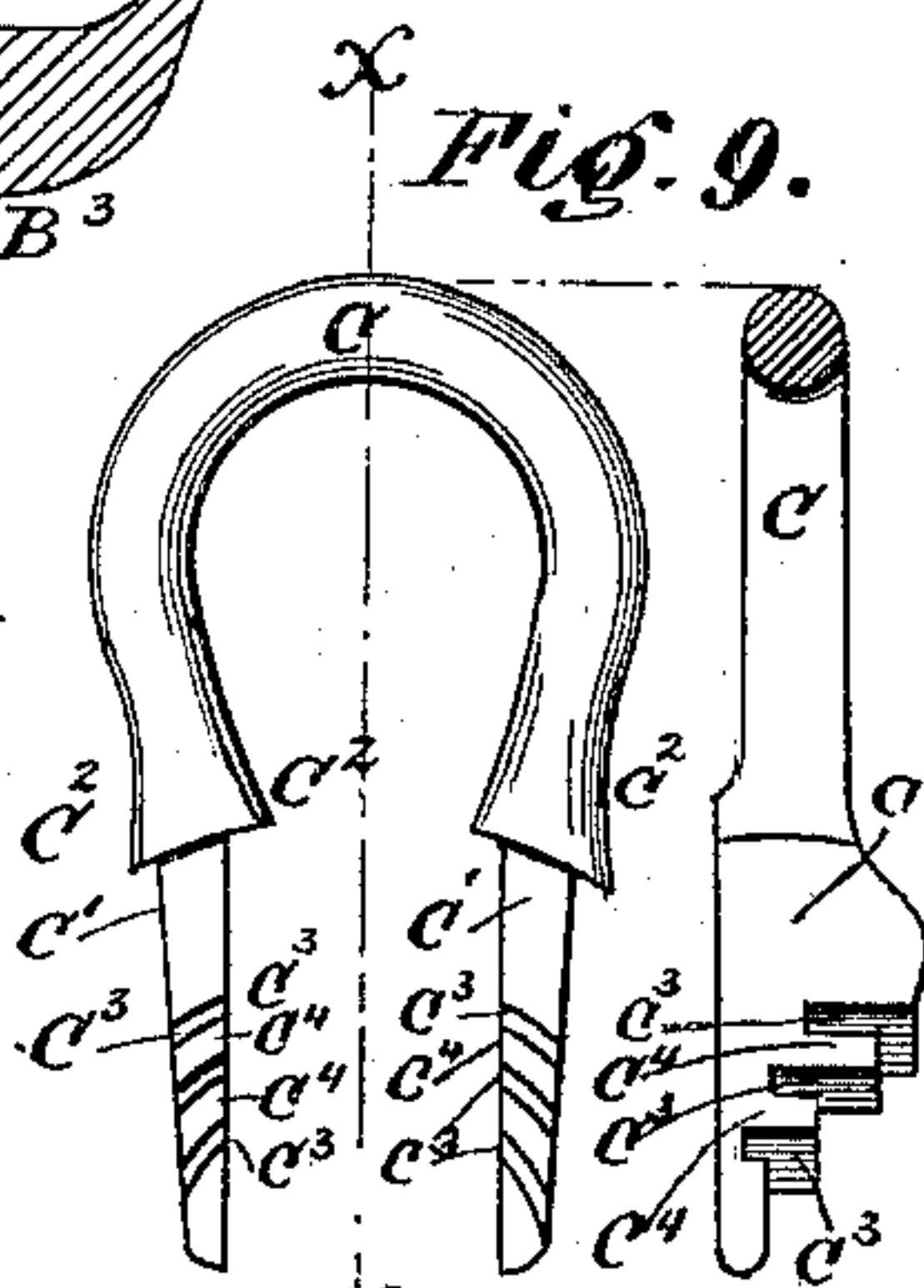


Fig. 10.

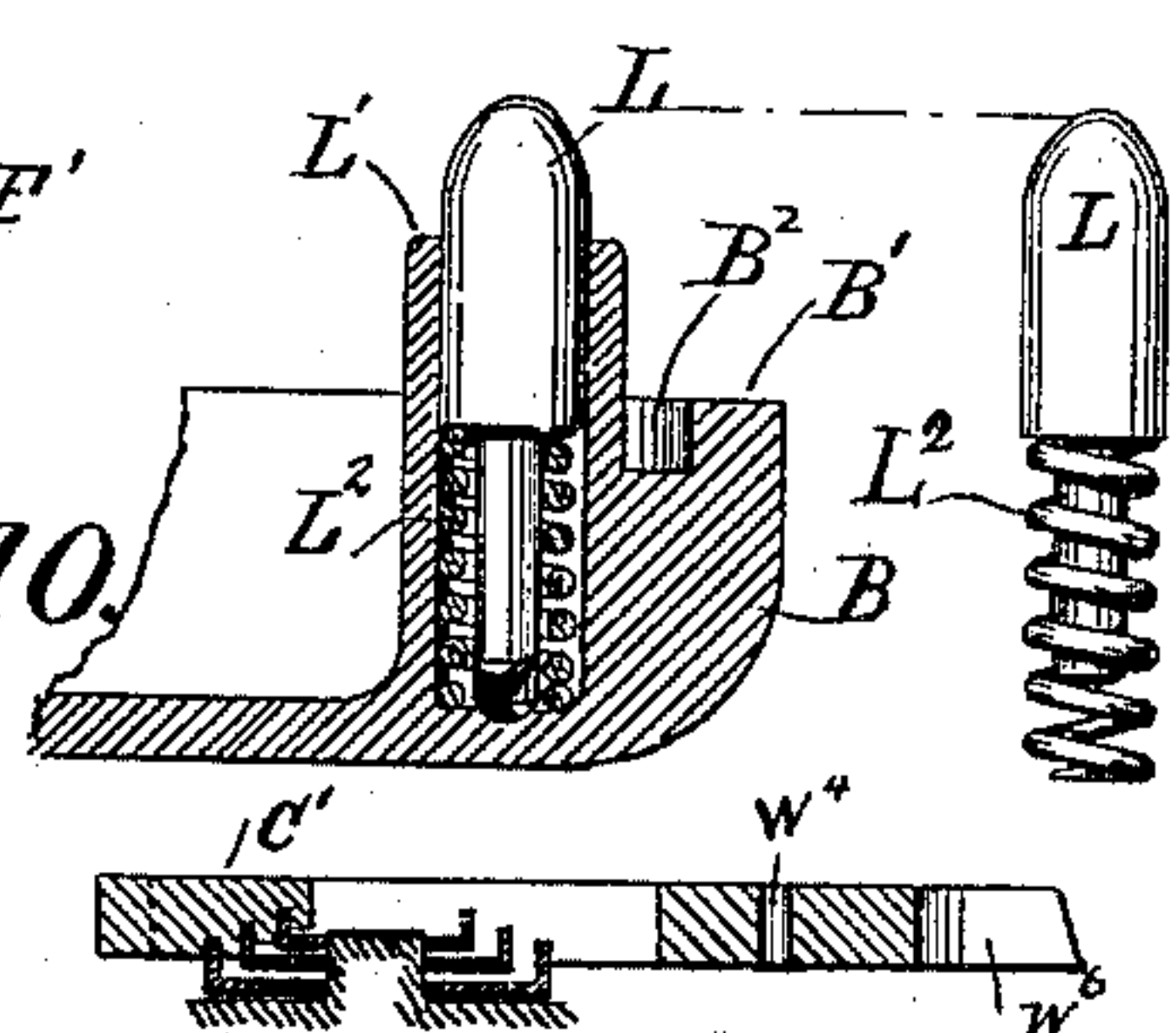
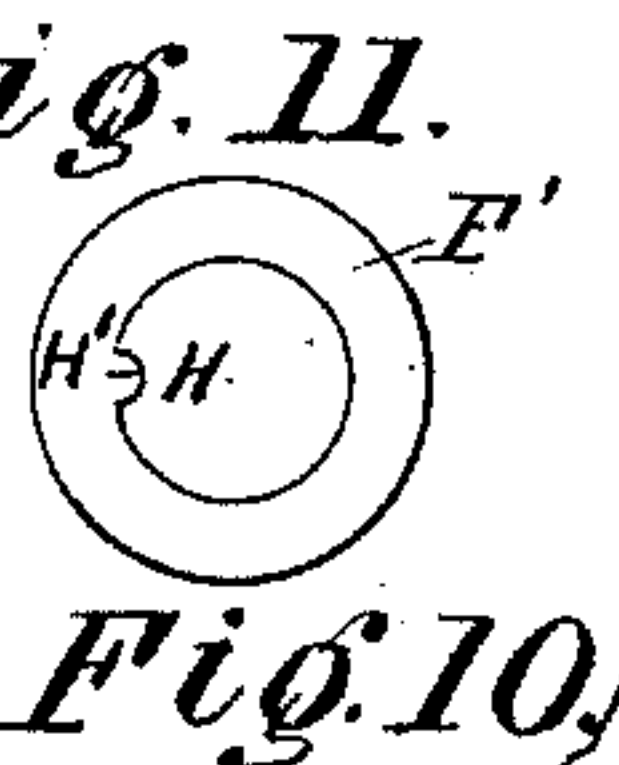


Fig. 12.

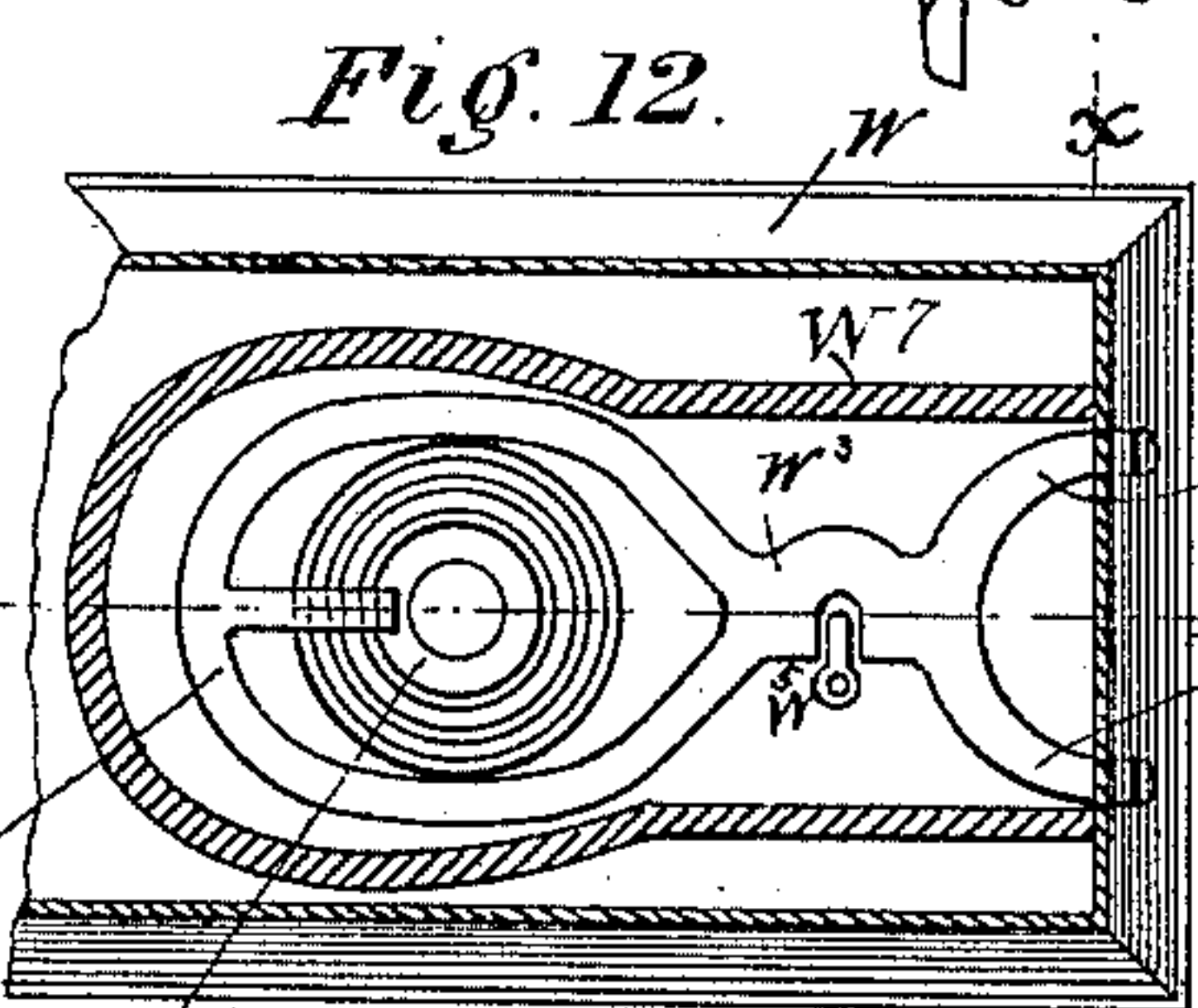
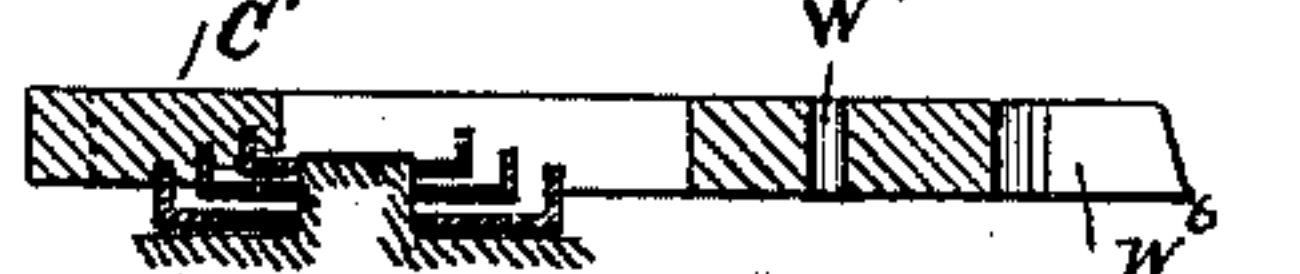


Fig. 13.



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PERMUTATION-PADLOCK.

SPECIFICATION forming part of Letters Patent No. 467,506, dated January 26, 1892.

Application filed May 12, 1890. Serial No. 351,373. (Model.)

To all whom it may concern:

Be it known that I, JOSEPH H. HUNTER, a citizen of the United States of America, and a resident of the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Permutation-Locks for Padlocks, Safes; and other Structures, of which the following is a specification.

The various features of my invention and the several advantages resulting therefrom will be apparent from the following description and claims.

In the accompanying drawings, making a part of this specification, and to which reference is hereby made, Figure 1 is a front elevation of a padlock embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged vertical central transverse section of the padlock. Fig. 4 is an elevation of the inner or front side of the rear half of the case of the lock and of the end of the spindle, whereby the interior is primarily operated. Fig. 5 is a view of the rear face of the disk which operates, in connection with an opposing spring pawl or stud, as a ratchet, and also operates to turn the adjacent disk. In this view the inner edge of the front half or portion of the case of the lock is seen. This disk lies within the said half of the case. The rear or free end of the said actuating-spindle is also seen in elevation. Fig. 6 shows at the left a rear elevation of the rear hollow tumbler or flanged disk of the lock, and at the right shows a vertical central transverse section thereof, that face of the section being seen which faces toward the right hand of the drawings. Fig. 7 shows at the left a rear elevation of the middle hollow tumbler or flanged disk of the lock, and at the right shows an edge elevation of the right-hand edge of said last-named tumbler, the upper half of the tumbler being broken away to disclose the interior construction thereof. Fig. 8 shows at the left a rear elevation of the front disk of the lock, and at the right shows an edge elevation of the right-hand edge of said last-named tumbler, the upper half of this tumbler being broken away to disclose the interior construction thereof. Fig. 9 shows at the left an elevation of the rear side of the

hasp of the padlock and the tongues of the said hasp, and at the right shows an elevation of the inner side of the right-hand half of the said hasp, both halves being alike, the section forming this half being taken in the plane of the dotted line xx of the figure showing the hasp in elevation. Fig. 10 is a vertical transverse section of a part of the rear half of the case, said section being taken in the plane of the dotted line 10 10 in Fig. 1, and showing in elevation the spring stud or pawl heretofore mentioned. Fig. 11 is a side elevation, of one of the washers located between adjacent disks. Fig. 12 is a view in side elevation, on a diminished scale, of the rear or inner side of the door and lock-box and lock of a burglar-proof safe and of one mode of combining certain features of my invention with other well-known features thereof. Fig. 13 is a sectional view of the bolts, bolt-bar, yoke, and tongue of the lock illustrated in Fig. 12, the section being taken at the dotted line 13 13 of Fig. 12.

A indicates the front half or portion of the case of the padlock, and B the rear half of the said case.

C indicates the hasp, and C' C' respectively indicate the respective tongues of said hasp, each end of the hasp being provided with such a tongue. Each of the halves of the case is provided with a flange, which enters a recess in the opposite flange. Thus the front half is provided with flange A' , which enters recess B^2 of the rear half, and the last-named half is provided with a flange B' , which enters a recess A^2 of the front half. As a further protection against the halves of the lock being pried apart, and for the purpose of securing them together, those portions of the flanges A' B' which are near the bottom of the case in Fig. 1 are interlocked. Thus the flange B' is provided with a teat or detent B^3 , projecting toward the axial center of the lock-case, and the flange A' has a recess A^3 , into which said detent B^3 is received. At the upper end of the case, and near to one of the openings P in the case for the insertion of one tongue of the hasp, a set-screw A^4 is passed down through an opening B^4 in the flange B' , and is screwed into an interiorly-screw-threaded opening in the flange, and

thus holds together the upper ends of the two halves A and B of the case. For additional security a similar set-screw A^4 is passed through a similar opening B^4 in said flange B' , near to the place where the other tongue of the hasp enters the lock, and engages a female screw-thread in an opening in the flange.

C indicates the staple or hasp. Each end of the hasp is provided with an extension or tongue C' . The hasp, at the point where each tongue C' is connected to it, extends laterally, forming the shoulders C^2 C^2 . When the tongues are in the lock, these shoulders fit down upon and close to the case. One of these shoulders of one limb of the hasp completely covers and hides from view the head of the adjacent screws A^4 aforementioned, and the head of the other screw A^4 is covered and hidden by the adjacent shoulder of the other limb of the hasp. Thus, until the hasp is removed from the lock, the separation of the two halves A and B of the lock-case is prevented.

The rear half B of the lock is at its inner or front side centrally provided with a basal stud D, from which centrally extends forward an arbor D' , of somewhat smaller diameter than the stud D. Thus an annular shoulder D^2 is present on the front of the stud D between the periphery of the said arbor and the peripheral edge of the said stud. Upon the arbor D' are located the hollow tumblers E E' E^2 . Each of these hollow tumblers consists of a disk E^3 , provided with a flange T. The latter is located at the rear outer or peripheral edge of the disk and extends around the same. The peripheral surface of this flange T—that is to say, the plan of it in the direction of its depth—extends rearwardly and at substantially right angles to the radial plane of the disk. This flange T has two openings T' T' . These openings are both located in one half of the circle described by the flange—viz., at such a distance apart as that, when the tongues C' C' of the hasp are in the lock, if one of these tongues is in or opposite one of these openings T' the other of these tongues shall be in or opposite to the other of these openings T' . Each of these tumblers is of a diameter different from the others. Thus the tumbler E is the smallest, and the tumbler E' the next larger, and the tumbler E^2 the largest of this set of disks; also, the flange T of the tumbler E' is wider than the flange T' of the tumbler E. The flange T' of the tumbler E^2 is wider than the flange T' of the tumbler E' . The object of making the flanges T' of each tumbler wider than the flange of the one preceding it is to enable the flange of each larger tumbler to overlap the flange of the next smaller tumbler. In this way the tongues are not required to be so thick from front to rear, or their walls of their wards, which respectively receive these flanges, need not extend so far forward as they otherwise would have to do. Each of these tumblers E E' E^2 is provided with a central circular opening of such

a shape and width as to slide upon the cylindrical arbor D' with the least friction, being so nearly the diameter of the arbor that each tumbler will have substantially no play in the direction of the radii of its diskal part.

The arrangement of the tumblers in the lock is shown in Fig. 1, and is substantially as follows, viz: The smaller tumbler E is placed upon the arbor and against the shoulder D^2 of the basal part D of the arbor. A small washer F' is now located on the arbor D' and next to the tumbler E. The tumbler E' , next larger in size, is now placed on the arbor and against the said washer. A second washer F' , preferably larger in diameter than the first, is now passed onto the arbor D' and against tumbler E' . The tumbler E^2 , next larger in size, is now placed on the arbor. The washers F' F' are prevented from turning on the arbor by suitable means—such as, for example, the longitudinal groove H in the periphery of the arbor and the lug H' of the washer projecting into the circular space enclosed by the washer and toward the center of the said space. This lug H' enters said groove. The function of these washers is well known—viz., to separate adjacent tumblers and prevent one tumbler when turned from communicating its motion to the adjacent tumbler or tumblers. The front side of each tumbler is provided with a stud or lug M, and the rear side of each of the tumblers E' and E^2 is provided with a stud or lug N. The rear stud N of one tumbler comes into contact with the front stud M of the tumbler next behind it as the first-named tumbler is revolved, and the latter tumbler is thereby revolved the desired amount.

Within the lock and at the front thereof is a disk F. In front of the lock is the usual index-dial K. This dial is set in a recess K' in the front half of the lock. The dial is connected to and is rotated by the usual knob G. An arbor K^3 is connected to the rear side of the dial at the center of the latter and extends rearwardly toward the arbor or pivotal stud D' , but does not touch the latter. This arbor K^3 , index-dial K, and knob G are preferably integral. On this arbor K^3 is fixed the disk F.

The preferred mode of securing the disk F on the arbor K^3 so as to turn with the arbor K^3 and be turned thereby is as follows: The disk F has a central opening F' to receive the arbor K^3 and closely fit thereto. In the periphery of the arbor K^3 is a groove K^4 , parallel to the axis of said arbor. A stud F^2 , projecting from the edge of the opening F' toward the center of the opening, enters the groove K^4 , and not only prevents the disk F when the latter has been adjusted on the arbor K^3 (the latter being within the said opening F') from rotating independently of the arbor K^3 , but compels it to turn with said arbor. This disk F is prevented from slipping off the arbor K^3 .

In the rear side of the disk F are the two

circular rows of recesses or depressions. Those in the outer row are indicated by the characters F^3 and those in the inner row by the characters F^4 . These depressions may be holes penetrating completely through the disk F. In either event it will be desirable to have the rear edge of the exterior row of depressions or holes F^3 slightly beveled, to enable the latch L to readily enter any one of these holes which come opposite to the latch L, and also to enable the latch to readily slip out of said holes as the person operating the lock continues to turn the knob G and with it the disk F.

The latch L, preferably cylindrical in form, is located in a recess or chamber L' in the rear half B of the lock. The latch is pressed outward and forward by resilient means. The preferred description of these means consists of a coiled spring L^2 , located in the bottom of the chamber L' . The bottom of the latch L rests on the top of this spring, and a central shank of smaller diameter than the latch proper is within the coil L^2 . The exterior or free end of the latch is rounded, so as to easily slip into and out of the recesses F^3 of the disk F as the latter is rotated.

For each tongue C' of the hasp there is provided in the edge of the lock an opening and guideway P, the latter extending into the lock. The sides P' of each guideway are cast or otherwise secured to the half B of the lock. These guides P cause the tongues C' to correctly enter the lock and there be held in a position proper for engagement with the tumblers $E E' E^2$.

In the front side of each tongue C' are recesses $C^3 C^3 C^3$. That recess which is uppermost—viz., nearest to the hasp C—is farthest forward. The next or middle recess C^3 below is not so far forward as the upper recess, and the lower recess C^3 is not so far forward as the middle recess C^3 . The stud or partition C^4 between the middle and lower recesses C^3 does not project as far forward as the partition C^4 between the upper and middle recesses.

When the tumblers E, E' , E^2 , and F are in position in the lock, as shown, the free end of the latch will rest against the inner surface of the disk F, near the periphery of the latter. The stud M of tumbler E^2 is located in one of the depressions F^4 , and is turned with disk F. The stud N of the tumbler E^2 as the latter is rotated will impinge against the stud M of tumbler E' . As the latter is in turn thereby rotated its stud N will strike against the stud M of tumbler E and thereby rotate the latter.

The number of tumblers used in the lock may be varied at will.

The mode in which the mechanism of the lock is operated in locking or unlocking the padlock is as follows: The tumblers $E E' E^2$ being in the position where their openings T' are in a line with and opposite to the respective adjacent guideways P, the tongues $C C'$ of the hasp are now introduced into the lock, one tongue entering one of the guide-

ways and passing down and into the adjacent openings T' of the tumblers $E E' E^2$ and the other tongue entering the other of these guideways and passing down and into the adjacent openings T' of the said disks. The dial is now rotated several times, and the tumblers E, E' , and E^2 are thereby rotated, and their respective flanges T are thereby caused to enter the adjacent recess C^3 in each tongue. The padlock is now securely locked, inasmuch as the tongues are securely held within the lock by the interlocking flanges T of the tumblers $E E' E^2$. When the lock is to be unlocked, the handle G and dial K' are first rotated from left to right a number of revolutions. Then the handle and dial are rotated from right to left to a given number, and then from left to right to a given number. These given numbers being the correct ones in the combination for opening the lock, the tumblers $E E' E^2$ and their openings T' are now located as when the tongues were inserted into the lock, the flange T of each tumbler having been fully withdrawn from the recesses C^3 . The tongues can now be withdrawn from the lock. The lock is thus unlocked.

To lock the lock, the first-named operation of inserting the tongues into the lock and rotating the tumblers is repeated. During the operation of locking the lock the latch L performs important and exceedingly useful functions, viz: As the dial is rotated the latch passes over the surface of the disk F, and as it reaches one of the depressions F^3 in its path it drops into such depression, and if the disk were no longer turned it would hold the disk securely in such position. The latch creates a tendency in the disk F to stop at each of the depressions F^3 . Hence, when the dial is being turned there is less chance of the dial being turned past a given number by the lack of nerve and precision on the part of the person knowing the combination and while unlocking the lock. In the next place, as the latch passes each depression it gives a clicking sound. This prevents an expert unacquainted with the proper numbers of the combination for unlocking the lock, and who is trying to pick the lock, from ascertaining when the given number is reached, for the reason that all the numbers when reached give a similar click, whereas in many other kinds of combination-locks there is no sound emitted until the given number is reached and in line for the tumbler to enter the notch of a disk of said lock. The lock may be set to open a given set of numbers by separating the halves A and B of the padlock and locating the stud M of tumbler E^2 in the proper depression or hole F^4 of disk E.

An important feature of advantage arising from the employment of my hollow tumblers is as follows, viz: These hollow tumblers form a rotary system, which makes it impossible to open the lock without knowing the combination. By experimental trifling it is possible to

turn the dial so that one tumbler will open. To ascertain that this one tumbler is open, the expert must pull the hasp. In thus attempting to withdraw the hasp from the lock he has moved the hasp outwardly far enough to bring the partitions C^4 C^4 of the tongues into binding contact with the flanges T T of those tumblers whose openings are not in position for the tongue to be withdrawn from them. As a result of this operation, the two hollow tumblers last named will not rotate. Hence the dial can no longer be turned, and the party attempting to pick the lock will be successfully foiled in his attempt to unlock it. Before he can rotate the dial the tongues of the hasp must return to their original position. When thus returned, the operator is no nearer the ascertainment of the combination. As heretofore mentioned, those two screws at the top of the case, together with the interlocking flanges at the bottom of the case, secure the two halves of the case together. These screws are not accessible, except when the combination is worked and the staple or shackle is withdrawn from the lock.

The lock clicks at all times when the index-dial is turned. There is one index-finger or indicator V on the dial and another index-finger or indicator V' on the body of the case adjoining the outer edge of the dial. These indicators can be felt and their position ascertained in the dark. Where the operator knows the combination he can, by means of said index-fingers, determine the starting-point, and then while turning the dial and counting the clicks he will be able to stop the dial each time in succession on the correct number of the combination, and thereby open the lock in the dark.

Certain features of my invention are applicable to permutation-locks of safes. One mode of the application thereof to a safe is illustrated in Figs. 12 and 13. In these figures W indicates a safe-door diminished in size. W^7 indicates the lock-box located within the door W and inclosing the lock. W' indicates a set of hollow tumblers, as E E' E^2 , each consisting of a disk E^3 and a flange T , such as shown in Figs. 6, 7, and 8. Each flange T is provided with one opening T' . These disks are mounted on an arbor, as D' , and a flange F is mounted on and fixed to an arbor K^3 , fixed to the dial K' and thumb-wheel G . A reciprocating latch L is also present, engaging depressions F^3 in the disk or circular flange F . A single tongue, as C' , is carried by a reciprocating piece W^2 , preferably of a yoke form, this yoke surrounding the edge of the said disks, and at front connected with the bolt-bar W^3 , having the recess W^4 , into which the free end of the latch W^5 turns by a separate handle at the exterior of the door. This bolt-bar W^3 carries one or more bolts W^6 , connected to the bolt-bar, as shown, or in any other suitable manner. When the disks are turned to the correct combination, the tongue C' will be free to be moved back

and out from the disks, as in the case of the padlock heretofore specified. The latch W^5 being now moved, the tongue C' , yoke W^2 , bolt-bar W^3 , and bolts W^6 W^6 are retracted and the safe-door is unlocked and ready to be opened.

An additional advantage of my invention in preventing a safe-lock from being picked is the following: The index-dial of my lock will always turn when power is applied to turn it, and it will thus turn irrespective of whether the bolts of the safe are shot or retracted. In this way I am enabled to conceal all the combination-numbers. In the safe-locks employing disks radially slotted, when the bolt or bolts are retracted the index-dial cannot be turned in either direction. Any attempt to turn it in a direction away from the free end of the door is prevented by the driver then in engagement with the tumblers. This condition of the mechanism reveals the last number of the combination. By my invention the index-dial can be turned in either direction after the lock is unlocked, and in this way any attempt to ascertain from the lock the last number of the combination can be frustrated.

While the various features of my invention are preferably employed together, one or more of said features may be used without the remainder, and in so far as applicable one or more of said features may be used in connection with locks of other descriptions than the one hereinbefore particularly specified.

What I claim as new and of my invention, and desire to secure by Letters Patent, is—

1. In a padlock, the case made in two halves, each half provided with a flange, the flanges interlocking, and the hasp provided with tongues and shoulders, as C^2 , a screw A^4 , the half B of the case having an opening B^4 through the flange B' , and the half A having a screw-threaded opening in the flange A' , the screw A^4 being received in said openings and engaging the screw-thread in the last-named flange, the head of said screw being covered from view and being kept out of reach by a shoulder C^2 of the hasp when the latter is locked to the padlock, substantially as and for the purposes specified.

2. In a padlock, the case made in two opposing pieces or halves A and B , the one half provided with the flange A' and recess A^2 and the other half provided with the flange B' and recess B^2 , the recess A^2 provided with an additional recess A^3 , and the flange B having detent or lip B^3 entering said recess A^3 , the halves at the conjunction near the point where the hasp enters the lock being secured together by means substantially as hereinbefore set forth, the hasp being provided with shoulders C^2 , covering said screw, substantially as and for the purposes specified.

3. In a lock, a number of rotatable hollow tumblers, as E E' E^2 , each provided with a flange T , having an opening T' for the passage therethrough of the tongue or extension

of the bolt or hasp of the lock, and the said tongue or extension C' having recesses C³ C³, into which the respective flanges T of said tumblers respectively enter, and spindles D D², on which are mounted the said tumblers, and disk F, having recesses F⁴ for receiving the adjacent pin M of the adjacent tumbler and index-dial, and knob G and spindle K³, fixed together, the spindle K³ carrying the disk F, fixed thereto, substantially as and for the purposes specified.

4. In a lock, an index-dial and spindle K³, turning together, a disk F, provided with an inner circle of recesses F⁴ and exterior circle of recesses F³, one of said series of recesses engaging the pin of the adjacent disk of a series of disks of a permutation-lock, and the other of said series of recesses engaging in turn a latch L, the latch L, and an elastic means connected to the latch and continually advancing the latter toward disk F, substantially as and for the purposes specified.

5. In a permutation-lock having a series of disks employed in locking or unlocking the lock, the latch L, located in recess or chamber L' of one part of the lock, the latch having a shoulder and a shank, and a coiled spring L², surrounding said shank within said chamber and bearing against the shoulder of the latch, and a disk F, operated on a spindle K³, connected to the knob G, and provided with a series of recesses into which the free end of said latch successively enters as the disk F is rotated, and said disk F also engaging one of the first-named disks for rotating the same, substantially as and for the purposes specified.

6. The hasp provided with tongues C' C', said tongues having recess, as C³ C³, and the case in halves provided with interlocking flanges and recesses and securing-screw, the hasp having shoulders C² covering said screw,

hollow tumblers, as E E' E², spindle D', having offset shoulder D² and carrying said tumblers, washers F', respectively separating adjacent tumblers, latch L, disk F, having the two annular series of recesses F³ and F⁴, the former for engagement with the stud M on the front of the adjacent tumbler and the latter for engagement with the stud, the tumbler E², having also a stud N on its rear face, and tumbler E', having similar studs M and N, similarly located, tumbler E having on its front side a stud N, spindle K³, knob G, and dial K, the knob G and dial being connected to and rotated by spindle K³, substantially as and for the purposes specified.

7. In a permutation-lock, the divided spindle, the forward spindle carrying the knob G and index-dial exterior to the lock and the disk F within the lock, and the second or rear spindle carrying the tumblers, the disks F having a series of recesses and the lock having the latch for engaging with said recesses and producing a recurring audible click, substantially as and for the purposes specified.

8. In a permutation-lock, the divided spindle, the forward spindle carrying the knob G and index-dial exterior to the lock and the disk F within the lock, and the second or rear spindle carrying the tumblers, the disk F having a series of recesses and the lock having the latch for engaging with said recesses and producing a recurring audible click, and index-finger V on the rotatable dial and stationary index-finger V' on the exterior front face of the lock and near the rotatable dial, substantially as and for the purposes specified.

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