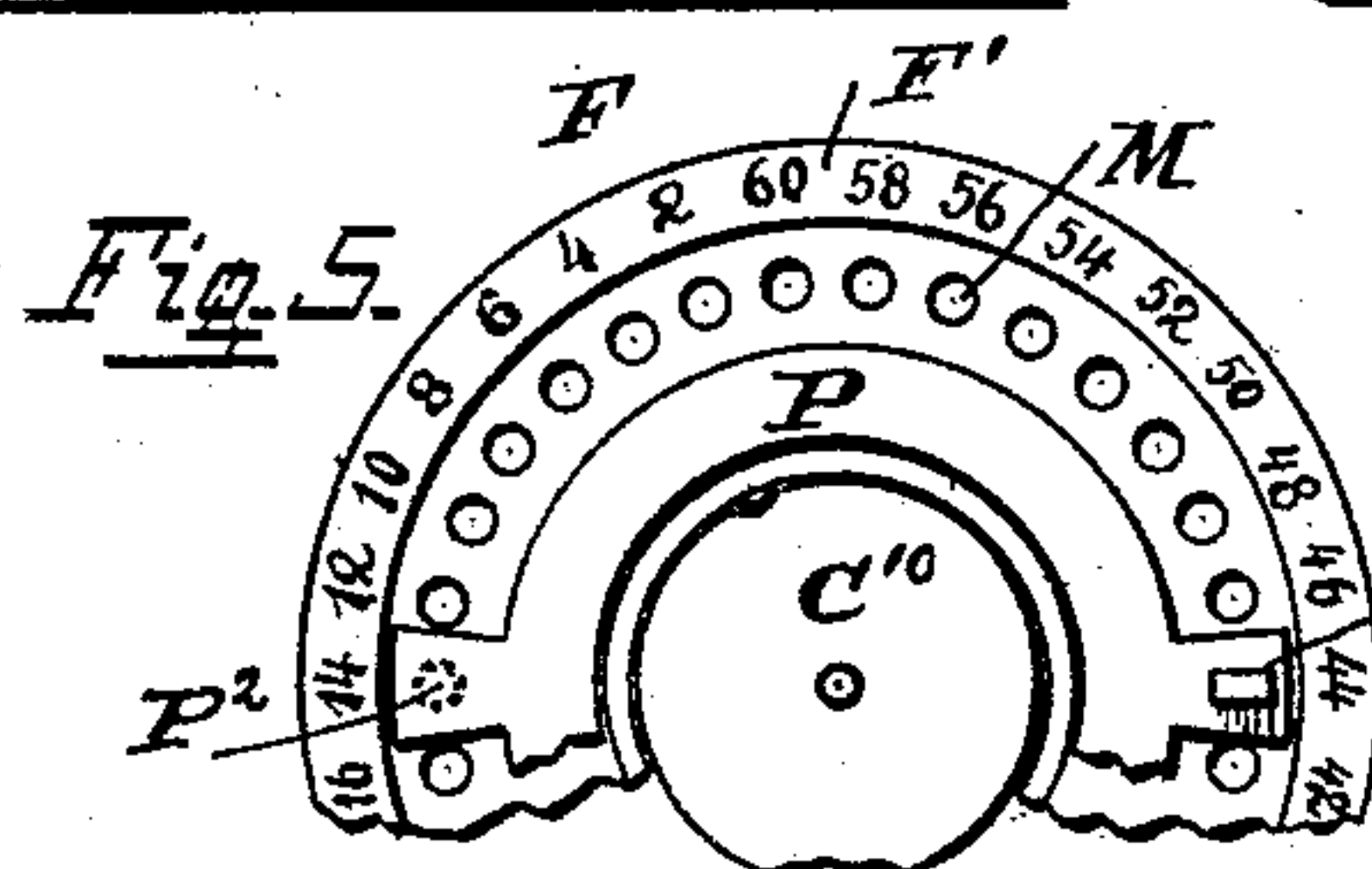
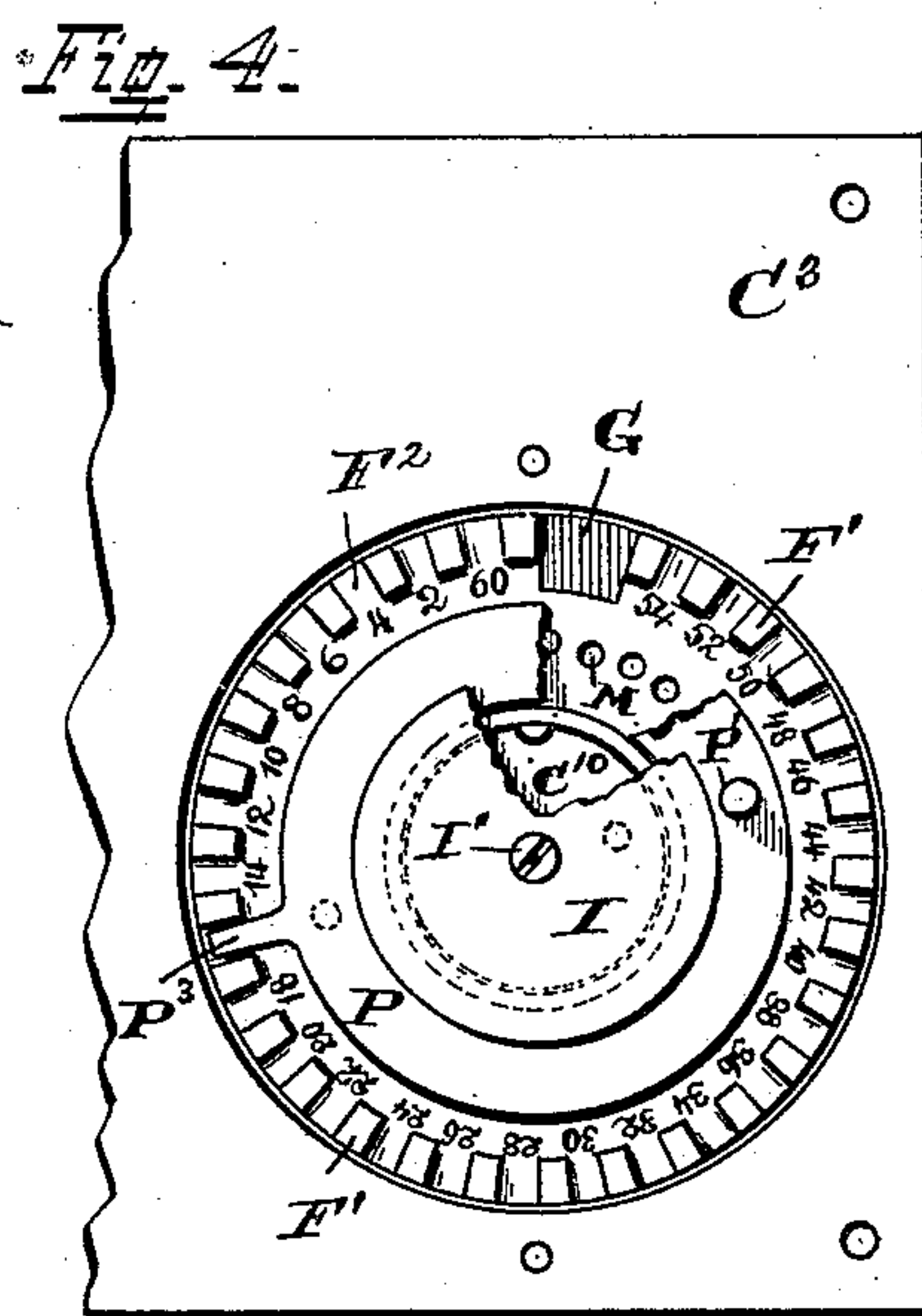
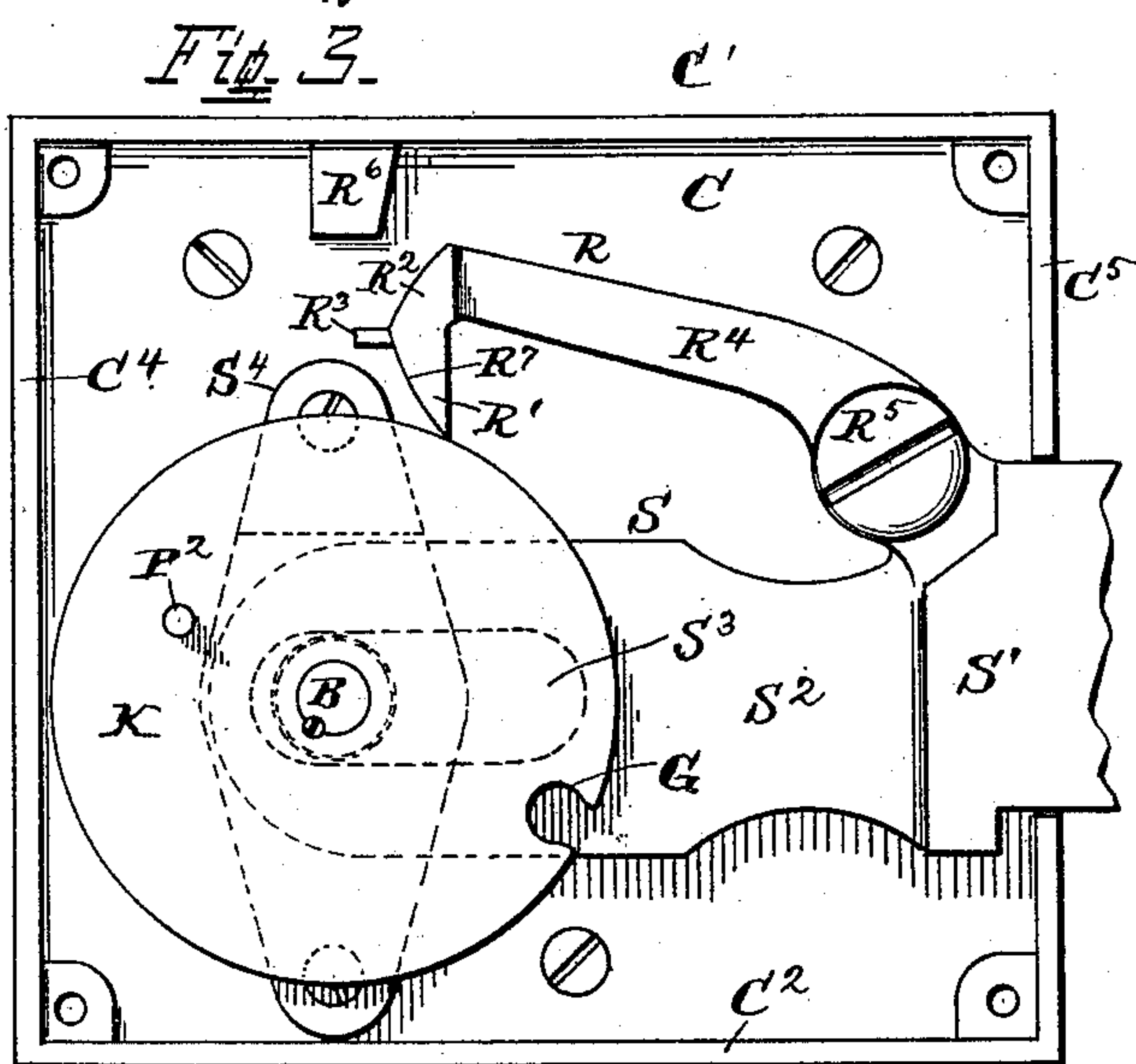
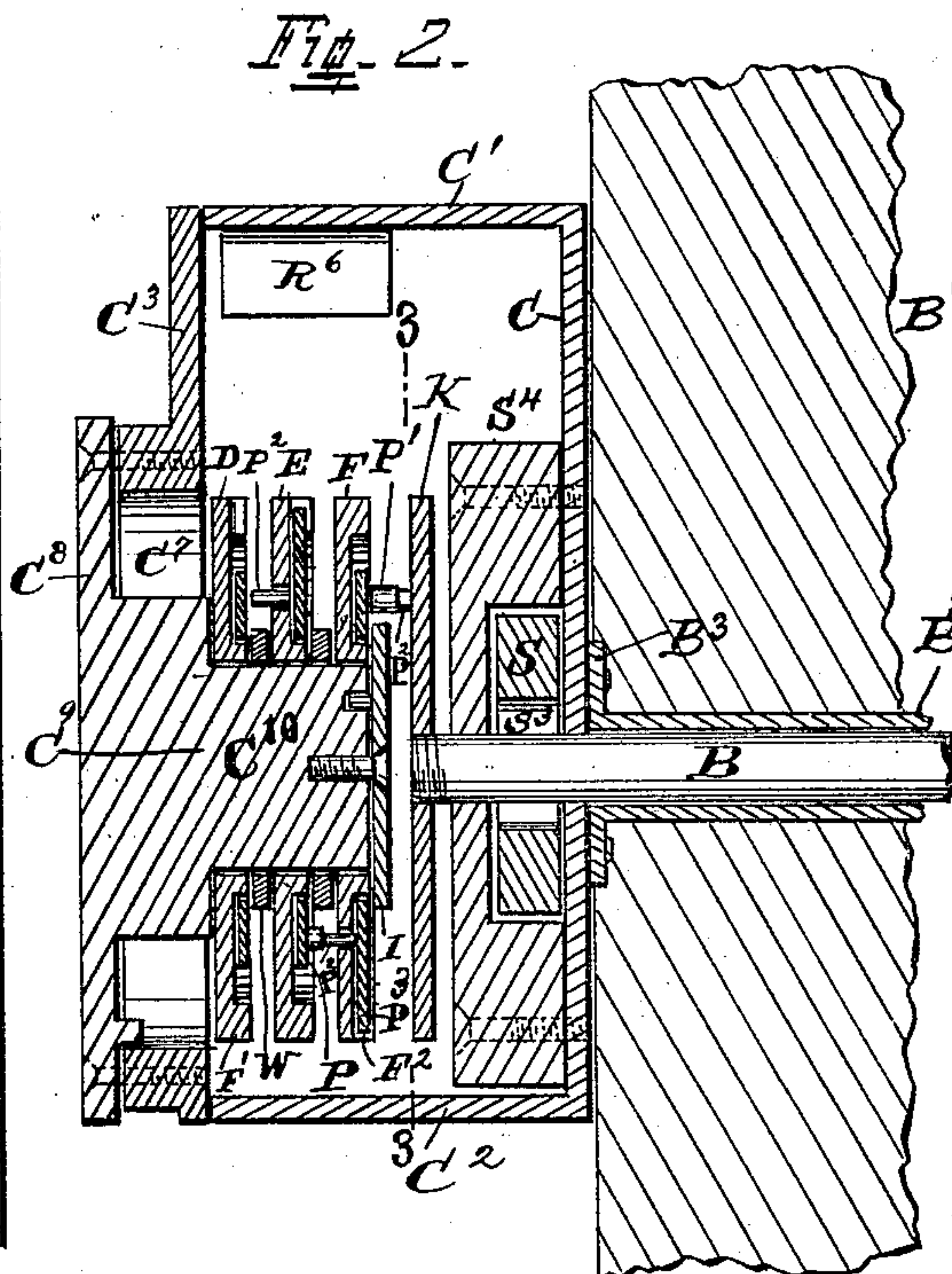
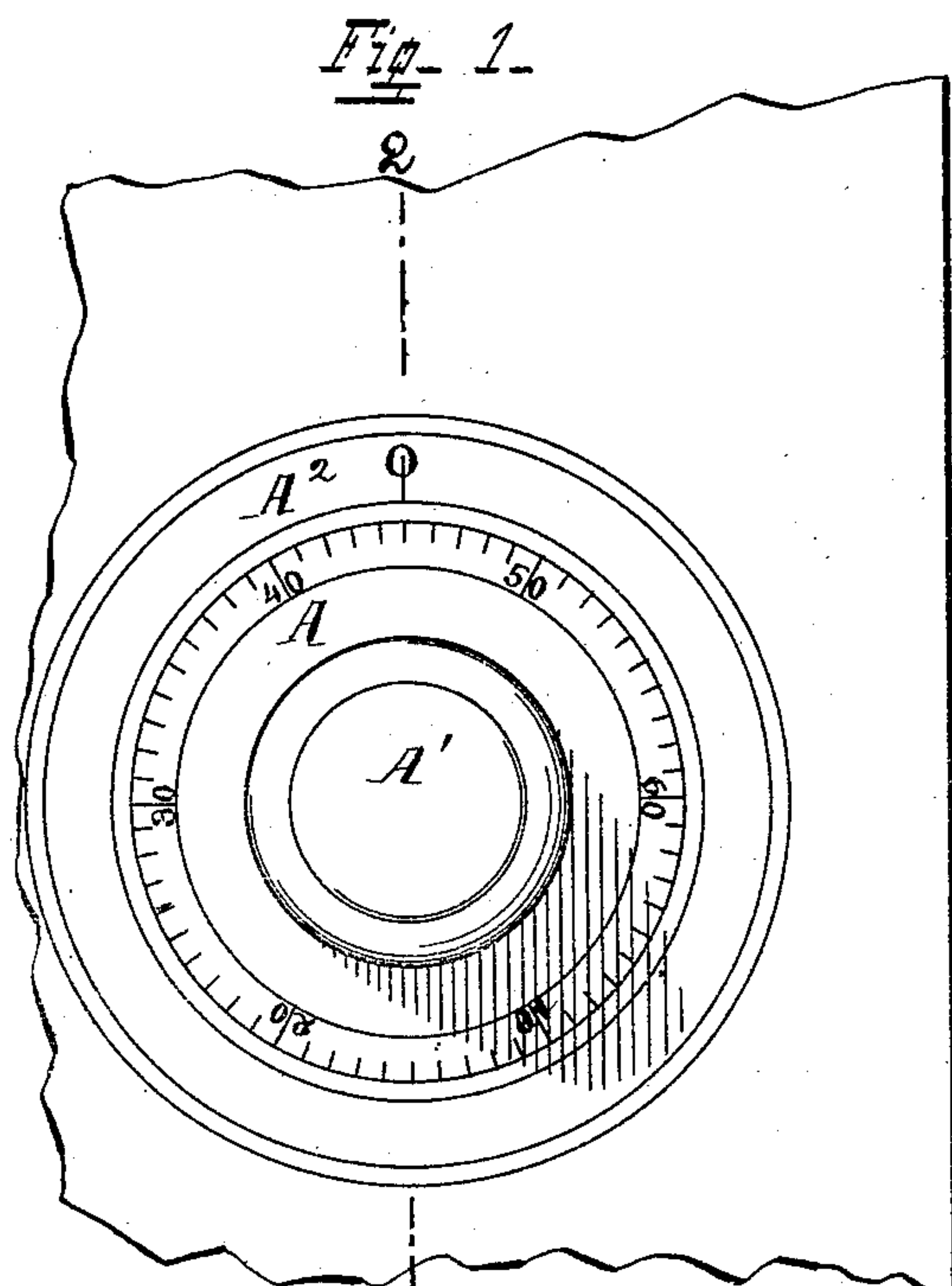


T. AVERBECK.
PERMUTATION LOCK.

Patented Jan. 10, 1893.



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UNITED STATES PATENT OFFICE.

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PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 489,447, dated January 10, 1893.

Application filed February 1, 1890. Serial No. 338,886. (Model.)

To all whom it may concern:

Be it known that I, THEODORE AVERBECK, 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, of which the following is a specification.

The various features of my invention and the several advantages accruing from their use, conjointly or otherwise, will be apparent from the following description and claims.

In the accompanying drawings making a part of this specification,—Figure 1 represents an elevation of the front exterior of a permutation lock embodying my improvements. Fig. 2 is a vertical section from front to rear of the lock, taken in the plane of the dotted line 2, 2, of Fig. 1, and looking at that side of the section which faces toward the left of Fig. 1, the index dial, its knob end and the annular ring surrounding the dial being omitted from this view. Fig. 3 is an elevation of a part of the lock when the opposite portions thereof have been separated at the dotted line 3, 3, of Fig. 2, the portion seen being that located to the right of said dotted line 3, 3, the spectator looking at that side of this portion which faces toward said dotted line 3, 3. Fig. 4 is a view of a part of the lock when the two opposite portions thereof have been separated at the dotted line 3, 3, of Fig. 2, the portion seen being an elevation of that part of the lock which lies to the left of said dotted line 3, 3, the spectator looking at that side of this portion which faces toward the right in said Fig. 2. In this figure a portion of the securing disk and of the annular collar are broken away to disclose the construction and interrelation of the parts. Fig. 5 is a side elevation of the index face of a discal tumbler and of its changeable collar with extensions illustrating certain modifications of the tumbler and collar and of the extensions of the latter, a portion of the said tumbler and collar unimportant in this illustration being omitted for lack of space.

A indicates the usual index dial at the exterior of the front of the safe door. A' is the knob for turning this dial, and A² is the usual stationary ring surrounding the peripheral edge of the dial A. The customary knob

spindle B fixed at one end to the inner side of the knob or dial and concentric therewith, extends back (in Fig. 2 toward the left) through the door B' of the safe, and thence through the forward wall C of the lock box to the discal tumbler K, more properly termed the driver. This is the disk whereby the bolt is moved through the agency of the dog. This disk K is the means intermediate between the knob spindle and the tumblers whereby the adjacent tumbler is rotated. The inner end of this knob spindle B is fixed to the center of said tumbler K. This spindle B is suitably journaled preferably in the customary sleeve B² located in the door. This sleeve has at each end an annular flange B³ whereby it is at one end riveted to the outside door plate and at the rear end to the front wall of the lock box.

C' indicates the top or roof piece of the lock box. C² is the bottom piece thereof, and C³ is the rear wall thereof.

C⁴ is one end wall of the lock box, and C⁵ is the other end wall thereof. The rear wall C³ is provided with the usual circular opening C⁷, and around this opening has the annular flange C⁶ projecting rearwardly beyond the rear face of the wall. This opening C⁷ is closed by the cap C⁸, screwed or otherwise secured to the annular flange C⁶. The abutment C⁹ at rear of the rear tumbler is suitably supported preferably by the cap C⁸. This abutment prevents the discal tumblers on the arbor C¹⁰ and the devices these tumblers carry from slipping rearward on the said arbor. This arbor is suitably supported. In the present illustrative instance, it is supported by abutment C⁹, the cap C⁸ and abutment C⁹ and arbor C¹⁰ being preferably integral as shown.

D indicates the rear discal tumbler.

E indicates the discal tumbler immediately in front of discal tumbler D. The discal tumbler F lies immediately in front of the discal tumbler E. These tumblers are rotatable on the fixed arbor C¹⁰ already mentioned. Each of these tumblers is provided with a hub H. Between the hub of tumbler D and the rear side or face of tumbler E is an annular washer W. The latter operates to separate the tumblers D and E and also serves to diminish the friction between them. In like manner, an annular washer W intervenes between the

hub of tumbler E and the tumbler F, and performs the same functions in relation to these tumblers E and F, that the first named washer W does for tumblers D and E.

5 The small disk I is secured by a screw or other means on to the front end of the arbor. The rear outer portion of this disk I near the periphery of the latter bears against the hub H of the tumbler F. In this way, all of the
10 tumblers D, E and F and their washers I are kept in the proper juxtaposition on the arbor C¹⁰.

One of the features of my invention relates to a novel construction whereby the driving
15 pins or lugs of the tumblers can be set so as to change the combination and produce another given combination, without experiment, and without turning the tumblers in the lock and without turning and returning the index
20 dial, and continually examining the latter until the precise predetermined combination is obtained. In other words, the novel construction of my tumblers and the parts immediately connected therewith, now to be described, enables the lock to be set upon a
25 predetermined combination, without groping after it by frequent manipulations of the index dial and tumblers, and trials therewith. The tumbler F is provided with the
30 marginal flange F', projecting forward in the same direction as does the hub H. At stated intervals along this flange are recesses or channels F². The general direction of each channel F is the same as that radius
35 of the tumbler which passes through said channel. Immediately within the flange F', and on the same side of the tumbler as is said flange, numbers or characters are marked. This marking is usually done by stamping the
40 letters in the metal of the tumbler by a suitable die, but it may be otherwise performed. One number is opposite a recess F². Thus each recess has a number. For convenience, I usually employ fifteen or twenty-eight recesses, but the number of recesses is to depend upon the wish of the manufacturer. Likewise in numbering, I prefer to skip every
45 alternate number. Thus the first recess from the notch or gate would be numbered 2, the second 4, the third 6, and so on. Therefore, where there were sixteen recesses, the last one would be numbered 32, and where twenty-eight recesses were present, the last one would be designated by the number 56, as illustrated in
50 the drawings, Fig. 4. But each succeeding recess may bear a consecutive number, the first recess being numbered 1, the second recess being numbered 2, &c., or in the successive numbering of the recesses, two or more consecutive
60 numbers may be omitted at pleasure between two adjacent recesses. The discal tumbler is also perforated at intervals in a circle lying within the circle occupied by the numbers. These perforations M are of a like size. There
65 are as many perforations as there are numbered places on the disk. A perforation is opposite each number.

On the hub H of the tumbler F fits a collar P. This collar is provided with two spring pins or lugs P', P². One of these, viz: pin P' extends
70 forward from that side of the collar P which is farthest away from the tumbler F. The axial length of this pin is in a direction at right angles to the general plane of the surface of the side of the tumbler. The other pin P² extends
75 rearward from that side of the collar P which is in contact with the tumbler F. The longitudinal axis of this pin is parallel to the longitudinal axis of the aforementioned pin P'. The pins P' and P² are located on opposite
80 sides of the axis of the tumbler F, and in a diameter of the tumbler. The pin P² of the collar is, when the latter is in position on the tumbler, located opposite the circle where-
85 in the perforations M are situated, and is small enough to enter and closely fit any one of these perforations. This pin P² is of such length that when located in any given perforation M of the tumbler F, it passes through
90 the same and extends beyond the rear side of the tumbler F far enough to impinge against a pin P' of the collar of the next tumbler, as E, when the tumbler F is duly rotated. From
95 the periphery of this collar P outwardly extends a lug P³, the latter being on the same diameter of the tumbler which passes through pins P' and P². This lug P³ is of a size such as to be received within any one of the recesses F² and closely fit therein.

The tumbler E is formed and constructed
100 with recesses or channels F² and perforations M, and provided with numbers, all as in tumbler F. The tumbler E is likewise provided with collar P having pins P', P² and lug P³, like the collar of tumbler F. In like manner,
105 where the lock has more than four tumblers, all of the tumblers behind the tumbler E, (excepting the tumbler D, which is the last in the series) are formed as tumbler F and provided with a collar having pins and a lug, like
110 the collar of tumbler F. The last named tumbler, as D, of the series is formed like the tumbler F, and its collar is provided with pins P', P² and lug P³, like the collar of tumbler F, with the following exception, to wit: the pin
115 P² need not, and consequently does not, extend beyond the rear side of said tumbler, there being no other tumblers behind D to be operated.

It should be here noted that each of the
120 aforesaid discal tumblers has in its peripheral edge the usual notch or gate G, for the admission therein of the tooth R' of the dog R, when the said notch comes adjacent to and directly beneath said tooth. Each of
125 these notches is situated between the lowest and the highest numbers on the tumbler. The discal tumbler K is a plain disk or discal frame, having in its peripheral edge a notch or gate G. This tumbler also carries a pin
130 P², fixed to and projecting from its rear side, at right angles to the plane of the latter, and when the tumbler K is rotated, this pin P² comes in contact with the pin P' of tumbler I.

The pin P^2 is on the opposite side of the axis of the tumbler from where the notch G is located, and that diameter of the tumbler which passes through the notch G also passes through the longitudinal axis of said pin. In this way, the lock is regulated, so that the tooth R' of the dog drops down straight into the notch of this disk, this notch being so placed that when the highest number is reached on the dial, the tooth R will drop into the notch G of said driving disk or driver K . The numbers on the tumblers run as high as those on the dial, with this exception that one or two of the highest numbers on the tumbler are cut away to form the notch G to receive the tooth of the dog. Thus, in the present illustrative instance, the numbers erased by the notch G are 58 and 60. The numbers on the index dial run as high as 60.

The mode in which the combination is changed is as follows,—The cap C^8 , abutment C^9 arbor C^{10} carrying tumblers D , E and F and their washers, collars &c., are taken out of the lock. The annular disk I is next removed. The collar P is then lifted from tumbler F , and the extension P^3 is now placed in the recess F^2 above that number which has been predetermined upon. The collar is now slipped over the hub H of this tumbler, the pin P^2 passing through the perforation directly beneath it, and projecting behind the tumbler in position to impinge against the driving pin P' of the collar of tumbler E . The pin P^2 is by this same operation set for contact with the pin P^2 of the driver K . This changes one element of the combination, viz: that tumbler. The pins P' , P^2 of collar P on tumbler E may also be set in like manner at any predetermined number thereon. So also may the collar on tumbler D . In this way, the entire combination is properly and quickly set at a predetermined combination. The tumblers having been replaced upon the arbor from which they were taken for the purpose of changing the combination, they are secured in place by means of the washer W . The cap C^8 , carrying the abutment C^9 and arbor C^{10} is now secured in working position in the lock as hereinbefore specified and shown in Fig. 2. The combination is now ready for use.

In Fig. 5, the modification of the tumbler consists in dispensing with the notches G . In such event, the rim or flange F' of the tumbler may be the place to receive numbers belonging to this tumbler. The extension P^3 of the collar P for insertion in the notch where notches are present, will preferably be omitted when the notches are absent, and the collar will be modified to this extent. The collar P and its pins P' and P^2 will be set for a predetermined combination by seeing that P^2 enters the perforation M indicated by the desired number on the dial. The bolt is, as shown, of the usual form, and slides through the wall C^5 of the lock, and preferably has a detent S^4 to prevent it sliding out beyond the

desired limit. The rear or inner end of the shank S^2 of the bolt slides upon the spindle B . A slot in the bolt, shown by dotted lines in Fig. 3, receives the spindle B , which passes through said slot on its way from the knob A' to the driver K . When desired, a series of bolts can be used, connected together in any of the well known modes.

Another feature of my invention relates to an automatic means for compelling the latch or dog R' to be always in readiness to enter the notches G of the tumblers. The rear end of the shank R^4 of the dog R is pivoted at R^5 to the bolt S in the usual manner, the other or free end of the dog carries the tongue R' , being capable of being elevated and depressed. The forward part of the tongue R' is formed with the usual bevel R^7 . By means of this bevel, the tongue R' of the dog is forced out of the notches G , when the tumbler K is turned from the left over toward the right, when looking at Fig. 3, in order to break the combination, and lock the safe. Fixed to a stationary part of the lock, preferably to the roof or top C' thereof, is a lug R^6 located just above and beyond the end of the dog. This lug R^6 extends down so far, as that when the dog is lifted out of the notches G , and the lower end of the tongue R' of the dog rides upon the periphery of a tumbler, the upper portion of the free end of the dog shall be above the lower end of this lug R^6 and opposite to the side of the latter. The lug R^6 now prevents the latch from being moved rearward and consequently prevents the bolt from being retracted and the lock unlocked. The tendency of the pressure of the dog against the lug R^6 , when the operator is attempting to open the safe before the correct combination is reached, and the notches come under the latch, is to cause the end of the dog to bind against the lug R^6 and be there upheld instead of falling into the notches of the driver and tumblers, when said notches are in line directly beneath the tooth R' of the dog and the safe cannot therefore be unlocked. By my invention this objection is obviated. I form the upper part of the free end of the dog with a bevel R^7 . I provide the free end of the dog with the lug or flange R' . As the free end of the dog is lifted, this lug R' strikes the lug R^6 of the roof of the lock and prevents the free end of the dog below the bevel R^7 from passing above the lower end of said lug R^6 . When the dog is lifted, the bevel R^7 bears against the lug R^6 . The effect of this bevel R^7 on the dog is that at any effort at retraction, the bolt pushes the dog downward so that its tooth R' rests on the periphery of the driver K . So long as the notches of the tumblers and drivers are not beneath the tooth R' of the dog, the bolt cannot be retracted, as the upper part of the free end of the dog cannot pass by the lug R^6 . But when the notches are in line beneath said tooth, the latter will drop into said notches, the bevel R^7 on the dog preventing the latter

from clinging to or being upheld by the said lug R^6 . Thus this feature of my invention keeps the dog in constant readiness to enter the notches of the driver and tumblers.

5 While the various features of my invention are preferably employed together, one or more of the said features may be employed without the remainder, and in so far as applicable, one or more of said features may be employed
10 in locks other than the one herein specifically set forth.

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

1. In a permutation lock, the tumbler pro-
15 vided with perforations and bearing numbers, distinguishing such perforations, and carrying collar P , carrying pin P^2 for entering the perforations and pin P' , substantially as and for the purposes specified.

20 2. In a permutation lock, the tumbler having the annular flange F' , provided with notches, and also having numbers indicatory of said notches, and an annular row of perforations, and collar P having pins P^2 and P' ,
25 located in opposite radii of the collar, the pin P^2 being received by any one of the perforations, the collar likewise being provided with extension P^3 of a size to enter any one of the said notches, substantially as and for the pur-
30 poses specified.

3. In a permutation lock, the combination of a driver K , and two or more tumblers, each having an annular row of holes M , and numbers indicatory thereof, and each having a col-
35 lar having pins P^2 and P' , an opposite radii

of the tumbler, the pin P' extending forward, and the pin P^2 extending backward through any one of the holes, and extending beyond the rear surface of the tumbler, and a rear tumbler like those described with the excep- 40
tion that pin P^2 does not extend behind the rear surface thereof, the tumblers and drivers being provided with the customary notch or gate G , substantially as and for the purposes specified. 45

4. In a permutation lock, a reciprocating bolt, a dog R pivoted to said bolt and reciprocating therewith, and having a tooth R' , driver and tumblers having the customary notch or gate into which said tooth R enters 50
when the lock is in position for the bolt to be retracted, the dog at other times resting on the periphery of the driver or tumblers, the dog having at its free end the extension R^3 , and provided above said extension with a 55
beveled end R^2 , the lock having a fixed lug or detent R^6 , above and in advance of the free end of the dog, and in a position substantially as described for engagement with the dog,
when the lock being locked and the dog rest- 60
ing on the drivers or tumbler, the bolt is moved forward, and the dog is forced upward and forward, the extension R^3 limiting the upward movement of the dog, as the bevel R^2 of the latter causes it to rise, substantially as 65
and for the purposes specified.

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Attest:

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