

O. SMITH.
COMBINATION LOCK.

No. 494,605.

Patented Apr. 4, 1893.

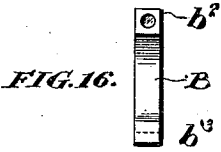


FIG. 1.

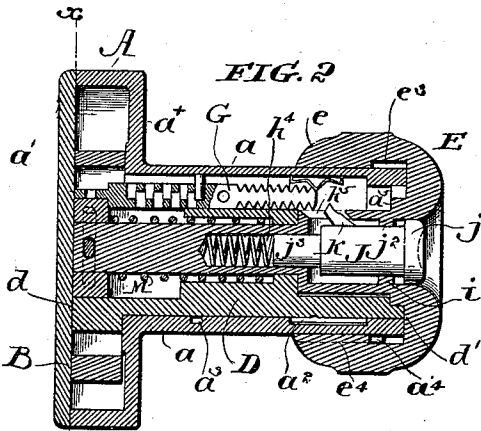
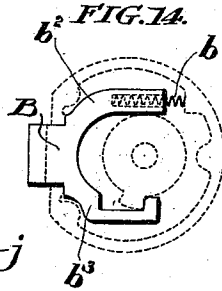
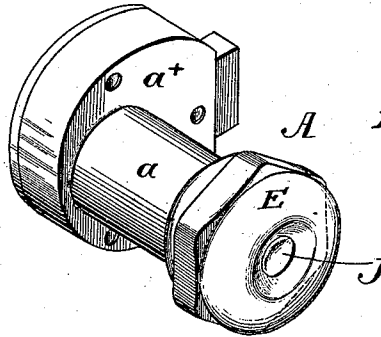


FIG. 2

FIG. 3.

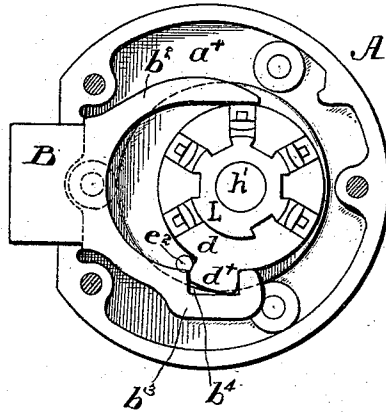


FIG. 5.

FIG. 4.

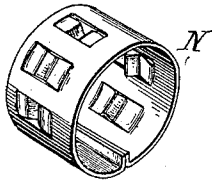
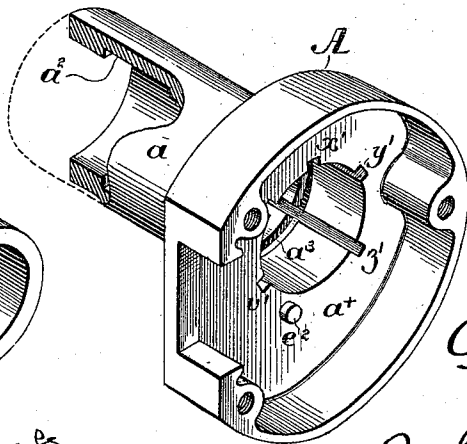
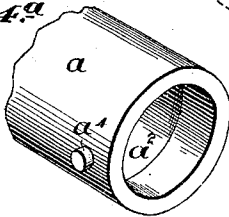


FIG. 4ᵃ



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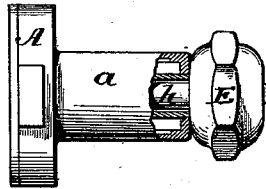
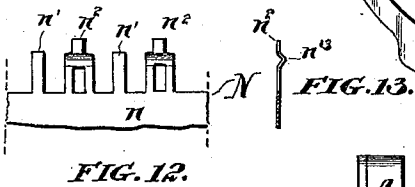
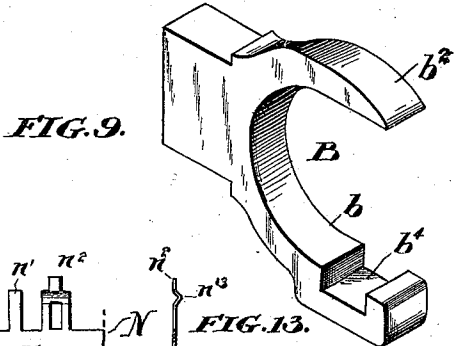
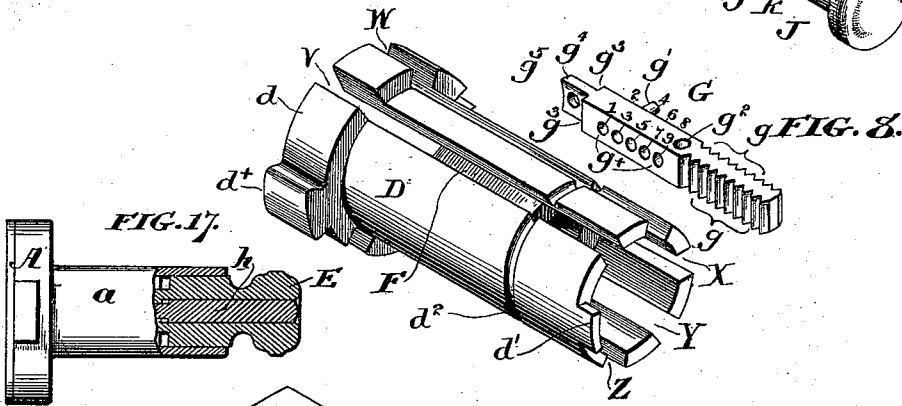
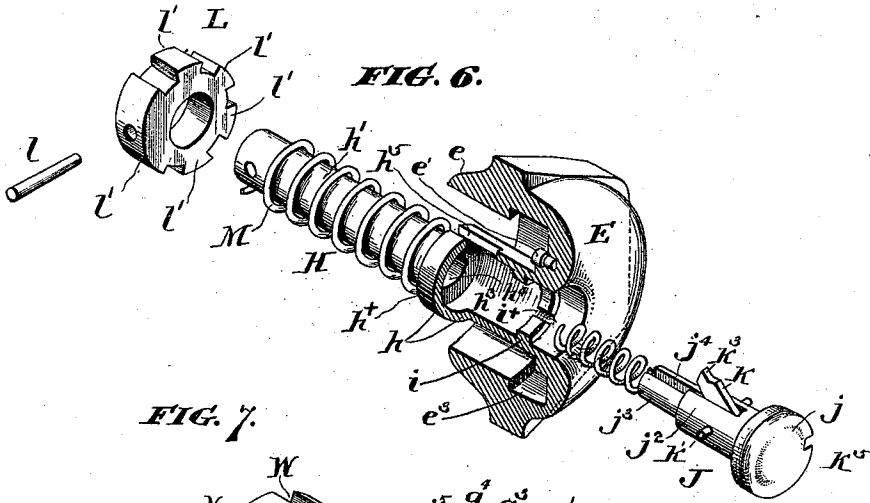
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UNITED STATES PATENT OFFICE.

OBERLIN SMITH, OF BRIDGETON, NEW JERSEY.

COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 494,605, dated April 4, 1893.

Application filed October 4, 1890. Serial No. 367,122. (No model.)

To all whom it may concern:

Be it known that I, OBERLIN SMITH, a citizen of the United States, residing at Bridgeton, in the county of Cumberland and State of New Jersey, have invented certain new and useful Improvements in Combination-Locks, of which the following is a specification.

My invention relates to the class of locks in which the shooting of the bolt is occasioned through the manipulation of a permanent actuating stem or spindle operating upon it through intermediate mechanism which is adapted to be set at will to any one of a variety of adjustments or combinations of which each yields only to a corresponding distinct manipulation of said stem.

Heretofore locks of the foregoing character have been constructed and arranged in such manner that in operating them and following a particular combination to either secure or release the bolt, a knob or head upon the handle or stem has been rotated in one direction or the other to bring a given point upon the periphery of said handle successively into registry with various symbols of a series of symbols, such as figures, marked upon the face of the lock or its surroundings. Incident to this arrangement has been the difficulty experienced in operating the lock when the light is imperfect, and the impossibility of operating it in darkness.

It is the object of my invention to provide a combination lock the operation of which is guided by the sense of touch rather than that of sight; a further object is the provision of a lock which independently of the foregoing characteristic, is simple in construction, direct in operation, capable of a large range of possible combinations, and of such construction that "picking" it is practically impossible; and a further object is the provision of a lock the parts of which may be so set that its permutation-forming instrumentalities are not called into play, with the result that the knob through which the lock is ordinarily manipulated, serves as the ordinary knob or handle by the rotation of which the bolt may be shot in one or the other direction at will.

In the drawings I show and herein I describe a preferred form of a convenient embodiment of my invention, the particular sub-

ject-matter claimed as novel being hereinafter definitely specified.

In the drawings, Figure 1 is a perspective view of a lock embodying my invention. Fig. 2 is a vertical central longitudinal sectional elevation of the same, the plunger however not being in section. Fig. 3 is an elevational view of the end of the lock which I term the inner end, the cap being supposed removed. Fig. 4 is a view in perspective of what I term the outer end of the casing. Fig. 4^a is a view in perspective of a portion of the casing. Fig. 5 is a view in perspective of a tumbler spring. Fig. 6 is a view in perspective of the knob, spindle, follower, follower spring, plunger, and plunger spring, the parts being separated from each other but grouped in a manner from which may be understood their relationship when assembled,—the knob, however, being shown in section to exhibit its interior. Fig. 7 is a view in perspective of the barrel. Fig. 8 is a view in perspective of a tumbler. Fig. 9 is a view in perspective of the bolt. Fig. 10 is a central, vertical, longitudinal, sectional elevation of the plunger. Fig. 11 is a side elevational view of a lock provided with a modified form of casing and knob. Fig. 12 is a side elevational view, and Fig. 13 an end elevational view of a portion of a tumbler spring. Figs. 14, 15, and 16, are respectively a side, an edge, and an end, view of a spring-actuated latch bolt. Fig. 17 is a view in side elevation, partly in section, of a modified form of lock embodying my invention.

Similar letters and figures of reference indicate corresponding parts.

In the drawings, A is the casing, designed to conveniently contain and support the various elements composing the embodiment of my invention shown in the drawings, and consisting of a cylindrical chamber or body, *a*, the inner end of which is enlarged or expanded laterally to form a bolt chamber *a'*, to the open end of which is fitted a cap *a'*.

In practice the lock is, as to its bolt chamber, set in to the material of the door or other closure in connection with which it is employed. The bolt itself, B, may, as to its outer end, be either square or blunt as shown in Fig. 9, or wedge shaped as shown in Figs. 14 and 15, and is pressed constantly outward by

a spring b . The inner end of the bolt is preferably provided with two arms $b^2 b^3$ arranged with their concavities facing each other, and the inner face of the arm b^3 , embodies a squared recess b^4 . Between said arms exists the head d of a barrel D, the cylindrical body of which extends through and snugly fits the bore of the chamber a . The head d is of greater diameter than the bore of the chamber a , whereby it serves as a stop to hold the barrel in proper longitudinal position with reference to said chamber, and said head is conveniently provided with a boss d^x , which plays in the recess b^4 , so as in the rotation of the barrel, to occasion the throw of the bolt. The outer end of the barrel which is conveniently flush with that of the wall of the chamber a , is provided with a small stud or projection d' .

E is a knob applied to the chamber a , embodying a head or outer end which covers the end of said chamber, and an inwardly extending lip or flange e which embraces a portion of the exterior of said chamber. The inner face or bottom of the knob is provided with a lug e' , located some distance from its axial center, so as to be beneath, and in the rotation of the knob, follow the circular contour of the wall of the barrel. In such rotation said lug e' encounters the stud d' of the barrel, and carries said barrel with it, whereby the bolt is in turn, by reason of the engagement of the lug d^x in the slot b^4 , thrown in one or the other direction, according to the direction of such rotation.

The device so far described is, as will be understood, adapted for use as an ordinary door latch or fastening, the bolt of which is thrown by the simple rotation of the knob, and is so used when the combination-forming instrumentalities constituting a part of the complete lock are out of action, that is to say when the tumblers, whereof hereinafter, are all so set that their pins take into the tumbler way, or said pins are all removed from the pin seats and set in the apertures g^2 of the respective tumblers.

In closing a door in connection with which the lock is employed, when a bolt of the character shown in Figs. 14, 15 and 16, is used, no rotation of the knob is necessary to shoot said bolt, it being of the self-acting variety,—and this is true whether the combination forming instrumentalities are or are not to be operated.

The combination forming instrumentalities referred to, and which I will now describe, are in the particular embodiment of my invention herein set forth, arranged within such small compass as to exist within the interior of the knob and casing, while the devices which are manually operated to secure and release the bolt, form part of the exterior contour of the handle, so that the whole presents a simple, compact, and neat appearance.

The interior of the chamber a is, near its outer end, formed with a broad annular

spring-groove or recess a^2 ,—with a series (five being the number shown in the drawings) of straight parallel tubular grooves, designated respectively V' W' X' Y' and Z', extending from its inner end to the recess a^2 ,—and with a narrow circumscribing or annular groove, which I term a tumbler way, a^3 , at a point about midway between the groove a^2 and the inner end of the casing.

The barrel D is of a general cylindrical shape, and embodies a series of parallel slots, corresponding in number and distribution to the straight grooves in the wall of the casing a . These slots, which are respectively designated V, W, X, Y, and Z, extend from end to end of the barrel, open at its outer end entirely through its wall, and at its inner end entirely through both its head and wall, but the wall of said barrel being at its longitudinal center somewhat thicker than at its ends, said slots are not deep enough to cut clear through the metal at that point, but leave an internal band F formed of the metal of the barrel, by which the parts separated by the slots are held in their normal relationship. The bore of the band F is slightly contracted at its outer end for a purpose hereinafter explained.

G is a tumbler, shown particularly in Fig. 8, and consisting of a bar of metal, of general quadrangular cross section, two of the opposite faces of which at or near one end embody each a series of notches, g ,—and at or near the other end embody each a series of pin seats g^x , five of said pin seats designated respectively, 1, 3, 5, 7, 9, constituting one series, and four of said pin seats designated respectively 2, 4, 6, and 8, constituting the other series. The number of recesses or teeth formed in a side of the tumbler equals the aggregate of pin seats in both its sides; thus there being nine pin seats altogether, there will be nine notches or recesses in each of the series of recesses. Incidentally the pin seats are each of a depth slightly greater than half the thickness of the tumbler, and those on one side alternate with, or are staggered with respect to, those on the other side, the result being that each pin seat is at its base in angular communication with the adjacent pin seat or seats on the opposite side of the tumbler.

g' is a tumbler pin, the same being a small straight bar, adapted to be set into and retained by the tightness of its fit within any one of the seats g^x , it being in Fig. 8 shown as being set in seat No. 4. The seats on opposite sides are arranged to open into each other as described so that when the pin g' is in place in any one of them, and it is desired to remove it, such removal can be conveniently accomplished by inserting any small implement in the nearest opposite seat and against the lower end of the pin.

g^2 is an orifice extending transversely through the tumbler, and designed to receive and contain the entire pin when it is desired to place the tumbler out of service. The in-

ner end of the tumbler is cut away to form oppositely facing shoulders g^3 and the tongue of metal, g^4 , remaining embodies an aperture g^5 . The aperture g^5 is provided so that when it is desired to remove a tumbler from its seat between the barrel and casing, said tumbler can be readily withdrawn longitudinally by means of a hook or similar implement which may be engaged in said aperture.

The tumblers,—of which five are provided, are placed each within one of the barrel slots, are of such diameter as to snugly fit therein and be flush with the surface of the barrel,—and are of approximately two-thirds the length of said barrel. To insert the tumblers into place, the barrel, supposed to be in position within the casing, is rotated until its slots are brought into registry with the straight tumbler grooves of the same, and said tumblers are inserted at the inner end of the casing, with notch-provided ends foremost, one into each of said slots, each tumbler when inserted being turned so that its pin presents radially away from the barrel, so that said pin may take into the straight tumbler groove in registry with the slot. It will be understood that when the tumblers are in position within the respective slots they become in effect parts of the barrel, and incapable of independent lateral movement,—and the tumbler pins being engaged in the tumbler grooves of the casing, by such engagement firmly hold the tumble-equipped barrel against rotation. When the parts are in this arrangement therefore, it will be understood that a bolt with which the barrel is, as described, engaged is firmly held in the position it may occupy, and when in its outwardly projected or shot position, the door upon which the device is mounted will be effectually secured. While the tumblers and the barrel are described ordinarily held against lateral movement, they become free for such movement when all the pins are even with or in the plane of the tumbler way, said tumbler way serving as an outlet so to speak from the tumbler grooves. When therefore the tumblers are all brought to a position in which their pins are abreast of or even with the tumbler way, said barrel may be rotated, the tumbler pins traveling in the common tumbler way, and the lock bolt engaged with said barrel, may be shot as desired.

I now proceed to describe the mechanism by the operation of which the tumblers, in place within the barrel slots, and having their pins set in variously numbered apertures, (the predetermined sequence of the occupied pin seats of the successive tumblers forming the combination to which the lock is set) may all be brought into the position in which their pins are focused upon or even with the tumbler way, whereby the barrel is made free for rotation, and the bolt becomes capable of movement.

H is what I term the knob spindle, the same being a bar conveniently formed inte-

gral with the knob, and extending from the center of said knob, inwardly for a distance equal to that of the barrel. The basal portion h of said spindle is diametrically larger than its extremital portion or shank proper, h' , said basal portion terminating in or being provided with a squared shoulder h^x . The basal portion is hollow, its bore opening through the exterior of the knob, and the plunger socket h^3 , as I term it, so formed, extends if desired a short distance into the body of the shank of the spindle, to form a spring recess h^4 .

h^5 is an opening through the side of the basal portion h . The interior of the plunger socket is preferably provided with an annular rib i embodying two notches or recesses i^x on opposite sides thereof.

J is what I term a plunger, the same consisting of a head j of size to snugly fit the mouth of the plunger socket,—and of a body j^2 which exists within said plunger socket.

j^3 is a boss on the inner end of the body j^2 , which fits within the spring recess h^4 , and bears against a light spiral spring termed the plunger spring situated therein. This boss incidentally serves as a guide to the reciprocation of the plunger, and as a convenient bearing for the spiral spring, against which it is preferred that any inward thrust of the plunger should take place. The body j^2 of the plunger embodies a recess j^4 , in which is mounted a trigger K, mounted for oscillation upon a pivot K' passing through the plunger and projecting from it at each side.

K^2 is the trigger spring which so influences the trigger as to cause it to constantly present its point K^3 outside the body of said plunger, said spring being conveniently mounted in a spring recess K^4 in the head of the plunger and bearing against a seat formed for it in said trigger. When the plunger is introduced within the plunger socket the projecting ends of the pivot K' register with and pass through the recesses i^x in the rib i , and upon slight rotation of said plunger engage against the inner side of the rib and prevent withdrawal of the plunger. The head of said plunger embodies a notch K^5 in which a small tool may be inserted to effect such rotation. After the plunger is in place within the socket it is to be rotated until the trigger comes opposite to and thereupon projects through the opening h^5 . The exterior of the plunger socket fits the interior of the outer end of the barrel, its shoulder h^x rests against the outer edge of the band F, and the shank or spindle h' snugly fits within the contracted lower end of said band. The inner end of the shank is equipped with a follower L. Said follower consists of a ring, seated upon said shank and conveniently retained in place thereon by a pin or holder l , passing through both ring and shank. The periphery of the ring embodies a series of projections l' corresponding in number, breadth, and distribution with the slots of the barrel. The greatest diameter of the follower

is such that it snugly fits within the bore of the barrel.

M is a spiral spindle spring which encircles the shank h' , and bears as to one end against the follower, and as to the other against the interior of the contracted end of the band F. Within the outer end of the barrel D is arranged, in connection with each tumbler employed, a yielding catch of any suitable, but preferably of the following, construction:

N, Fig. 12, is a band of sheet metal such as spring steel, consisting of a strip n from one side of which projects a series of tongues, the whole being bent up to form a ring. Five of the tongues, namely, those designated n' , are simply straight tongues of metal, perpendicular to the plane of the ring, while the other five, which alternate with the five first mentioned, are as to their intermediate portions bent toward the center as at n^3 , Fig. 13, to form the spring catches, and are lettered n^2 . The tongues n^2 are preferably somewhat broader than those lettered n' , and have a portion of their metal cut away to give them greater resilience. The distribution of the tongues n^2 corresponds with that of the straight grooves of the casing. The ring so formed is placed within the broad recess or groove a^2 formed as described in the interior of the outer end of the barrel, in such manner that its band is outermost, and the free ends of its tongues innermost. In Fig. 5 the ring N is shown with the working tongues n^2 only, the body being a solid band, which serves instead of tongues n to guide it. The inner face of the lip e of the knob embodies at or near its base an annular groove e^3 and also embodies a straight groove e^4 extending from said groove e^3 to the edge of the lip, while the exterior of the chamber a is provided with a stud a^4 adapted to take into said grooves e^3 and e^4 .

Assuming the parts of the lock separated from each other, their assembling will be effected as follows: The barrel is placed within the casing, and rotated until its slots are in registry with the tumbler grooves of said barrel. The plunger with its trigger, trigger spring, and plunger spring, is placed within the plunger socket in the manner described. The spindle is then entered within the outer end of the barrel and pushed inward (the stud a^4 on the exterior of the casing a , in such inward movements traveling up the straight groove e^4 of the lip of the knob) until the shoulder h^x rests against the band F and the stud a^4 enters the groove e^3 . A tumbler with its pin set, for example, in its aperture No. 5 is placed within the slot V of the barrel; a second tumbler with its pin set, for example, in its aperture No. 4 is placed within the slot W of the barrel; a third tumbler with its pin set, for example, in its aperture No. 3 is placed within the slot X of the barrel; a fourth tumbler with its pin set, for example, in its aperture No. 2 is placed within the slot Y of the barrel; and a fifth tumbler with its pin set, for

example, in its aperture No. 1 is placed within the slot Z of the barrel. Each of the tumblers is pushed inward until its advance end touches a shoulder a^5 surrounding the lower end of the spindle, in which position its outermost notch on one side is opposite to and engaged with a tongue n^2 of the tumbler spring catch, its outermost notch on the other side at the same level abreast of the point of the trigger when the latter is in its normal position, and its pin seat No. 1 a distance below the tumbler way equal to the distance from one notch g to another. All of the tumbler pins now exist in their appropriate casing grooves at a distance from the tumbler way, and each at a different distance therefrom. The spring M is next placed in position over the spindle, and the follower placed and secured in position upon the end of said spindle. The bolt is then laid in place within the bolt chamber with its arms surrounding the head of the barrel, and the cap is screwed on said bolt chamber. It will now be understood in this position of the parts that while the knob, its contained plunger, its spindle and follower, may be rotated in either direction until its lug e' encounters the stud d' at the outer end of the barrel, such rotation will be idle, that it cannot pass or move said stud, for the reason that the barrel of which said stud forms a part is locked by means of the tumbler and tumbler pins into fixed engagement with the casing a , and therefore that as said barrel cannot be moved the bolt which it controls cannot be moved. In order therefore to unlock said barrel from the casing and permit its rotation to shoot the bolt, the operation is as follows: The knob is rotated to the left until the lug e' encounters the stop d' as stated, in which position the point of the trigger is just beyond the slot V of the barrel. Turning the knob then slightly to the right, said trigger will be brought into registry with said slot and the recessed face of the lower end of the tumbler existing therein, and the point of said trigger will engage with the notch No. 1 of said serrations. An impulse or pressure on the plunger will force it inward, and by the engagement of the trigger with the tumbler will force said tumbler inward past the spring tongue n^2 . The inward movement of the plunger is limited by contact of the head of the latter with the rib i to only slightly exceed the distance from one notch g to another. When released the plunger will under the actuation of its spring fly outward until its pivot K' strikes the rib i ,—and its trigger, held against the face of the tumbler by its spring K^2 will thereupon engage in the second notch of said tumbler, said tumbler having been retained in the position in which it was placed by the first impulse of the plunger, by the action of the spring tongue n^2 . As the pin of the tumbler under consideration was supposed set in its seat No. 5, this operation repeated four more times will carry said tumbler up until said pin is level with

and entered in the tumbler way. The knob is thereupon rotated until the trigger is opposite the tumbler in the second slot W, which tumbler as its pin occupies seat No. 4, will require four impulses of the plunger to carry it to the point at which its pin enters the tumbler way, and so on. The pin of the last tumbler, in slot Z, occupied seat No. 1, and therefore but one impulse of the plunger will be required to carry said pin to the tumbler way. When all of the tumblers have been thus acted upon, the knob is rotated to the right until its lug e' again encounters the stud, d' , and it will in its continued rotation carry said stud, the barrel of which it is a part, and the tumblers, around with it, effecting the desired shooting of the bolt. In such rotation the in-turned portions of the springs n^2 take into the groove d^3 in the exterior face of the barrel. When the tumblers are all thus set so that their respective pins ride in the tumbler way, they may be permitted to remain in such set, and the device be used as an ordinary knob and latch, rotated in one or the other direction as desired, without setting the combination. To again, however, set the combination and secure the bolt, the knob is rotated to the left carrying the barrel with it, until the lug d^x of the head of the barrel encounters a small stud or stop e^2 in the bolt chamber, (which stop e^2 is provided to limit the movement of the lug d^x , and permit it to be thrown only far enough to shoot the bolt forward) in which position the device is so timed or arranged that the projections of the follower are each in registry with one of the slots of the barrel, the stud a^4 on the exterior of the barrel in line with the straight slot e^4 in the interior of the lip of the knob, and the tumbler pins in the tumbler way each in line with a straight tumbler groove. The knob is then drawn outward, riding by means of its straight slot e^4 past the stud a^4 and drawing its spindle and the follower outward through the barrel. Each projection of the follower in such movement comes against a shoulder g^3 of the tumbler within the slot with which it is in registry, and draws said tumbler outward, the tumbler pins riding through the straight tumbler grooves of the casing, until said follower makes contact with the end of the band F, and this movement leaves the tumblers in the positions which they occupied when first inserted, as described, and the pins in the same "scattered" position described. Upon the release of the knob it is by the spring M sprung forward again into position. The knob is preferably exteriorly shaped in such manner as to furnish a tangible guide by which in its rotation the trigger may be carried into registry with the successive tumblers, and the lock therefore operated through or under the guidance of the sense of touch alone. To this end I make it at the place of its greatest circumference of a polygonal contour so that when

five tumblers are as in the present instance employed six facets and six angles are formed. These angles are so set with reference to the lock elements that when one of said angles is over, and in the same vertical plane as, the center of the knob, the trigger will be in registry with a tumbler. When the knob is rotated to the left until the lug on the head of the barrel encounters the stop e^2 as described (in which position the trigger is carried slightly past the first tumbler), and is then rotated to the right and the first angle comes uppermost, the arrangement or timing is such that the registry of said first angle over the axial center of the knob, will indicate that the trigger is in engagement with the first tumbler V,—after said tumbler is by the plunger operated to set its pin within the tumbler way, further rotation of the knob to the right will bring the second angle uppermost and the trigger in engagement with the second tumbler W, and so on. The breadth of the tumblers being considerably in excess of that of the trigger, considerable latitude in the stopping of the knob in the position described is permitted, the differences in breadth mentioned allowing a variation of several degrees in the position of the knob, thus suiting the operation to a condition of darkness.

It will be understood that the pin seats are arranged in the alternated disposition described in order that as large a series of numbers as possible may be comprised within the limited space available,—and that said tumblers are reversible, the recesses being correspondent, and being similarly operated upon by the spring tongues, no matter which side is outermost. It will also be understood that a very large number of combinations may be formed from the five series of nine numbers each, and also that the number and size of the series may be varied.

If it be desired to have a combination formed from less than the whole number of series, it may be done by removing the pin of the tumbler which it is desired to throw out of service, and inserting it bodily within the aperture g^2 whereupon the said tumbler becomes idle. In such condition of the lock, however, care must be taken, in the rotation of the knob in the opening of the combination, to carry the trigger past said idle tumbler, and only to engage it with the tumblers in service. In practice therefore, while the removal from service of one or more of the tumblers expedites the operation of the lock, the very fact that certain of the tumblers must be passed being necessarily remembered, said idle tumblers will still play a part in the entire combination. When such a combination is formed, as for instance when the third tumbler is the one out of service, it is expressed in writing by a cipher.

To alter the combination to which the lock may be set, as many tumbler pins as it is de-

sired to change are removed from the tumbler slots, and their pins changed from one pin seat to another.

In Fig. 11 is illustrated a construction in which the outer end of the casing *a* is partially inclosed by the turning in of the end metal of its wall, and the knob exists beyond the end of said casing, and does not inclose it. The contained parts of the lock are substantially similar to the parts already described in detail in connection with the other figures of the drawings, and only modified in so far as is necessary to permit the use of this form of casing. The object of this construction is to render the device especially burglar proof, because, as is obvious, if the lock were attacked, the knob would be easily broken off, but would leave the tumblers which control the bolt completely protected by the in-turned lip of the casing.

In Fig. 17 is shown a modified construction wherein the casing *a* is made of greater length than usual, as is also the basal portion of the spindle, by means of which room is provided for the end movement of the knob, without the necessity of the knob's being as large as in the other construction wherein it must entirely surround the casing *a*. This construction is desirable for safes where the door is thick and in which the casing *a* should be relatively large and strong.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a lock, in combination with a bolt, mechanism which controls the bolt and may be arranged to secure it in a given set, which mechanism is adapted to be brought, by a sequence of impulses, into position to allow movement of the bolt,—a rotatable knob, and a device carried by said knob and adapted to be manually reciprocated to occasion said impulses, substantially as set forth.

2. In a lock, in combination with a bolt, a rotatable knob embodying structural divisions such as flat sides which serve as manual indicators in the rotation of said knob, a movable device such as a plunger, capable of reciprocatory movement, and permutation mechanism which controls the bolt and is adapted to be manipulated to release the bolt by alternate reciprocatory movements of the plunger and rotative movements of the knob, substantially as set forth.

3. In a combination lock, in combination, a series of projection-equipped tumblers, a grooved or slotted device adapted to receive said tumblers, a device embodying grooves in parallelism with the tumblers and adapted to receive the projections of the latter, which parallel grooves are connected by a tumbler way, a locking device such as a bolt, connected or engaged with one of devices mentioned, a movable device such as a plunger equipped with a tumbler engaging device such as a trigger, the arrangement being such that by rotation of certain of the parts the trigger reg-

isters successively with the respective tumblers, whereby the latter may be operated to bring their projections within the tumbler way, substantially as set forth.

4. In a combination lock, in combination, a series of projection equipped tumblers, a grooved or slotted device adapted to receive said tumblers, a device embodying grooves in parallelism with the tumblers and adapted to receive the projections of the latter, which parallel grooves are connected by a tumbler way, a locking device such as a bolt, connected or engaged with one of the devices mentioned, a movable device such as a plunger equipped with a tumbler engaging device such as a trigger, the arrangement being such that by rotation of certain of the parts the trigger registers successively with the respective tumblers,—and means for scattering or distributing said tumblers, substantially as set forth.

5. In a combination lock, in combination, a bolt, a rotatable body engaged or connected with said bolt, a casing surrounding said rotatable body, a series of tumblers, provided with adjustable projections, interposed between said body and said casing, by the longitudinal adjustment of which tumblers the body may be at will locked to the casing or permitted to rotate with reference thereto, and means for adjusting said tumblers, substantially as set forth.

6. In a combination lock, in combination, a bolt, a rotatable body engaged or connected with said bolt, a casing encircling said rotatable body, said body and casing embodying grooves, a series of tumblers interposed between said body and said casing and existing in the grooves thereof, by the longitudinal adjustment of which tumblers the body may be at will locked to the casing or permitted to rotate with reference thereto, and a trigger, or kindred contrivance, adapted to engage with and longitudinally move said tumblers, supported free for reciprocation, and means for bringing the trigger into registry with the successive tumblers, substantially as set forth.

7. In a combination lock, in combination, a bolt, a rotatable body engaged or connected with said bolt, a casing encircling said rotatable body, said casing and body embodying grooves, a series of notched tumblers interposed between said body and said casing and existing in the grooves thereof by the longitudinal adjustment of which tumblers said body may be at will locked or released, a knob seated upon said casing, and adapted for rotation thereon, and a reciprocating trigger mounted in or on said knob, and adapted to be carried by the rotation of the knob successively into contact with the respective tumblers, substantially as set forth.

8. In a combination lock, in combination, a bolt, a rotatable body engaged or connected with said bolt, a casing encircling said rotatable body, said casing and body embodying grooves, a series of notched tumblers inter-

posed between said body and said casing and existing in the grooves thereof, by the longitudinal adjustment of which tumblers said body may be at will locked or released, a knob seated upon said casing and adapted for rotation thereon, a trigger adapted for reciprocation mounted in or on said knob and adapted to be carried by the rotation of the knob successively into contact with the respective tumblers to occasion their movement in one direction, and a follower by which is occasioned their movement in the opposite direction, substantially as set forth.

9. In a combination lock, in combination, a bolt, a rotatable body engaged or connected with said bolt, a casing encircling said rotatable body, said casing and body embodying grooves, a series of notched tumblers interposed between said body and said casing and existing in the grooves thereof, by the longitudinal adjustment of which tumblers said body may be at will locked or released, a knob seated upon said casing and adapted for rotation thereon, and also adapted when in a given position for longitudinal movement thereon, a trigger adapted for reciprocation mounted in or on said knob and adapted to be carried by the rotation of the knob successively into contact with the respective tumblers to occasion their movement in one direction, and a follower adapted to make contact with the tumblers, mounted upon a spindle projecting from the knob, substantially as set forth.

10. In a combination lock, in combination, a bolt, a body and an encircling casing, one of which is connected with the bolt, and adapted for rotation with reference to the other, corresponding longitudinal grooves in said casing and body, a series of tumblers existing between said casing and body, each tumbler existing in a groove in one of said devices and having a projecting pin engaged with the corresponding grooves of the other, said grooves in which the projecting pins are engaged being connected by a tumbler way, and means for longitudinally moving said tumblers, as specified.

11. In a combination lock, in combination, a bolt, a body and an encircling casing, one of which is connected with the bolt, and adapted for rotation with reference to the other, corresponding longitudinal grooves in said casing and body, a series of tumblers each embodying a series of pin seats in one of which is seated a pin existing between said casing and body, each tumbler existing in a groove in one of said devices while its pin is engaged in the corresponding groove of the other, said grooves in which the projecting pins are engaged being connected by a tumbler way, and means for longitudinally moving said tumblers, as specified.

12. In a combination lock, in combination, a bolt, a body and an encircling casing, one of which is connected with the bolt, and adapted for rotation with reference to the

other, corresponding longitudinal grooves in said casing and body, a series of tumblers each embodying a series of pin seats in one of which is seated a pin existing between said casing and body, each tumbler existing in a groove in one of said devices while its pin is engaged in the corresponding groove of the other, said grooves in which the projecting pins are engaged being connected by a tumbler way, a rotatable knob mounted on said casing equipped with a reciprocating trigger, which in the rotation of said knob is successively presented against the notched tumbler, substantially as set forth.

13. In a combination lock, in combination, a bolt, a body and an encircling casing, one of which is connected with the bolt and adapted for rotation with reference to the other, corresponding longitudinal grooves in said casing and body, a series of tumblers each embodying a series of pin seats in one of which is seated a pin existing between said casing and body, each tumbler existing in a groove in one of said devices while its pin is engaged in the corresponding groove of the other, said grooves in which the projecting pins are engaged being connected by a tumbler way, a rotatable knob mounted on said casing equipped with a reciprocating trigger, which in the rotation of said knob is successively presented against the notched tumblers, and a follower connected with the knob and adapted to scatter the tumblers, as specified.

14. In combination with a casing consisting of a cylindrical chamber the interior of which embodies a series of straight tumbler grooves connected by a transverse tumbler way and a bolt chamber, a barrel embodying a series of longitudinal slots and provided with a head which exists in said bolt chamber and is equipped with a bolt engaging device, a bolt existing in said bolt chamber, a series of tumblers each provided with a movable pin and placed one in each of the barrel slots, so that their pins engage in the tumbler grooves in the casing, and means for occasioning the longitudinal movement of said tumblers, substantially as set forth.

15. In combination with a casing consisting of a cylindrical chamber the interior of which embodies a series of straight tumbler grooves connected by a transverse tumbler way, and a bolt chamber, a barrel embodying a series of longitudinal slots and provided with a head which exists in said bolt chamber and is equipped with a bolt engaging device, a bolt existing in said bolt chamber, a series of tumblers each provided with a movable pin and placed one in each of the barrel slots, so that their pins engage in the tumbler grooves in the casing, a knob mounted for rotation on the outer end of said casing, and a reciprocating trigger carried by said knob, substantially as set forth.

16. In combination with a casing consisting of a cylindrical chamber the interior of which embodies a series of straight tumbler grooves

connected by a transverse tumbler way, and a bolt chamber, a barrel embodying a series of longitudinal slots and provided with a head which exists in said bolt chamber and is equipped with a bolt engaging device, a bolt existing in said bolt chamber, a series of tumblers each provided with a movable pin and placed one in each of the barrel slots, so that their pins engage in the tumbler grooves in the casing, a knob mounted for rotation on the outer end of said casing, a spindle connected with the knob and projecting through the interior of the barrel, a follower mounted on said spindle, and provided with tumbler engaging projections, and a reciprocating trigger, substantially as set forth.

17. In combination with a casing consisting of a cylindrical chamber the interior of which embodies a series of straight tumbler grooves connected by a transverse tumbler way, and a bolt chamber, a barrel embodying a series of longitudinal slots and provided with a head which exists in said bolt chamber and is equipped with a bolt engaging device, a bolt existing in said bolt chamber, a series of tumblers each provided with a movable pin and placed one in each of the barrel slots, so that their pins engage in the tumbler grooves in the casing, a knob mounted for rotation on the outer end of said casing, a spindle connected with the knob and projecting through the interior of the barrel, a follower mounted on said spindle, and provided with tumbler engaging projections, a reciprocating trigger adapted to engage successively with the notched triggers, spring tongues engaged with said notched triggers, and a spring existing between the follower and the barrel, substantially as set forth.

18. In combination, the casing consisting of a cylindrical chamber and a bolt chamber, the bolt, means for controlling said bolt, a knob mounted on the cylindrical chamber or casing, said casing being provided with an external stud, and said knob embodying in its interior a straight groove leading to an annular groove, in which said stud engages, substantially as set forth.

19. In combination the casing, the barrel, the bolt with which said barrel is engaged, the lug or stud on the outer end of the barrel, the knob mounted for rotation on said casing, and provided with a lug adapted to encounter the lug of the barrel, substantially as set forth.

20. In combination, the casing consisting of the cylindrical chamber and the bolt chamber, the barrel mounted in said cylindrical casing and provided with a head which is in place within the bolt chamber, a lug projecting from the barrel head, a bolt the rear portion of which is engaged about the head of the barrel, and embodies a recess in which the barrel stud is engaged, and means for rotating said barrel, substantially as set forth.

21. In combination, the casing, the bolt, the barrel, the notched tumblers, the rotatable

knob and spindle, embodying the plunger socket, and an opening through the walls thereof, a plunger consisting of a body existing in said socket, in which body is pivotally mounted a trigger the point of which normally projects out through the wall opening of the socket, substantially as set forth.

22. In combination, the casing, the bolt, the barrel, the notched tumblers, the rotatable knob and spindle, embodying the plunger socket, and an opening through the wall thereof, a plunger consisting of a body existing in said socket, the outer end of which forms part of the contour of the knob, and in the body of which is pivotally mounted a trigger, so influenced by a spring as to present its point through the opening in the wall of the socket, a spring in said socket which tends to force the plunger outward, and means to retain the plunger within the socket, substantially as set forth.

23. In combination, the casing, the bolt, the barrel, the notched tumbler, the rotatable knob and spindle, embodying the plunger socket, and an opening through the wall thereof, a plunger consisting of a body existing in said socket, a trigger supported upon a pivot passing through and having ends projecting beyond, the plunger, a spring which occasions the presentation of the trigger out through the opening in the socket wall, a spring within the socket, and an annular rib embodying notches, within said socket, substantially as set forth.

24. In combination the casing, the bolt, the barrel, the pin provided tumblers, the spindle, the follower, the follower spring, the trigger provided plunger, and the knob, substantially as set forth.

25. In combination the casing, the bolt, the barrel, the pin provided tumblers embodying notches, tumbler springs which engage in said notches, and means for occasioning the movement of said tumblers, as set forth.

26. In combination, the casing, the bolt, the barrel, the pin provided notched tumblers, the knob, the trigger provided plunger, and the tumbler springs, substantially as set forth.

27. In combination the casing, the bolt, the barrel, the pin provided tumblers embodying notches, the spindle, the follower, the follower spring, the knob, the trigger provided plunger, and the tumbler spring, substantially as set forth.

28. In a lock of the character described, a tumbler provided with a pin and embodying a series of pin seats, situated some in one and some on the opposite side of the tumbler, those on one side being alternated or staggered with respect to those on the other, substantially as set forth.

29. In a lock of the character described, a tumbler provided with a pin and embodying a series of pin seats, situated some on one and some on the opposite side of the tumbler, those on one side being alternated or staggered with respect to those on the other, all

said seats being of a depth equal to or greater than half the thickness of the tumbler, so that the seats on opposite sides of the tumblers open diagonally into each other, substantially as set forth.

5 30. In a lock of the character described, a tumbler provided with a pin and embodying a series of pin seats, situated some on one and some on the opposite side of the tumbler,
 10 those on one side alternating with or being staggered with respect to those on the other,— and also embodying in each face occupied by pin seats a series of recesses equal to the whole number of pin seats which recesses
 15 cover an area or length equal to that occupied by the series of pin seats, substantially as set forth.

31. In a combination lock, in combination, a bolt, a body and an encircling casing, one
 20 of which is connected with the bolt, and adapted for rotation with reference to the other, corresponding longitudinal grooves in said casing and body, a series of tumblers each embodying a series of pin seats in one
 25 of which is seated a pin existing between said casing and body, each tumbler existing in a groove in one of said devices while its pin is engaged in the corresponding groove of the other, said grooves in which the pro-
 30 jecting pins are engaged being connected by a tumbler way, a rotatable polygonal knob

mounted on said casing equipped with a reciprocating trigger, which in the rotation of said knob is successively presented against the notched trigger, substantially as set forth. 35

32. In a lock of the character described, in combination with the casing, the barrel, the bolt, the tumbler, the spring and the plunger, a polygonal or non-circular rotatable knob, substantially as set forth. 40

33. In a combination lock, in combination, a casing, embodying grooves, a barrel embodying slots, a series of notched tumblers adapted to be placed in said slots, and provided with projections adapted to engage in
 45 said grooves, a plunger provided with a trigger adapted to force said tumblers forward, mounted in order to be carried successively into contact with the tumblers upon a rotatable knob, which knob is made of polygonal
 50 form and arranged so that a given position of its angle indicates the engagement of the trigger with a given tumbler, substantially as set forth.

In testimony that I claim the foregoing as
 55 my invention I have hereunto signed my name this 15th day of September, A. D. 1890.

OBERLIN SMITH.

In presence of—

JAMES I. REEVES,
 ROBERT S. SCHILLER.