

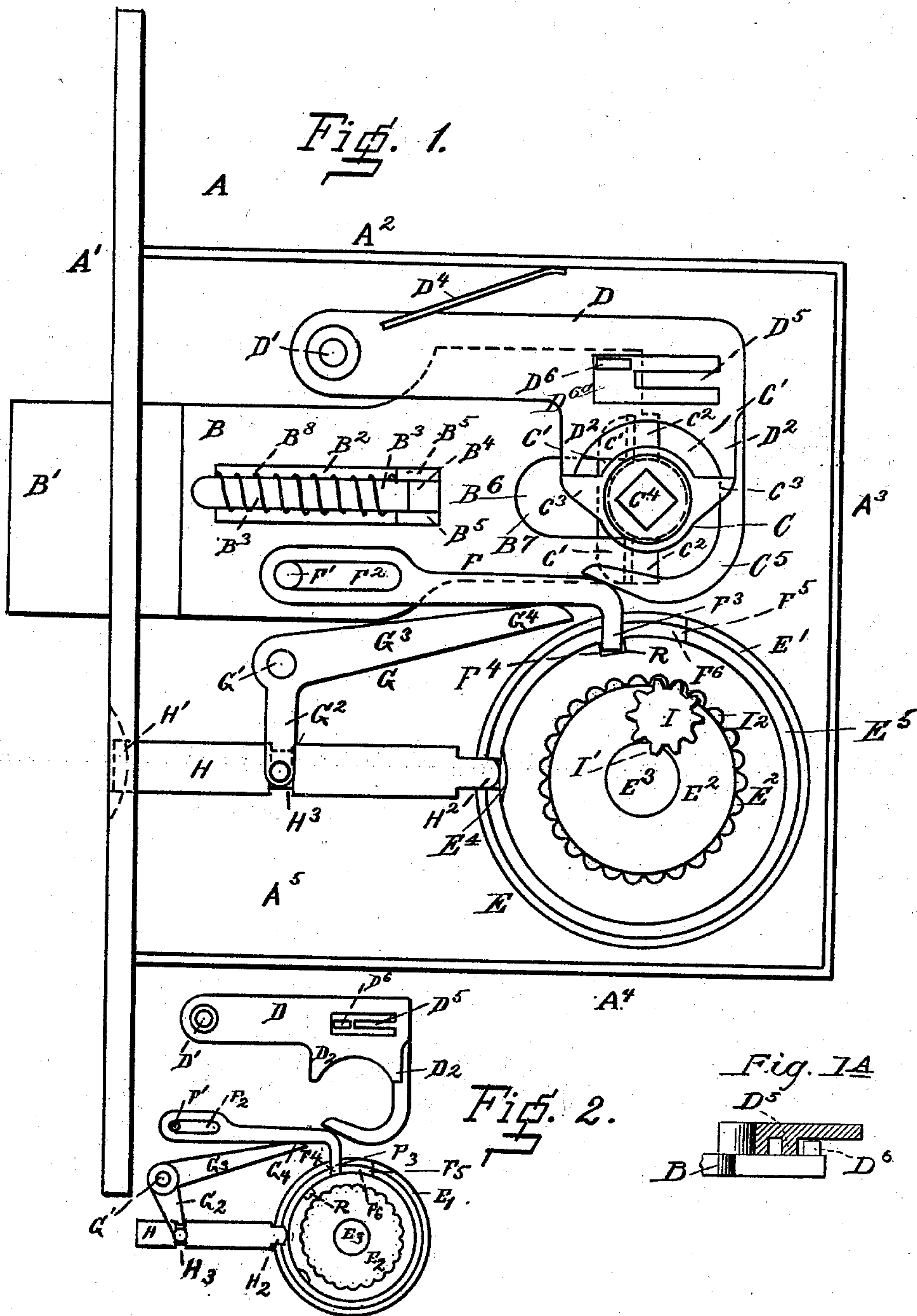
(No Model.)

2 Sheets—Sheet 1.

H. H. DANIELS.
COMBINATION LOCK.

No. 505,157.

Patented Sept. 19, 1893.



WITNESSES.

John M. Gleason
N. Smith

INVENTOR,

Henry H. Daniels,
per Wm. Hubbell Fisher
ATTORNEY.

(No Model.)

H. H. DANIELS.
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2 Sheets—Sheet 2.

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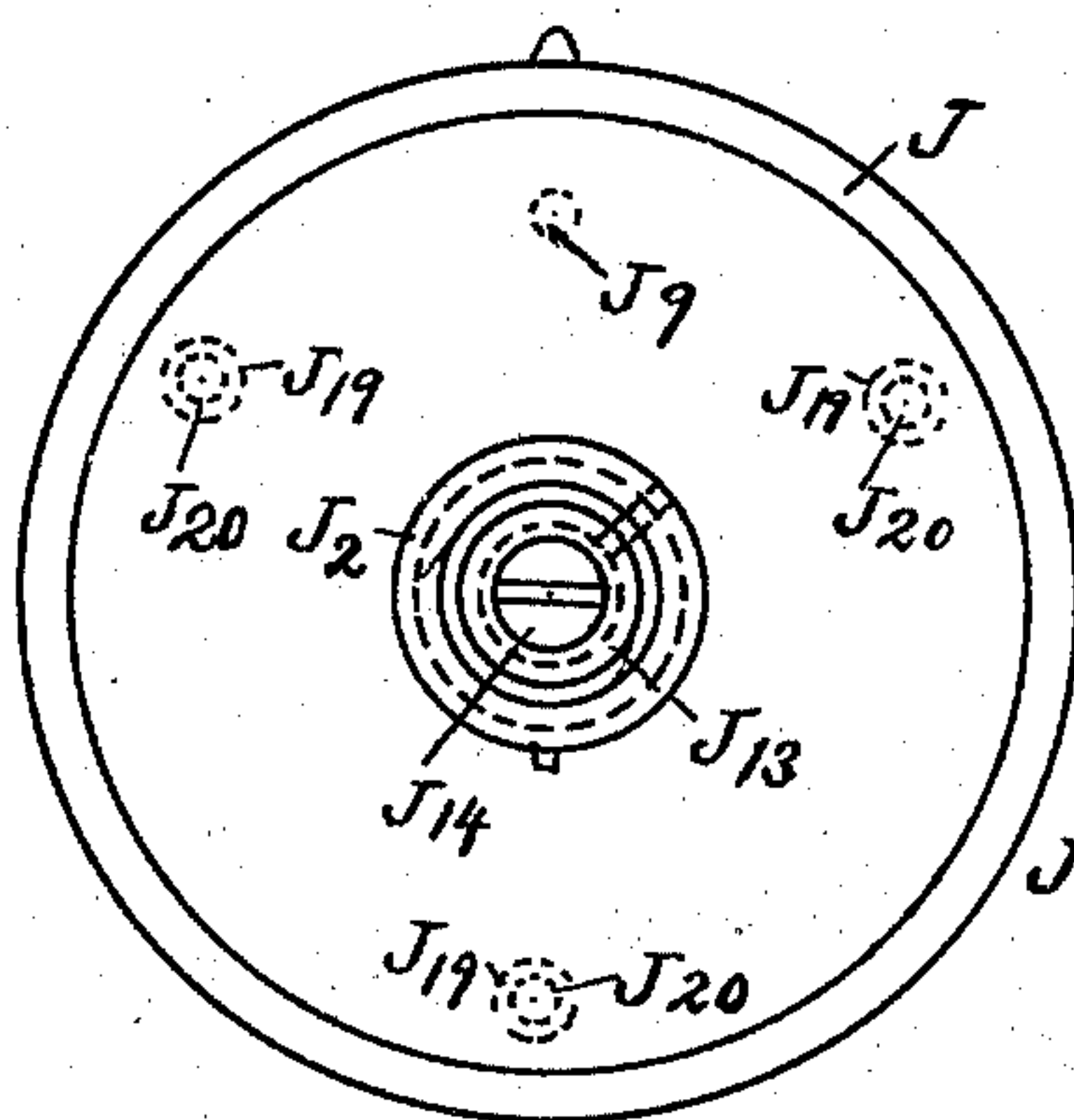


Fig. 3.

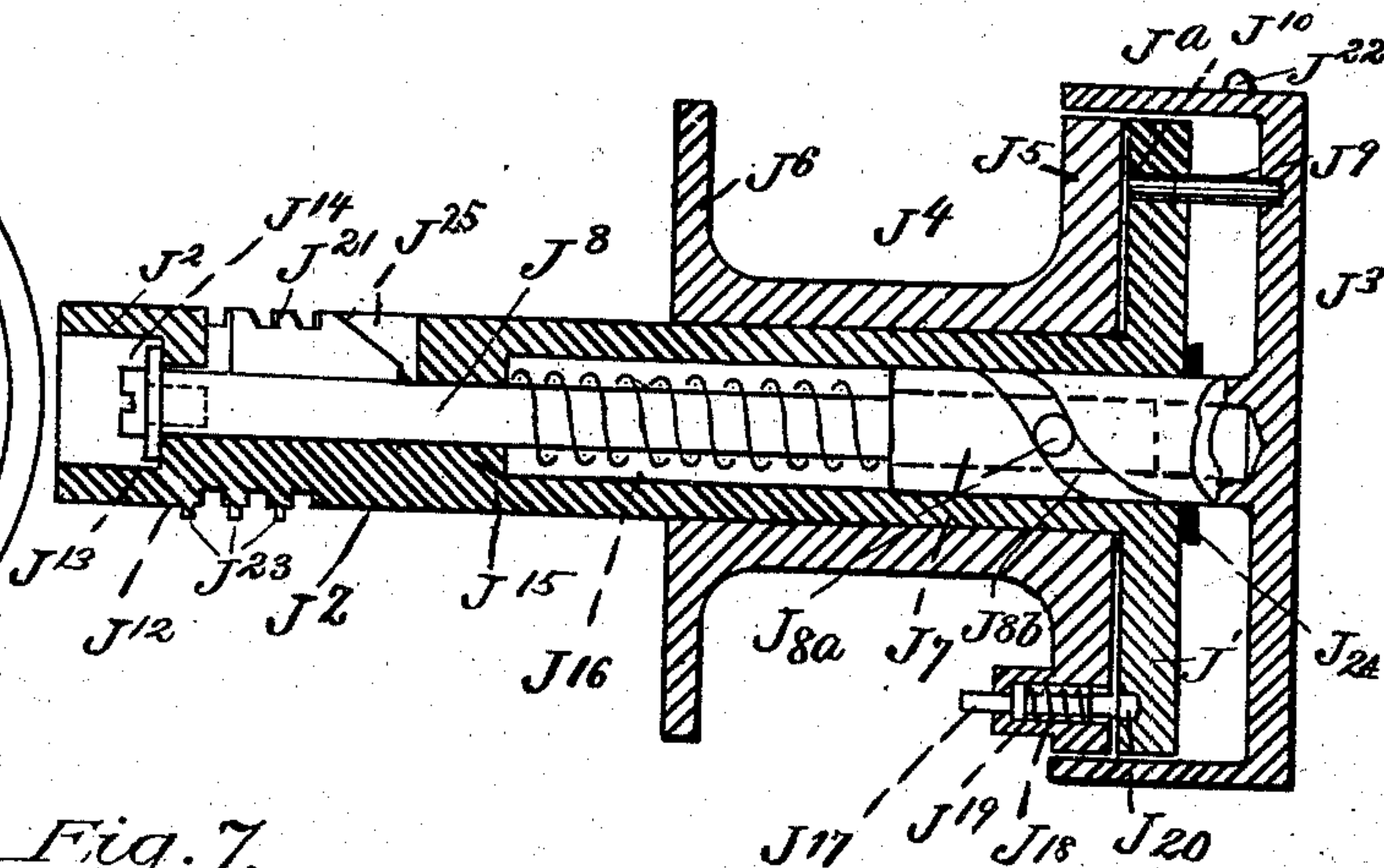


Fig. 7.

Fig. 4.

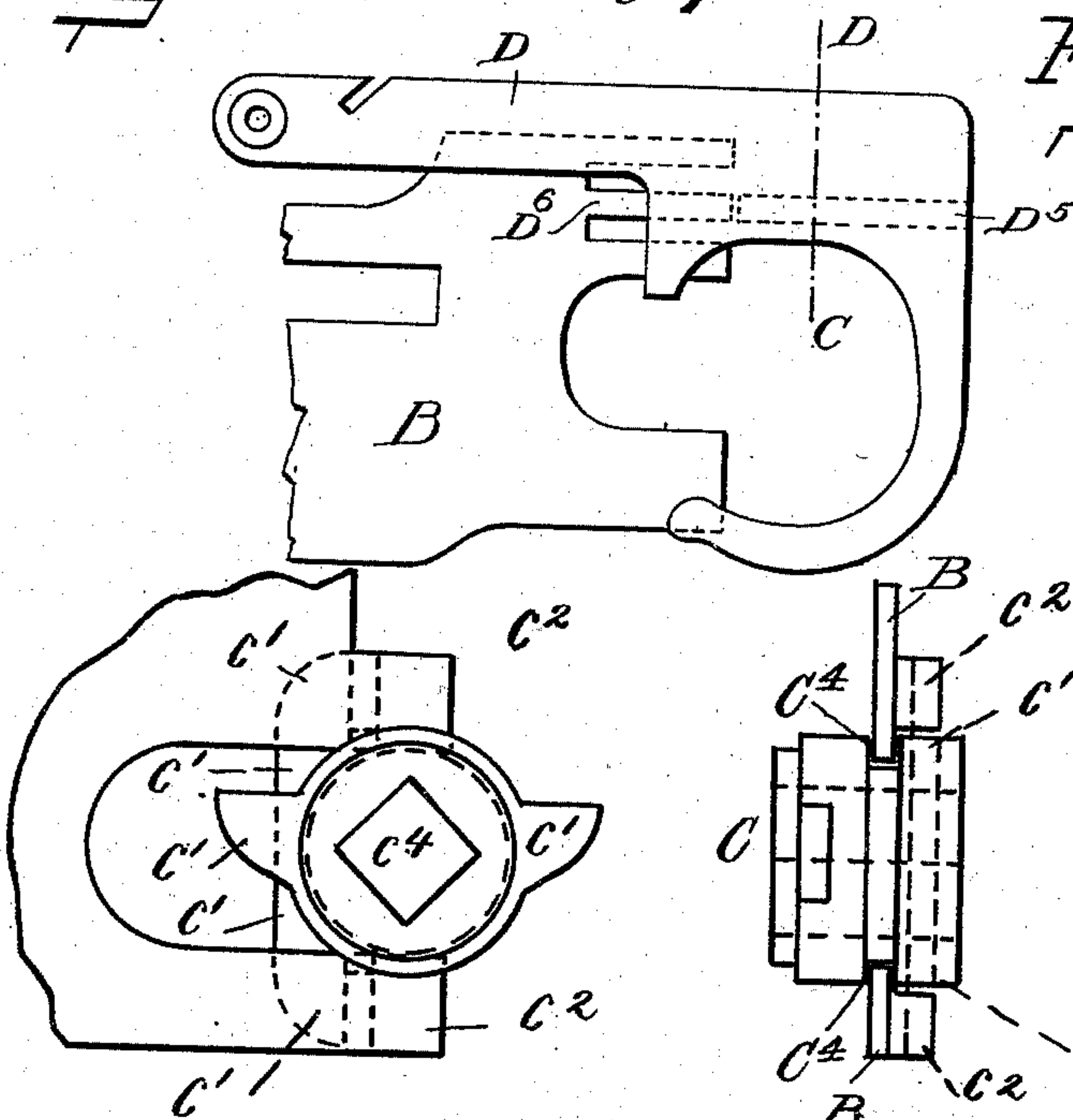


Fig. 5.

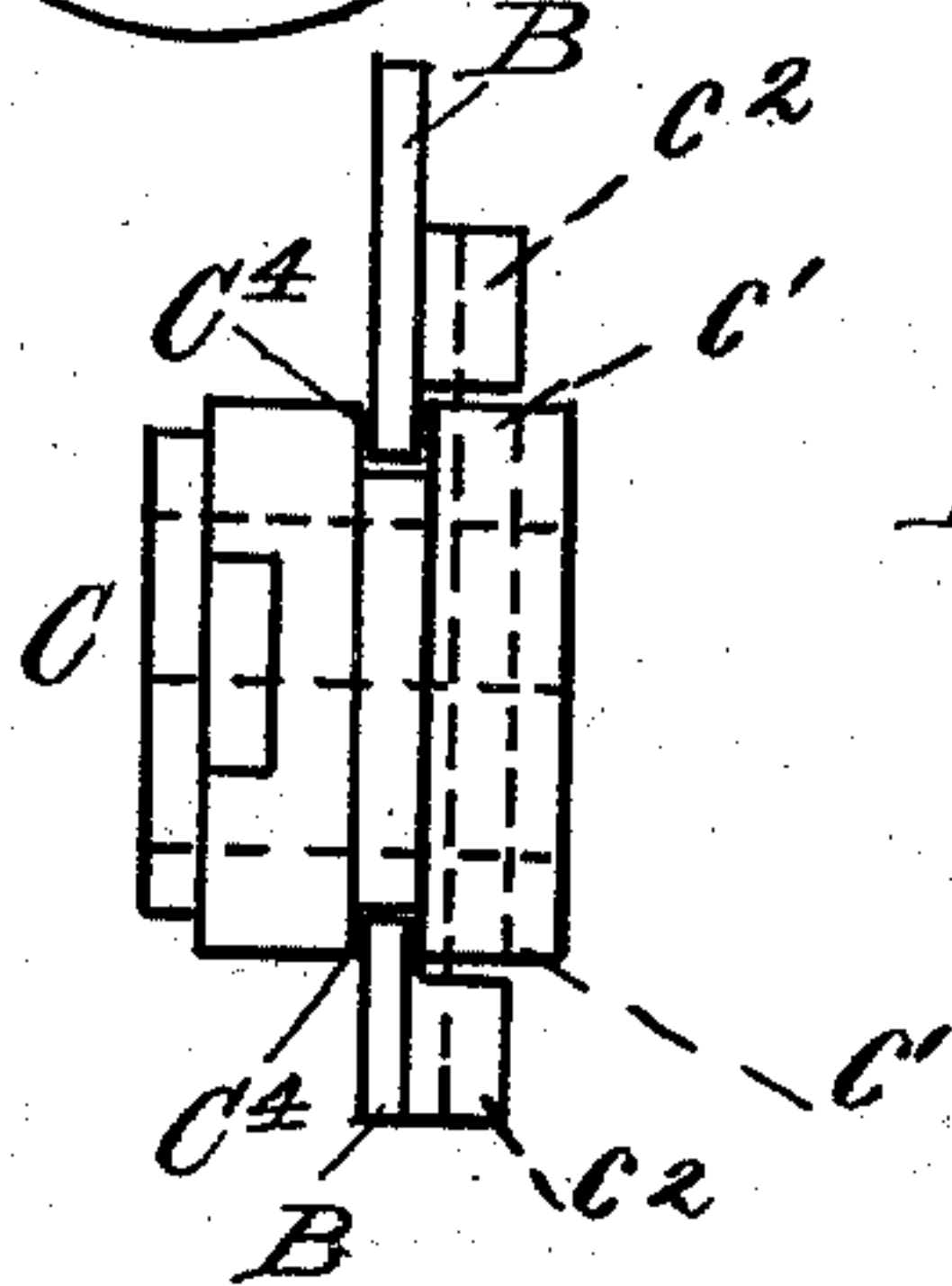


Fig. 6.

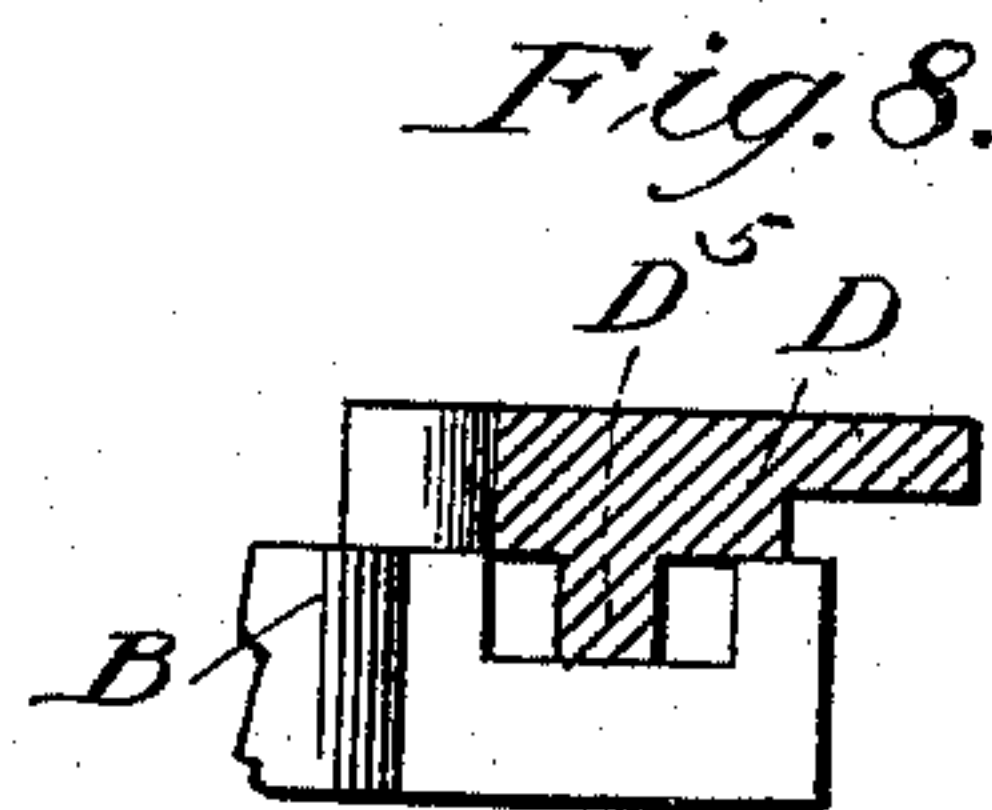


Fig. 8.

WITNESSES.

Jos. H. Glusman
H. Smith

INVENTOR.

Henry H. Daniels,
per Wm. Hubbell Fisher
ATTORNEY.

UNITED STATES PATENT OFFICE.

HENRY H. DANIELS, OF CINCINNATI, OHIO.

COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 505,157, dated September 19, 1893.

Application filed December 9, 1892. Serial No. 454,682. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. DANIELS, a citizen of the United States, 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 Combination-Locks, of which the following is a specification.

The several features of my invention and the various advantages resulting 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 and to which reference is hereby made,—Figure 1, Sheet 1, shows in elevation the interior of the lock embodying my invention. Fig. 1^A, is a transverse section taken in a plane at the dotted line A, B, of Fig. 1, that side of the section being seen which faces toward the right in Fig. 1. Fig. 2 shows in elevation, and on a diminished scale, certain details of this lock, occupying another position from that shown in Fig. 1. Fig. 3, Sheet 2, is a vertical, central longitudinal section of the knob and mechanism immediately connected therewith for operating the combination lock. Fig. 4 is an elevation of that end of the device which is seen by a spectator located to the left of the device shown in Fig. 3. Fig. 5 is a detail view of certain parts of the lock hereinafter mentioned. Fig. 6 is an edge view of the devices of Fig. 5, but looking at the edge of same, from a point to the right of Fig. 5. Fig. 7 is a detail elevation, showing an obvious modification of a portion of the mechanism for locking the latch. Fig. 8 is a section taken at the line C, D, of Fig. 7, that side of the section being seen which faces toward the right hand in Fig. 7.

A indicates the frame of the lock, composed of a front piece A¹, top A², back A³, bottom A⁴, and side pieces as A⁵, secured together in any well known manner.

B is the latch bolt, having head B¹, provided on one of its free edges with the usual bevel. This bolt has a central slot or opening B² in which is located a guide rod or piece B³ rigidly attached at its left end to the bolt B. The other or free end of this guide rod or piece B³ is located in the guide slot B⁴, formed by and located between the two lugs or yoke B⁵, B⁵, in turn secured to the frame.

Embracing the rod B³ is a spiral spring B⁶, compressed between the front end of slot B² and the forward edges of the lugs B⁵, B⁵. The function of this spring is to allow the latch to be elastically moved back, and then when the latch is free to advance, to elastically advance the latter. A further function of the lugs B⁵ is to act as guides for the rear portion of the latch bolt B, compelling the latter to reciprocate in a given straight line.

The immediate mechanism for positively retracting the bolt consists of the lugs or arms C¹, C¹, respectively projecting from the upper and lower portions of the knob cylinder C, a little in advance of the center of the latter, and shown partly in solid, and partly in dotted lines in Figs. 1, 5 and 6. Each arm C¹ acts against an adjacent lug or projection C² on the latch bolt, and shown partly in solid and partly in dotted lines in Figs. 1 and 5 and in solid lines in Fig. 6. The mode in which said lugs operate in retracting the latch is well known, and needs no further explanation.

Pivoted upon pivot bolt D¹ fixed in the frame is an upper locking piece D, whose free end is bifurcated, and when the latch is out, rests upon the horns or arms C³, C³, of the cylinder C, one of the forks D² resting on one of the arms C³, and the other fork D² on the other arm C³. This locking piece D is continuously elastically pressed down by a suitable spring as D⁴, fixed to the piece D and pressing against the frame A². This piece D carries a tongue or stop lug D⁵, and to the front of the latter lies a lug D⁶, fixed on the latch bolt B. When both of the forks D², D², rest on their respective arms C³, C³, of the cylinder C, the tongue D⁵ lies below the lug D⁶ and the latch is free, as the door is shut, to be pushed back by the plate on the door casing usually known as the lock striker, and then to advance and latch the door, in the usual manner. This sleeve is turned by a knob spindle inserted into the hole C⁴, of the cylinder, this hole having angular sides for engaging the spindle closely fitting therein. This spindle communicates with a knob on the inside of the door whereby the knob cylinder C is turned to retract the latch and open the door, one of the arms C³ throws the lock-

ing piece D so high that the tongue D^5 is in a horizontal plane above the lug D^6 , and as the latch is retracted, the lug D^6 passes beneath the tongue D^5 without hinderance.

5 An obvious modification hereof (see Figs. 7 and 8) consists in omitting the ridge D^6 as a projection and making it in the form of a tongue in a flat extended portion of the latch bolt B, spaces x, x , being at the respective
10 sides thereof. The tongue D^5 now constitutes a ridge on the side of the pivoted locking piece D. At the middle part of the oscillation of the locking piece D an end of the ridge D^6 is opposite and against the end of the tongue D^5 , and locks the latch bolt B. At
15 the upper and lower positions of the piece D, the ridge D^6 misses the tongue D^5 , and can pass by it, leaving the latch bolt B free to be reciprocated. The other principal advantages of the pivot piece D as constructed and
20 of the tongue D^5 and lug D^6 will be hereinafter stated.

E indicates a circular combination lock, having two or more discal tumblers E^2 , capable of being set at desired numbers, and
25 held in a cylinder E^5 , which I designate as the tumbler chamber or support. These are contained in a suitable holder or cylindrical frame E' , located in the lock substantially as shown. When the tumblers are in a position
30 to allow the combination lock to be opened, the notches or recesses R of the tumblers will be coincident and will occupy the position shown in Fig. 1.

35 A pivotal pulling bar F is connected to the latch piece B by a pivot F' , located in a slot F^2 in the forward portion of the said piece F. The free end of said piece has a downward projecting end or tooth F^3 adapted to enter
40 the notches R of the tumblers when these notches are in line, substantially as shown in Fig. 1. This downward pressure and movement of said bar F is usually accomplished by not only its own weight, but also by the
45 spring D^4 pressing on the locking piece D. The forward sliding movement of the bar F is limited by the stop or edge at F^4 and the rear movement of said piece is limited by the stop or edge at F^5 . Consequently the distance or space F^6 between these stops is the
50 distance the latch can be reciprocated by the combination.

When the cylindrical shell E' is present, a convenient mode of forming these stops F^4
55 and F^5 , consists, as shown, in cutting through the said shell E' and tumbler or chamber support E a space equal to the distance F^6 , the ends of this space respectively acting as the said stops F^4 and F^5 . A provisional stop
60 for limiting the backward movement of the latch bar B is also present in the edge B^6 of the rear slot B^7 of the latch bar. When the latch bar is retracted, this stop B^6 impinges against the knob cylinder and prevents any
65 farther backward movement. The rear stop F^5 at the tumbler casing E' could therefore, if necessary, be dispensed with.

For certain purposes hereinafter stated, it becomes necessary to lift the free end of the bar F. Means for accomplishing this elevation of said bar F consists as follows: G indicates an angular lever pivotally fulcrumed at G' , and having a short arm G^2 and a longer arm G^3 . The free end of the short arm G^2 of this lever G carries a lug which works in a
75 transverse groove H^3 in the reciprocating rod H. The forward end of the latter is supported by and slides through the front frame A' , at H' , and its rear end slides through and is supported by a guide H^2 . The guide H^2 , when
80 the aforesaid cylindrical casing is present, is preferably formed by cutting through said casing, as shown. In each tumbler is a concave depression E^4 , and this depression is so located with reference to the recess R of said
85 tumbler that when the recess R is in position for opening the lock, viz: as shown in Fig. 1, this depression is opposite the rear end of the reciprocating rod H. These depressions allow the rod H to be pushed back far enough to sufficiently lift the bar F to cause it in turn to lift
90 the pivoted piece D heretofore described the requisite distance. This lifting is accomplished through an extension C^5 of the pivoted piece D, the said extension coming down
95 under the knob cylinder and resting upon the bar F. Pushing the rod H in toward the lock E as far as it can go, elevates the arm G^3 of the bell crank lever G, and in turn lifts the free end of pivoted bar F, and the latter elevates the pivoted piece D so high that the
100 tongue D^5 is brought above the lug D^6 , and the latch is thus unlocked. The tumblers of the combination lock E can now be turned, and the combination broken up. As they are
105 thus turned, the rod H is pushed, and causes the bar F to descend and its tooth to rest on the top of the periphery of the tumbler E^2 . The locking piece D at the same time descends and locates the tongue D^5 opposite the lug D^6 ,
110 and permanently locks the bolt.

The preferred combination employed in lock E is that fully set forth and described in those Letters Patent of the United States
115 granted to me on the 1st day of July, 1890, No. 431,336, and on the 30th day of August, No. 481,551, for improvements in combination padlocks, and further description thereof is deemed unnecessary except so far as it is desirable to do so in connection with certain
120 novel features of construction herein for the first time set forth.

J^2 indicates the knob spindle for turning the tumblers of the combination lock, as described in said Letters Patent. The knob
125 spindle is fixed to a discal part or piece J' . The spindle J^2 for a part of its length turns in the neck J^4 of the knob. This neck is stationary while the spindle J^2 turns therein. The knob cap J^3 has an annular flange J^a surrounding the piece J' and also the outer
130 flange J^5 of the neck J^4 . From the inner side of the cap J^3 projects a lug or pin J^9 , whose free end is always in a recess or opening J^{10}

in the piece J'. The cap J³ is free to slide to and from the piece J', but this movement is so limited that the pin J⁹ cannot come out of the opening J¹⁰. Hence the cap J³ and piece J' must always turn together.

To the central portion of the inner side of the cap J³ is fixed a hollow shank J⁷ containing a spiral slot J^{8b} in which plays a pin J^{8a} fixed to a central rod J⁸. The shank J⁷ slides in the outer portion of the hollow spindle J². The outer end portion of the central rod J⁸ slides longitudinally within the shank J⁷, and near its center slides through a guide J¹⁵ fixed to and a part of the spindle J². The extreme inner end of the rod J⁸ is journaled in a bearing J¹² of said spindle and the outward sliding of the rod is limited by the washer J¹³ and nut J¹⁴ to the left of the bearing J¹² (see Fig. 3).

The rod carries the teeth J²¹, one tooth for each tumbler, that is each tumbler is operated by its pinion I, engaging the tooth of its tumbler, and the rod J⁸ carries a tooth for each pinion I. The rod J⁸, therefore, is rotatable within the limits allowed by the play of the pin J^{8a} in the slot J^{8b} and can slide longitudinally the distance between the left hand tooth J²¹, and the washer J¹³ (see Fig. 1). The cap J³ and its shank J⁷ is always (except when pushed inward toward the lock by human agency) elastically kept at the outer portion of its longitudinal play by means of a spring J¹⁶ coiled around the rod J⁸, and compressed between the front side of the bearing J¹⁵ and the rear end of the hollow shank J⁷. Pushing the cap J³ in operates by means of the slot J^{8b} and pin J^{8a} to cause the lugs J²¹ to move round in an arc, and to advance to the left, (Fig. 1.) These lugs J²¹ are so arranged in relation to the gear or pinion wheels I respectively gearing into their respective tumblers E², that the arcal movement of said teeth J²¹ operates to turn the pinion I. For example, the tumblers E² are all out of combination and the cap J³ is set in position to begin to put them into combination. The operator pushes the cap in and thereby moves the teeth to the left, and brings one tooth into engagement with the pinion I, with which it was designed to engage. The teeth also describe an arc, and the tooth J²¹ in engagement with the said pinion I turns the latter and moves its tumbler E around a given distance. The cap J³ is now allowed to be elastically moved out, and the said tooth J²¹ comes out of engagement with the pinion I. This operation is repeated until the first tumbler has been turned till in accordance with the number it has been set on, the tumbler has been turned till the notch R is under the tooth F³ of the bar F. The cap J³ and piece J' of the spindle J² and the latter are now rotated to a position where a given tooth J²¹ shall engage the pinion I of the next tumbler E², when the cap is advanced. The cap J³ is now reciprocated the requisite number of times for turning the tumbler into combination, thus bringing its notch R under the tooth

F³. These operations are repeated with each successive tumbler, till all are brought into combination as aforesaid. These operations of the shank J⁷, slot J^{8b}, pin J^{8a}, rod J⁸, teeth J²¹, pinions I and tumblers are all fully described and set forth in my said Patent No. 481,551, to which reference is hereby made. The sliding cap J³ embracing the piece J' and its pin J⁹ and piece J' provided with recess J¹⁰ are features of special construction not set forth in the said patent.

Additional novel features are now to be described, viz: Upon the part J' is located a rubber bumper or stop J²⁴, preferably in the form of a ring surrounding the hollow shank J⁷ as shown. This renders the impact of the cap J³ against the piece J' noiseless, an important desideratum in a burglar proof combination.

An inquiry naturally arises,—how is the operator to know how far to turn the cap J³, in order to place it in position to turn a given tumbler? This he can know as follows:—A set catch J¹⁷ is located in the rim J⁵ of the stationary neck J⁴ of the knob. The rear side of the piece J' has recesses J²⁰, the number of which latter corresponds to the number of tumblers to be operated. These recesses J²⁰ are so located that as the cap J³ and piece J' are rotated, they consecutively come opposite the forward end of the said catch J¹⁷. One recess is so located that when the cap J³ is turned to begin the work of setting the combination, viz: of acting on the first pinion I, the catch J¹⁷ is opposite this recess. The successive recesses are in such positions that each comes opposite the catch when the cap J³ is in position to act on the corresponding pinion I. The catch J¹⁷ is elastically pressed backward to the left (see Fig. 4) by a spring J¹⁹, and away from part J'. The rear end of the catch then projects rearward beyond its support, viz: to the left, (see said figure.) In practice, the operator in setting the combination, presses the rear end of the catch J¹⁷ and moves the latter to the right, whereupon the forward end of the catch will press against the piece J', and as the operator rotates the cap J³ and piece J', as soon as the next recess J²⁰ comes opposite the catch, the latter will enter it, and hold the cap in position for the operator to reciprocate the cap J³ and turn and set a given tumbler. After this tumbler is set the operator withdraws pressure from the catch, and the latter is moved back out of engagement with the recess J²⁰. The operator then turns the cap and again pressing upon the catch in like manner, finds the next recess.

A convenient means for enabling the operator to place the cap in position for finding the combination is an indicating fixture. Such a one is the hump or projection J³², on the cap, the hump being at top, when the cap is in position for beginning to set the combination.

The rear upper and lower portions of the

latch bar B respectively slide in a groove C⁴ in the knob cylinder C, it being understood that in the rear portion of the latch there is present an opening or slot B⁷, substantially as shown. This arrangement for guiding the rear portion of the latch bar is a great advantage. It not only keeps the bar in perfect alignment, but enables the bar to slide with perfect ease and smoothness of movement. Consequently, only the very lightest description of spring need be employed to elastically press the latch bar outward and as a matter of fact, the springs which I employ are only one fourth of the strength usually required to elastically advance the latter.

The forward edge B⁶ of the slot B⁷ is utilized by me as a stop for limiting the rearward movement of the latch bar and, therefore, whenever it is found that the edge F⁵, heretofore mentioned, is unnecessary, it need not be retained to perform the functions of a stop, as said functions will be performed by the edge B⁶ aforementioned.

In practice, the mode of working the lock will be as follows: The combination lock is locked, and hence the whole locked during the night, the parts being in the position shown in Fig. 2. In the morning, the combination is set, the tooth F³ being in the notches R, and the parts as in Fig. 1. The latch can now be moved, all day, and the combination cannot be unset or broken up, as the tooth F³ will remain in the notches R, there being no bevels on it, or the notches to enable it to ride up and out from said notches. In order to permanently lock the door, I push the rod H backward till it enters the depression E⁴ in the tumblers, which movement lifts the locking bar D, so that its tongue D⁵ will be above the lug D⁶, allowing the door to latch by its own free will. Now by turning the knob of the combination lock, the combination is broken, and at the same time the rod H is pushed out, and lets the bar F down till its notch rests on the periphery of the tumblers, and brings the tongue D⁵ opposite the lug D⁶, thereby permanently locking the latch bar. The rear end of the spindle J² is encircled with grooves. This part of the spindle is located within the central opening E³ through the tumblers (see Fig. 1), and in each groove, the teeth I' of the wheel I rotate, a tooth at a time, passing in the groove and opening, substantially as shown in Fig. 1. It is understood that the teeth J²¹, in engaging the pinions move out through a slot or opening J²⁵ in the spindle J², as described in my said patent. On this spindle J² are the lugs J²³, which respectively throw the tumblers around and ultimately into their respective positions to be set, substantially as described in my said patent.

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

1. The combination of an auxiliary knob spindle, and another knob and tumblers in connection with the latter, and the sliding

latch B having stop-lug D⁶, and the locking piece D having tongue D⁵, and capable of being raised above and below the said lug, as well as opposite thereto, and also tailpiece C⁵, tooth F³, lever F, the latter for lifting the tooth F³ out of the notches of the tumblers, and elevating the locking piece D, the auxiliary knob-spindle carrying one or more arms for actuating the sliding latch, substantially as and for the purposes specified.

2. The combination of the sliding latch B, having stop lug D⁶, and the locking piece D having tongue D⁵, and capable of being raised above and below the said tongue as well as opposite thereto, and the arms D² on said piece D and arms C³, C³, of the knob cylinder C, supporting said arms D², and the lugs C², C², on said cylinder, and lugs C', C', on the latch bar B for engagement therewith, substantially as and for the purposes specified.

3. The combination of the latch bar B, and spring for advancing it, and the usual knob cylinder E and means for enabling it to move the latch, and bar F having slot F², and pin F' therein and secured to said bar and tooth F³ on said bar F and tumblers having notches R for receiving said tooth, for enabling the tumblers to move the latch independently of the cylinder C, substantially as and for the purposes specified.

4. The combination of the sliding latch bar B, having stop lug D⁶, and the locking piece D having tongue D⁵, and arms D² and lugs C', and cylinder C having arms C³, and lugs C² respectively engaging said arms D² and lugs C', and locking bar F, having slot F² and tooth F³, and tumblers E² having notches R for engagement with said tooth and the pin F' on the latch bar located in slot F², extension C⁵ of the locking piece resting on bar F, and pivoted angular lever G, one limb G³ against bar F, and bar H reciprocally sliding engaging the limb G² of the lever G, and a front stop for the bar F, substantially as and for the purposes specified.

5. The combination of the latch bar B and the locking piece D, and cylinder E cut away and forming stops F⁴ and F⁵, and the bar F for retracting the latch and lifting the locking piece D, whose tooth F³ engages said stops, substantially as and for the purposes specified.

6. The combination of the sliding latch bar B, having stop lug D⁶, and the locking piece D having tongue D⁵, and arms D² and lugs C', and cylinder C having arms C³, and lugs C² respectively engaging said arms D² and lugs C', and locking bar F, having slot F² and tooth F³, and tumblers E² having notches R for engagement with said tooth and the pin F' on the latch bar located in slot F², extension C⁵ of the locking piece resting on bar F, and pivoted angular lever G, one limb G³ against bar F, and bar H reciprocally sliding, engaging the limb G² of the lever G, and a front stop for the bar F, the bar H having end H², and the tumblers having depressions

E⁴, for receiving said end, substantially as and for the purposes specified.

7. The reciprocating bar H, and the frame A', and combination lock casing E', and tumbler cylinder E⁵, bearings for the said rod H being formed therein, tumblers having depressions E⁴, and the lever G, bar F, latch bar, knob cylinder C and locking piece, substantially as and for the purposes specified.

8. The combination of the sliding latch bar B, having stop lug D⁶, and the locking piece D having tongue D⁵, and arms D² and lugs C', and cylinder C having arms C³, and lugs C² respectively engaging said arms D² and lugs C', and locking bar F, having slot F² and tooth F³, and tumblers E² having notches R for engagement with said tooth and the pin F' on the latch bar located in slot F², extension C⁵ of the locking piece resting on bar F, and pivoted angular lever G, one limb G³ against bar F, and bar H reciprocally sliding, engaging the limb G² of the lever G, and a front stop for the bar F, spring D⁴, located in the bar D and pressing against the frame A, substantially as and for the purposes specified.

9. The sliding latch bar B, having the rear ends and the cylinder C having the groove C⁴, receiving said rear ends of the bar B, and forming a guide therefor, and spring for advancing the latch bar, substantially as and for the purposes specified.

10. The sliding latch bar B, having the rear ends and the cylinder C having the groove C⁴, receiving said rear ends of the bar B, and forming a guide therefor, and spring for advancing the latch bar, and the rod B³ fixed to the latch bar and located in slot B² of the latch bar and having the lugs B⁵, B⁵, in said slot and fastened to the frame, and the rod B³, sliding between same, substantially as and for the purposes specified.

11. In a combination lock, the devices substantially as described for operating the tumblers, and the reciprocating cap J³ having

flange embracing piece J', and pin J⁹, moving in recess J¹⁰ of part J', substantially as and for the purposes specified.

12. In a combination lock, the devices substantially as described for operating the tumblers, and the reciprocating cap J³ having flange embracing piece J', and pin J⁹, moving in recess J¹⁰ of part J', and rubber stop J²⁴, substantially as and for the purposes specified.

13. In a combination lock, the devices substantially as described for operating the tumblers, and the reciprocating cap J³ having flange embracing piece J', and pin J⁹, moving in recess J¹⁰ of part J', and catch J¹⁷, extending through the piece J', and held back by spring J¹⁹, the piece J' having recesses J²⁰ into which said catch can be pushed, substantially as and for the purposes specified.

14. In a combination lock, the devices substantially as described for operating the tumblers, and the reciprocating cap J³ having flange embracing piece J', and pin J⁹, moving in recess J¹⁰ of part J', and catch J¹⁷, extending through the piece J', and held back by spring J¹⁹, the piece J' having recesses J²⁰ into which said catch can be pushed, and indicator piece J²² located on the cap J³, substantially as and for the purposes specified.

15. In a combination lock, the combination of the sliding latch bar B, having stop lug D⁶, and locking piece D having tongue D⁵, and the bar F, tumblers E² having notch R, and means for lifting bar F, and the knob spindle with means substantially as specified for retracting the sliding latch bar, substantially as and for the purposes specified.

16. In a combination lock, the reciprocating knob or cap J³, and a pin J⁹ for compelling the rotation of the shank J², substantially as and for the purposes specified.

HENRY H. DANIELS.

Attest:

WM. E. JONES,
K. SMITH.