F. CLARK.

COMBINATION LOCK.

APPLICATION FILED OCT. 15, 1919.

1,401,044. **Patented Dec. 20, 1921.**

2 SHEETS—SHEET 1.

Fig. 1.

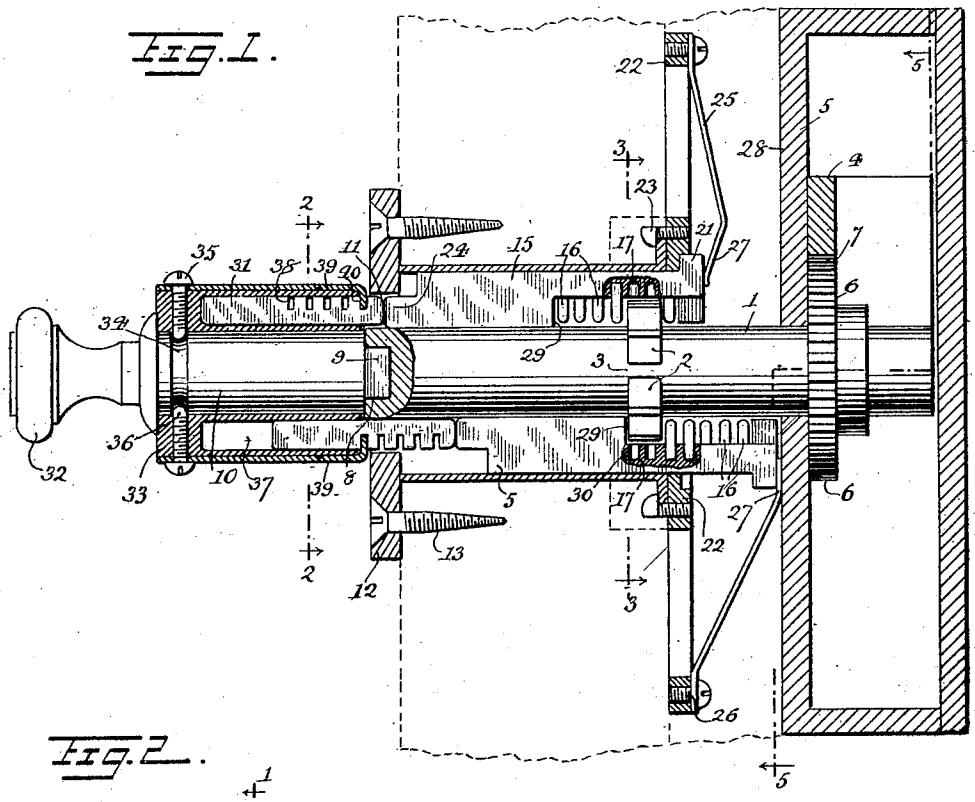


Fig. 2.

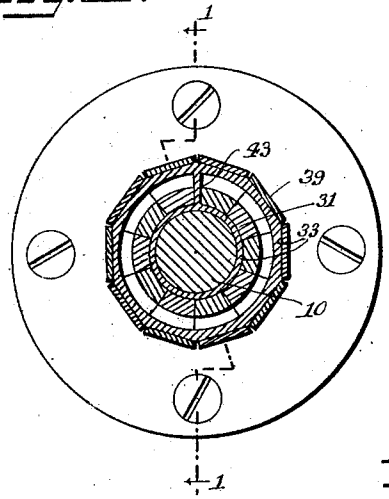


Fig. 3.

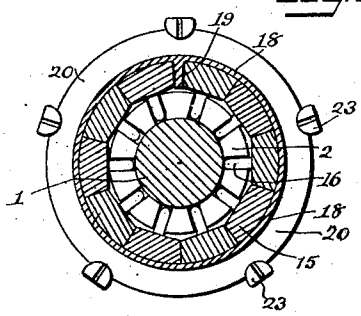
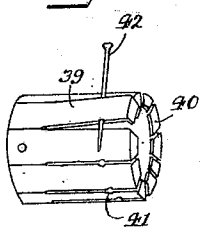


Fig. 4.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 5.

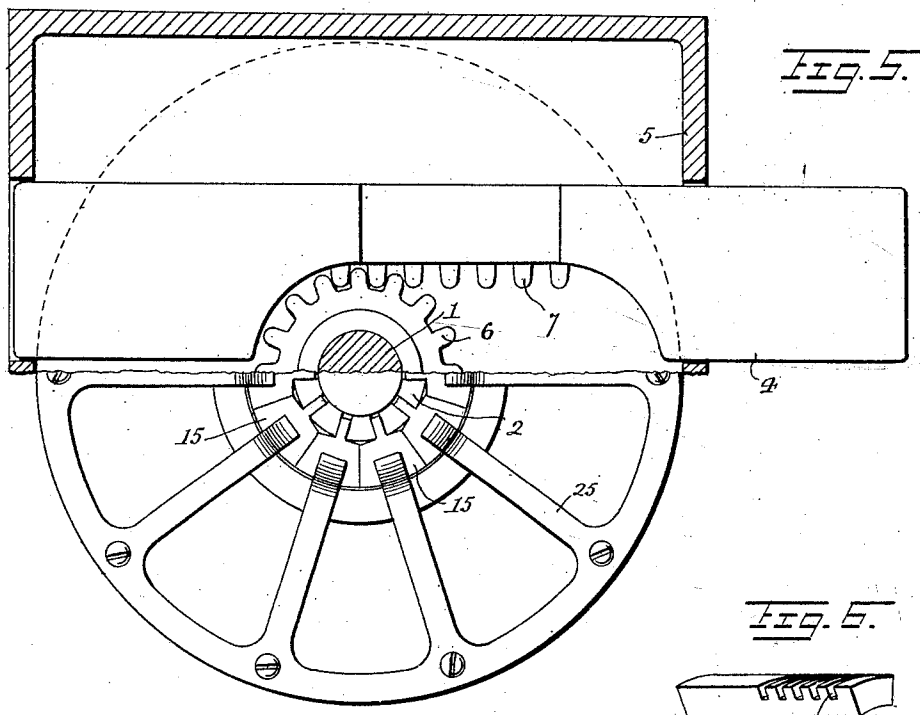


Fig. 6.

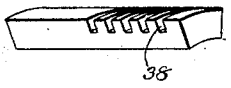


Fig. 7.



Fig 8

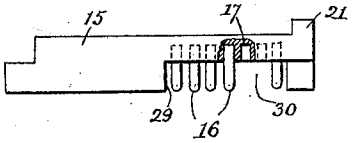


Fig. 9.

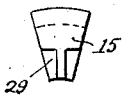


Fig. 10.

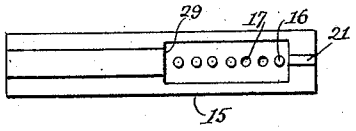
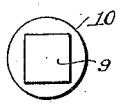


Fig. 11.



WITNESSES

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UNITED STATES PATENT OFFICE.

FRANCISCO CLARK, OF DURANGO CITY, MEXICO.

COMBINATION-LOCK.

1,401,044. Specification of Letters Patent. Patented Dec. 20, 1921.

Application filed October 15, 1919. Serial No. 330,840.

To all whom it may concern:

Be it known that I, FRANCISCO CLARK, a citizen of Mexico, and resident of Durango City, Durango, Mexico, have invented a new and Improved Combination-Lock, of which the following is a full, clear, and exact description.

This invention relates generally to a new and improved combination or permutation lock, and more particularly to a lock of this character having a plurality of tumbler members, actuated by a key to permit a bolt or latch control member to be moved.

One of the objects of this invention is to provide a combination lock of simple and compact construction, in which a plurality of tumbler members adapted to be actuated by a key, are provided with a means of simple construction, which may be readily adjusted to determine the movement of tumblers to permit the movement of a bolt control member.

A further object of this invention is to provide in a combination lock a simple and compact construction which will permit a single key to be used which will properly position the tumbler members of the lock, which will in turn permit the key to turn a bolt control member of the lock.

A further object of this invention is to provide in a combination lock, having tumbler members one end of which is exposed in the key hole, a means which will permit each of the tumbler members to have the same limits of travel, whereby the possibility of a person determining the exact setting or combination of the lock is prevented.

A further object of this invention is to provide in a combination lock having tumbler members, which normally restrain the movement of a bolt control member, a simple and inexpensive means adjustable on the tumblers for determining the necessary movement thereof in order to permit movement of the bolt control or actuating member.

Still another object of this invention is to provide in a combination or permutation lock, a construction which will permit the tumbler members thereof to be directly actuated axially of a bolt control member, by corresponding ward members, of a key and when moved a predetermined distance, will permit the bolt control member rotatably mounted, to be actuated.

Still a further object of this invention is to provide in a combination lock, a key construction having a body core portion, and a means rotatably mounted thereon for receiving longitudinally adjustable ward members.

The above objects are accomplished, in the practical embodiment shown herein, by providing in a combination lock, a bolt or latch, connected by a suitable means to an independent bolt control member rotatably mounted, and a plurality of spring pressed tumbler members movable axially of the control member and normally restraining the said member against rotary movement, a suitable means being provided to hold the said tumblers in proper relative position and against rotary movement, a means being provided for limiting the movement of each of the tumblers in each direction. A means longitudinally adjustable of the tumblers is provided for determining the movement required of the tumblers axially of the bolt control member, in order to afford an annular open path which will permit rotary movement of the bolt control member.

Other objects and advantages will be apparent from the following description and the accompanying drawings, and the invention more particularly pointed out in the appended claims.

Similar characters of reference designate corresponding parts in the several views. In the drawings showing one of the practical embodiments of the invention,

Figure 1 is a longitudinal sectional view partly in elevation, showing a key positioned in the key hole of a lock, embodying this invention, the said view being taken generally on the line 1—1 of Fig. 2.

Fig. 2 is a sectional view looking in the direction of the arrows and taken on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view looking in the direction of the arrows and taken on the line 3—3 of Fig. 1.

Fig. 4 is a perspective view of a part of the key showing a means whereby the wards of the key may be readily adjusted longitudinally.

Fig. 5 is a broken end sectional view partly in elevation, looking in the direction of the arrows and taken on the line 5—5 of Fig. 1.

Fig. 6 is an enlarged perspective view showing one of the ward members of the key.

Fig. 7 is an end view of the tumbler shown in Fig. 8.

Fig. 8 is an elevation view of one of the tumblers of the lock.

Fig. 9 is another end view of Fig. 8 looking to the left.

Fig. 10 is a bottom plan view of Fig. 8.

Fig. 11 is an end view of that portion of the key body which engages the bolt actuating member of the lock.

In the drawings showing one practical embodiment of the invention, a bolt control member 1 rotatably mounted, is preferably cylindrical in form, and is provided with a toothed or notched collar 2 extending circumferentially around the same. Slots 3 are formed by the tooth-like projections 2, the function of which will later appear. A bolt 4 which may be of any suitable form, is mounted in a suitable casing 5 to move transversely of the bolt control member 1. Any suitable means may be provided between the bolt control member and bolt, for effecting movement thereof. In the form shown, for example, a pinion 6 mounted on the bolt control member 1, engages a toothed rack portion 7 of the bolt. It is thus seen that the bolt 4 may be moved by turning the bolt control member 1 in the desired direction. Further, it is to be noted that if the bolt control member 1 is locked or held against movement, the bolt 4 will also be locked or held against movement. In the form shown, a recess 8 is arranged in one end of the bolt control member, and is adapted to receive a correspondingly shaped portion 9 extending from a key body 10, so that when the key is turned, the bolt will be moved by the control member 1. It is to be understood however that any suitable means may be provided between the key and the control member for effecting a turning movement thereof. Preferably, the end 8 of the control member will extend in a key hole 11 formed by the escutcheon plate 12, shown secured by screws 13 to a door 14 shown in dotted outline. It is understood however that the lock may have other applications than to a door.

As a means of normally restraining the said bolt controlling member 1 against rotary movement, tumbler members 15 are arranged about the said control member, and are movable axially thereof, each of said tumbler members being provided with a means adjustable thereon for determining the movement of the tumbler members axially of the control member 1, in order to permit rotary movement of the control member. In the form shown, the said adjustable means comprises a plurality of pins 16 which are seated in openings 17 spaced in the tumblers 15. A tubular casing 18 is provided to incase or fit around the tumbler members 15 arranged about the bolt actuating member 1, the said casing serving to hold the tumblers in proper relative position. A stop or web 19 extends inwardly from the casing 18, between certain of the tumblers, in order to prevent relative rotary movement between the casing 18 and the tumblers 15. One end of the casing extends to the escutcheon plate 12, a shoulder 20 being provided at the other end, which serves as a stop to limit the movement in one direction of all the tumblers held in proper position, it being only necessary in order to disconnect the tube from the plate 22, to turn the screws 23 through half a revolution. The tumbler members and other parts of the lock, are preferably so proportioned that one end 24 of the tumblers will normally be positioned in the key hole 11, the face of the tumblers, the escutcheon plate 12 and the exposed end of the plate or control member 1, preferably being in alinement to form a substantially smooth surface. As a means of normally holding the tumblers 15 in a forward position, the spring fingers 25 are provided, one end 26 of each finger being connected to the plate 22 by a screw or other suitable means, the other end 27 normally engaging a tumbler member, so as to exert a spring pressure on the same at all times. Any suitable arrangement may be provided for effecting a spring pressure upon the tumblers, but preferably the flat bent spring finger is provided, such a construction being particularly adapted for use herein on account of the convenient and compact construction, because the arrangement is such that a spring pressure is afforded throughout the limits of movement of the tumbler. As a means of limiting the movement of each of the tumbler members inward of the lock, the face 28 of the casing 5, is arranged at such distance from the end of the tumbler members when occupying their normal position, as will correspond to the limit of movement desired of the tumblers. When the tumblers 15 are moved axially of the bolt control member 1, the pins, 16 are moved through the slots 3 formed by the projecting tooth portions 2. If desired, instead of having the rearward movement of the tumblers limited by the face 28, the said rearward movement may be limited by the teeth 2, engaging the shoulder 29 of the tumblers. When the tumblers occupy their normal forward position, which position will be assumed when the key is not in the key hole, certain of the adjustable pins 16, as for instance the end pins, will lie within a slot 3 between the projecting tooth portions 2, and will thus prevent rotary movement of the bolt control member 1, and thus prevent movement of the bolt 4. Certain of the pins, on each of the tumblers, preferably two as shown, which will correspond to the width of the tooth portions 2, are

removed, so that when each of the tumblers have been moved such a distance as will bring the opening thus formed in alinement with the toothed portions 2 on the bolt control member 1, an open pathway 30 will be formed, which will permit the tooth portions 2 to pass therethrough, thus permitting relative rotary movement between the tumblers 15, and the bolt control member 1, which movement will in turn permit the bolt 4 to be actuated. It is to be understood that any suitable arrangement and construction of the tumblers and adjustable means for determining the movement thereof, and the bolt control member and projecting tooth portions may be provided, this invention not being limited to the form shown herein. In a lock of this character, in which one end of the tumbler members are exposed in the key hole, it is particularly desirable to have a means which provides for the same limit of movement for each of the tumbler members in order to prevent unauthorized persons from tampering therewith, and to prevent their determining the exact setting of the adjustable means on the tumblers, corresponding to a similar setting of the wards 31 of the key, which represents the combination of the particular lock. If however, it is desirable to change the combination of the lock, it is only necessary to change the position of the pins 16 of the tumblers, and to make the corresponding change in the setting of the wards of the key. Any suitable number of tumblers may be employed in the lock, and any suitable number of adjustable pins may be provided, depending upon the particular number of combinations or separate settings it is desired to have for any given lock. In the form shown, employing 10 tumbler members, and 5 adjustable pins, the mechanism of the lock may be set for over a million combinations.

In the form shown, a key is provided having a key body 9, including a cylindrical core 10, and a handle 32 connected thereto, the construction being such that the ward members 31 are arranged about the core in a position corresponding to that of the tumbler members 15 of the lock, the construction being such that the core 10 of the key may be rotated relative to the wards, and a means being also provided to permit adjustment of the wards 31 longitudinally of the key. The purpose of such an arrangement is to permit the ward members 31 of the key to move the corresponding tumbler members 15 of the lock such a distance as will form an open pathway to permit movement of the bolt control member 1, which movement is effected by turning the handle 32 of the key. It is thus seen that the core 10 of the key and the bolt control member 1 of the lock, may be rotated relative to the wards 31 and tumblers 15 of the key and lock respectively. In the key shown, a cylindrical casing 33 is provided which fits over the core 10 of the key body and is held against longitudinal movement thereon, by a suitable means being provided to prevent movement of the casing 33 longitudinally of the key body, but permitting relative rotary movement between the said core and the casing. For this purpose, a groove 34 extends circumferentially about the core 10, and a screw 35 or other suitable means extends through the casing, the end 36 of the screw extending within the groove or slot 34. An annular opening 37 extends inward from the end of the casing, in which opening the ward members are arranged, so as to permit movement for adjustment longitudinally thereof. Any suitable means may be provided for this purpose, but in the form shown, the wards are provided with spaced slots 38 preferably corresponding in number and arrangement to that of the adjustable pins 16 for the tumblers. As a means of holding the said wards in adjusted position, spring fingers 39 are provided, preferably one for each of the wards, each of the fingers having a bent end portion 40 adapted to fit within the slots 38 of the wards, preferably in such manner as to hold the wards against movement in either direction. In order to readily adjust the setting of the wards, openings 41 are formed between adjacent spring fingers 39 so that the end of a pointed instrument 42, such as a pin, may be inserted within the opening so that the spring finger 39 may be conveniently and readily raised to disengage the bent end portion 40 from the slot 38. The spring fingers 29 may be arranged in any suitable manner about the casing 33, but preferably the outer surface of the casing is flattened, to accommodate the spring fingers, and the said fingers are preferably formed from one piece of material, and held in proper position by the screw 35. As a means of holding the wards 31 in proper relative position to the casing 33, a web portion 43 integral or fixed to the casing extends between certain of the wards. In order to facilitate proper positioning of the members of the key with respect to the corresponding tumbler members of the lock, the web portion 43 of the key may project a certain distance and fit within a recess of the lock corresponding to the position of the web portion 19.

While one practical embodiment of the invention has been shown and described herein, it is understood that various changes and modifications may be made without departing from the spirit and scope of this invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A combination lock comprising a bolt,

an independent bolt control member, a plurality of spring pressed tumblers arranged circumferentially about said control member exteriorly, and means adjustably mounted on the tumblers for controlling the movement of the bolt control member.

2. A combination lock comprising a bolt or latch, another independent member connected therewith for controlling the movement of said bolt, a plurality of tumbler members arranged about the outside of said control member and normally restraining movement of said bolt control member, means arranged to permit relative longitudinal movement of the tumblers and said control member, and means adjustable on said tumblers for determining the movement required of the tumblers in order to permit relative rotary movement between tumblers and said control member.

3. A combination lock comprising a bolt control member rotatably mounted, spring pressed tumbler members arranged thereabout externally, and normally preventing movement of said control member, means restraining said tumblers against rotary movement, a means adjustably arranged upon the tumblers for determining the movement required thereof in order to permit rotary movement of said control members, relative to the tumblers, a bolt, and means connecting the bolt and said bolt control member.

4. A combination lock comprising a bolt control member including a core rotatably mounted, and a series of tooth portions extending therearound externally, means arranged at one end thereof to receive a portion of a key and to be actuated thereby, spring pressed tumbler members movable axially of said control member through the toothed portion thereof, and normally restraining the said control member against rotary movement, means for holding the said tumblers against rotary movement, and means adjustable on each of the tumbler members for determining the movement of said tumblers axially of the control member in order to permit relative rotary movement of said control member.

5. A combination lock comprising a bolt control member including a core rotatably mounted, and a series of tooth portions extending therearound externally, means arranged at one end thereof to receive a portion of a key and to be actuated thereby, spring pressed tumbler members movable axially of said control member through the toothed portion thereof, and normally restraining the said control member against rotary movement, means for holding the said tumblers against rotary movement, means adjustable on each of the tumbler members for determining the movement of said tumblers axially of the control member in order to permit relative rotary movement of said control member, a bolt, and a means connecting the bolt and said bolt control member whereby said bolt may be moved.

6. A combination lock comprising a bolt control member rotatably mounted having a notched collar thereon and a means at one end adapted to engage a portion of a key, spring pressed tumbler members, movable axially of said control member and arranged externally about the same and adapted to engage the notched collar to normally prevent rotary movement of said control member, means limiting the movement of said tumblers in each direction, a means arranged about said tumblers for holding them in proper relative position, and a means including a plurality of independently movable members adjustable on the tumblers to determine the movement required of said tumblers in order to permit relative rotary movement between said tumblers and said control member.

7. A combination lock comprising a bolt control member rotatably mounted, a bolt movable transversely thereof, means connecting said control member and said bolt for effecting movement of said bolt, tumbler members arranged circumferentially about said control member movable axially of said control member, and normally restraining the said control member against rotary movement, means arranged about the tumblers to guide the same and hold them in proper relative position, said means including a tubular member, means including spaced stops, for limiting the movement of the plungers axially of the control member, and means including a plurality of relatively movable pins adjustable on said tumblers for determining the movement of the tumblers axially of the control member, in order to permit relative rotary movement of said control member.

8. A combination lock comprising a bolt control member rotatably mounted having a notched collar extending therearound and having at one end a means arranged to receive a key and to be actuated thereby, a plurality of spring pressed tumblers arranged about said control member and movable axially thereof between the notched portions of the said collar whereby the said control member is normally restrained against rotary movement, a means including a sleeve, embracing the said tumbler members to hold the same in proper relative position, and to prevent rotary movement thereof, means for limiting the movement of said tumblers in each direction axially of the control member, the said means including a plurality of spaced stops, and a projecting portion on each of the tumblers adapted to engage the said spaced stops at the limits of travel, whereby each of the

tumblers have the same limited movement, and a means including a plurality of pins adjustable on the tumbler members for determining the movement of the tumblers axially of the control member in order to permit rotary movement of said control member.

9. A combination lock comprising a bolt control member rotatably mounted having a portion thereof adapted to receive a key, a bolt movable transversely of said control member, a means connecting said bolt and said control member for effecting movement of said bolt, spring pressed tumbler members arranged about said control member and normally restraining the said control member against rotary movement, means holding the said tumblers in proper relative position, restraining the said tumblers against rotary movement, means determining limits of movement of said tumbler members, means including a plurality of pins adjustable on said tumblers, the said tumblers being movable axially of the said control member, and adapted to be moved a predetermined distance by corresponding ward members of a key, whereby when the said tumblers have been moved a predetermined distance, by the corresponding ward members of the key, the said control member may be rotated to actuate the bolt.

10. A combination lock comprising a bolt, a bolt controlling member, tumbler members, said tumbler members normally retaining the said bolt controlling member against movement and coöperating means on the tumbler members and bolt controlling member for determining the necessary movement of said tumblers in order to permit relative rotary movement between the bolt controlling member and the tumblers, said tumbler means including spaced teeth adjustable along the same.

11. A combination lock comprising a bolt control member including a core rotatably mounted, and a series of toothed portions extending externally therearound, means arranged at one end thereof to receive a portion of a key to be actuated thereby, tumbler members movable axially of said control member through the toothed portion thereof, and normally restraining the said control member against rotary movement, means for holding the said tumbler members against rotary movement, and means adjustable on certain of said members for determining the movement of said tumblers axially of the control member in order to permit relative rotary movement of said control member past the teeth.

FRANCISCO CLARK.