E. A. CHRISTOPH.

LOCK.

APPLICATION FILED DEC. 8, 1913.

1,287,882.

Patented Dec. 17, 1918.

3 SHEETS—SHEET 1.

Fig. 1.

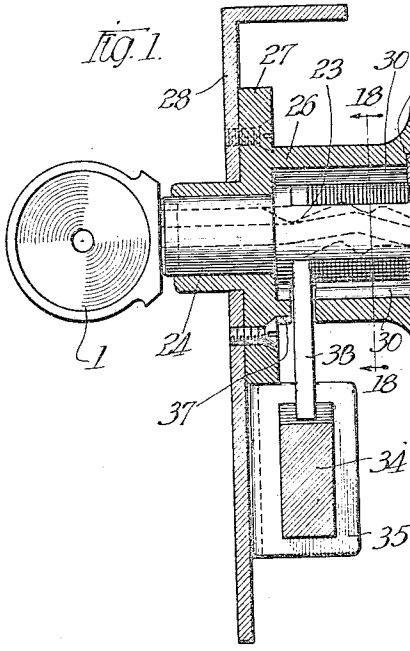


Fig. 5.

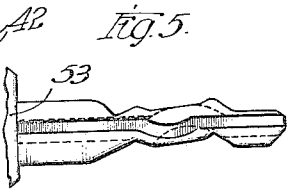


Fig. 3.

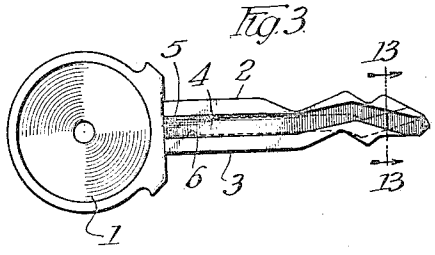


Fig. 4.

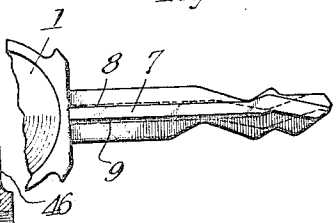
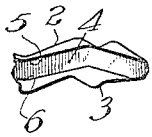


Fig. 2.



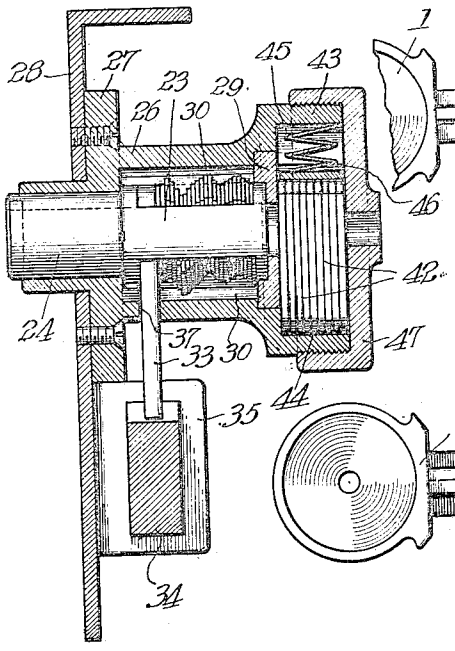
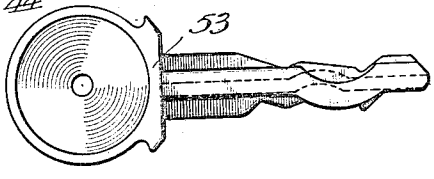


Fig. 6.



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3 SHEETS—SHEET 2.

Fig. 7.

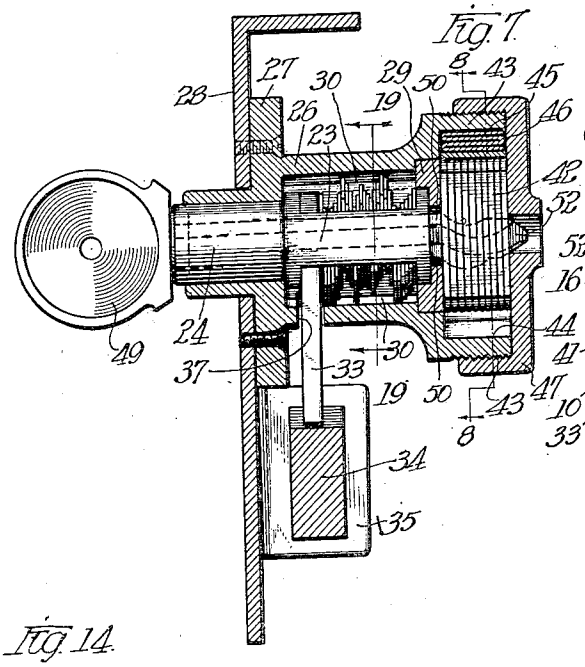


Fig. 8.

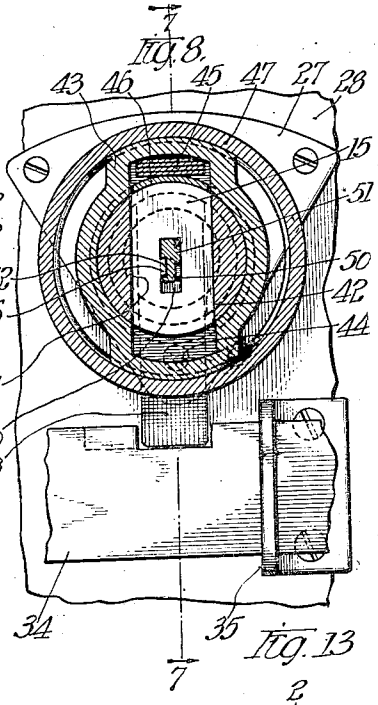


Fig. 14.

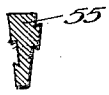


Fig. 15.

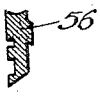


Fig. 9.

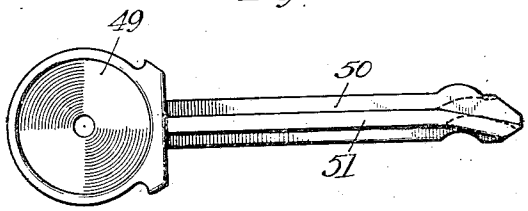


Fig. 13.

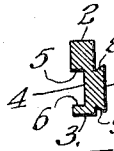


Fig. 16.

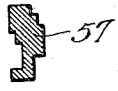


Fig. 11.

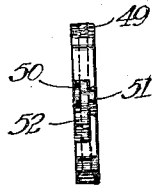


Fig. 10.

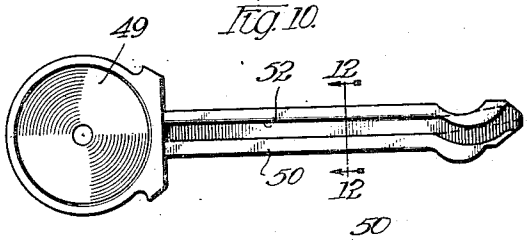
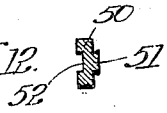


Fig. 12.



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APPLICATION FILED DEC. 8, 1913.

Patented Dec. 17, 1918.

3 SHEETS—SHEET 3.

1,287,882.

Fig. 20.

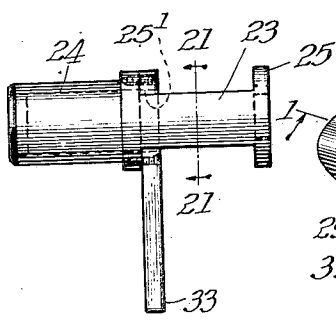


Fig. 17.

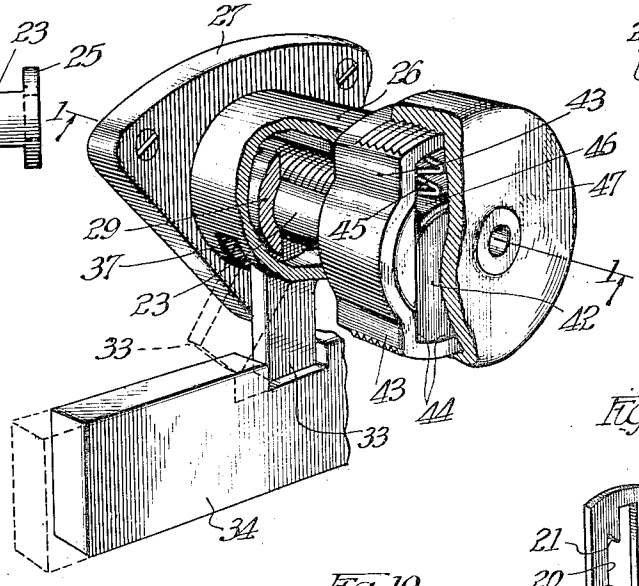


Fig. 21.

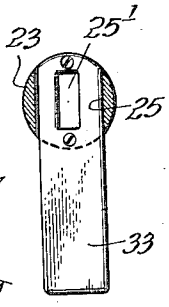


Fig. 25.

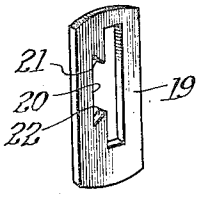


Fig. 18.

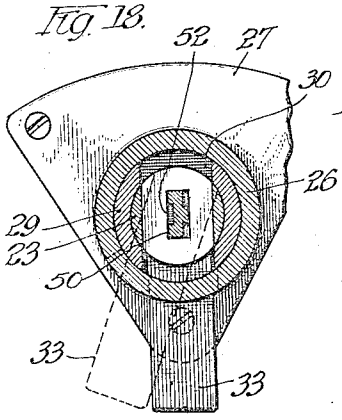


Fig. 19.

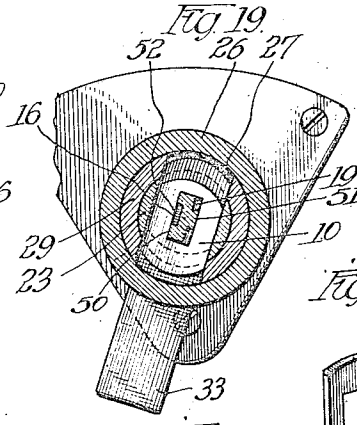


Fig. 26.

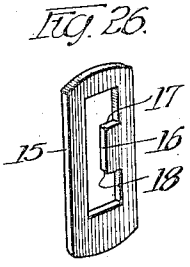


Fig. 24.

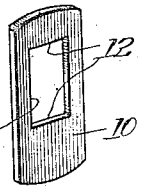


Fig. 22.

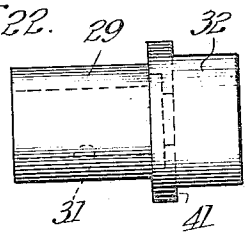
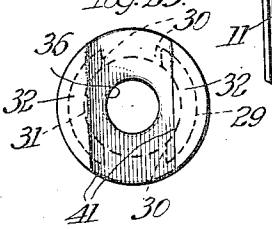


Fig. 23.



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UNITED STATES PATENT OFFICE.

EMIL A. CHRISTOPH, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE KING LOCK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

LOCK.

1,287,882. Specification of Letters Patent. Patented Dec. 17, 1918.

Application filed December 8, 1913. Serial No. 805,327.

To all whom it may concern:

Be it known that I, EMIL A. CHRISTOPH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Locks, of which the following is a description.

My invention belongs to that general form of devices known as locks, and relates particularly to a key-controlled or key-actuated locking device of the kind described. The present invention is in the nature of an improvement over the lock shown in my pending application, Serial No. 795,662, filed October 17, 1913, and has among its objects the production of a lock that cannot easily be picked, or one for which a key cannot easily be made. With the present invention any number of locks, each with its particular primary key, may be constructed, so that the lock can only be opened with its own primary key for which the lock is made, but the construction is such that all the locks may be constructed to fit one key, or its duplicates, so that any or all of the locks may be unlocked by a master key, as it is commonly termed. The invention has among its objects the production of a device in which there is practically no limit to the possible variations or number of different keys, each lock being opened by its individual set of keys, or any one or more, or all, by the master key. The invention has among its further objects the production of a device of the kind described that is simple, compact, efficient, durable, and satisfactory; that may be economically manufactured, that may be used wherever found applicable, and modified in its non-essential details to make it applicable for different types or styles of locks.

To this end my invention consists of the novel construction, arrangement and combination of parts herein shown and described, and more particularly pointed out in the claims.

In the drawings, wherein like reference characters indicate like or corresponding parts,

Figure 1 is a sectional view of a portion of a lock, embodying my device, the section being taken substantially on line 1, 1 of Fig. 17, or line 7, 7 of Fig. 8, the key being in position;

Fig. 2 is a similar view with the primary key removed;

Fig. 3 is a side elevation of the key illustrated in Figs. 1 and 2;

Fig. 4 is a side elevation of the opposite side of the same key;

Fig. 5 is a side elevation of a portion of another form of key;

Fig. 6 is a side elevation of the opposite side of the same key;

Fig. 7 is a sectional view taken on line 7, 7 of Fig. 8, and similar to Fig. 2, with the master key positioned in the lock; Fig. 8 is substantially a sectional view on line 8, 8 of Fig. 7;

Fig. 9 is a side elevation of one form of the master key;

Fig. 10 is a sectional view of the opposite side of the same;

Fig. 11 is an end elevation of the same key;

Fig. 12 is a sectional view taken substantially on line 12, 12 of Fig. 10;

Fig. 13 is substantially an enlarged cross sectional view of the primary key, taken on line 13, 13 of Fig. 3;

Figs. 14, 15 and 16 are similar views of modified forms of keys;

Fig. 17 is a perspective view of the lock with portions broken away, the primary key in position;

Fig. 18 is a sectional view taken substantially on line 18, 18 of Fig. 1, the primary key in position;

Fig. 19 is a sectional view taken substantially on line 19, 19 of Fig. 7, the master key inserted in the lock, the key turned;

Fig. 20 is a side elevation of the inner part or plate retainer 23;

Fig. 21 is a sectional view taken substantially on line 21, 21 of Fig. 20;

Fig. 22 is a side elevation of the outer part removed from the lock;

Fig. 23 is an end elevation of the same;

Fig. 24 is a perspective view of one type of plate;

Fig. 25 is a perspective view illustrating another type of plate, and

Fig. 26 is a perspective view illustrating still another type of plate.

2

Referring to the drawings, in which one form of my device is shown, 1 represents a key, which may be termed the primary key, and is of any suitable size. The key is provided with one or more, preferably a plurality, of irregular or undulated faces forming substantially a plurality of what might be termed cam faces, or series of cam faces. The key shown in the drawings, particularly in Figs. 3, 4 and 13, has an irregular or undulated top face 2, and a preferably parallel face 3, and is also provided with a suitably formed groove 4, upon one side, having parallel sides or faces 5 and 6, and on the opposite side is provided with a bead 7, having parallel faces 8 and 9. The groove and bead mentioned may be extended along the key in any desired manner, not necessarily parallel with each other, nor parallel with the top face 2, and, in fact, they preferably do not so extend. A plurality of plates, each having a suitable aperture therethrough, are arranged to coöperate with the key faces. These plates, or at least three forms of plates, are illustrated in Figs. 24, 25 and 26, it being understood that the plates vary with the particular key which may be employed.

The plate shown in Fig. 24 consists of a plate part 10, preferably of thin sheet metal provided with a suitable aperture 11 therethrough, the ends 12 of which aperture are arranged to coöperate with the faces 2 and 3 of the key shown in Fig. 3. The aperture is made of sufficient width to admit the key, that is, it is equal in width to the thickness of the key. The plate 15 shown in Fig. 25 is provided with a bead 16 at the aperture, having faces 17 and 18 adapted to extend in the slot 4, and coöperate with the faces 5 and 6 respectively. The plate 19 shown in Fig. 26 is provided with a suitably formed aperture having a notch 20 on one side, and faces 21 and 22 for coöperation with the bead 7 of the key. These three forms or types of plates shown are, of course, merely for illustration, for, as mentioned previously, the particular form and size of the aperture through the plates depends upon the key to be used. Likewise, the apertures are not located in the same place on the finished plates, even though the plates have similar apertures, as will be more fully understood from the further description. Where the bead 7 is omitted from the key, the plate 19 is not used, and likewise, where the notch or groove 4 is omitted, plate 15 is not used, and if the faces 2 and 3 are straight and not undulated, plate 10 in some cases is not used.

The plates are arranged face to face in any desired order with the beads 16 on the same side, and the notches 20 on the other side, and the parts positioned in what may be termed a plate retaining member or inner barrel 23. The retaining member 23 is preferably cylindrical in form, and is provided with an opening or slot 25 through the same, as most clearly shown in Figs. 18, 19 or 21. It will be noted by referring to these figures that the slot 25 is unobstructed and extends through the barrel with a suitable opening 25′ (see Fig. 21) to the front of the lock through the extended end of part 24. The part 23, 24, or inner barrel, as it may be called, is arranged within a coöperating lock part or casing 26, as will be hereafter described. Before being fitted to the lock the plates described are longer than the diameter of the part 23, so that they project beyond the face of the barrel. In fitting the lock to the key, the desired number and forms of plate are positioned in the slot 25 in member 23, and the key then inserted. The key passes through all the apertures in the plates, but owing to the irregular faces coöperating with the operative faces of the plates, slides them back and forth until when the key is in final position, the plates are substantially in the positions shown in Fig. 1, but being longer than the diameter of the part, project from one or both sides. The key being in place, the ends of plate members are then suitably cut off, preferably flush with the face of the barrel 23, so that when the key is positioned, they conform to the cylindrical face of the barrel 25, and they are substantially contained within the barrel, as shown in Fig. 1, this figure showing them after they have been fitted. (See also Figs. 18 and 19.) They may be cut off in any desired manner, either by turning, grinding, or the like.

Mounted within the casing 26 on the barrel part 23 is what may be termed an outer barrel 29, which contains the master key plates similar to the plates previously described, but preferably of greater length, as will be more fully described hereafter. The master barrel is shown separated from the lock in Figs. 22 and 23, and consists of the part 29, having a tubular bore 31 of a diameter corresponding with the barrel 23 and the primary key plates. This outer barrel is slotted upon each side as at 30 (see Fig. 23) and is provided with an end 32, which is slotted as at 41. The details of this member are clearly shown in the drawings, the same being provided with an opening through the same at 36, through which the master key may be inserted. This opening also serves to center the primary key. Arranged in the slotted end 32 of the master barrel or casing are plates 42, formed with apertures similar to the plates shown in Figs. 24 to 26, or in an equivalent manner, depending upon the keys used. These plates are constructed of greater length than the outside diameter of the end 32, and then turned down, or otherwise formed, to cor-

respond with the contour of the barrel after the master key is inserted in the same manner as the primary plates. As most clearly shown in Figs. 7 and 17, the casing 26 is extended as at 43 and formed with a groove or pocket 44, and a similarly formed pocket opposite, in which may be arranged a spring 45 and plate 46. Arranged over the end of the extended part 43 is a cap 47. The coöperating part or casing 26 containing the barrels and plates, and the keys for the same may be employed in any desired way to form a lock. As shown, the part 26 has a flange or extending part 27, by which the casing may be secured to a lock plate 28, or the equivalent. In order to fully explain the operation of the lock, I have shown a latch, bolt or lock-bar 34, carried by a bracket 35 from the lock plate 28, this particular lock being controlled by throwing the latch bolt 34 to engage a coöperating part (not shown). Movement is transmitted from the parts to the lock bolt in any desired manner. As shown (see Figs. 1 and 21) a finger 33 is secured to the bar 23, the same extending through an opening 37 and engaging in a notch in the bar 34. Any equivalent arrangement may be employed.

One form of master key is shown in Figs. 9 and 10, as well as Figs. 11 and 12. This key 49 is provided with a shank or stem 50, having a bead 51 upon one side, and a groove 52 upon the other. This preferably extends straight along the key to approximately the end. The same at the end is either undulated or extends in an irregular manner, so as to move the different plates 42 and slide them back and forth until they aline and conform to the contour of the barrel, or that is, disengage from part 43. The master key may, of course, be undulated where it lies in the primary barrel, this being a matter that is immaterial, since the primary barrel lies within or is contained in the master barrel 29, and is movable with the master barrel. Although the end in the master plates is not particularly long the keys and plates may be so varied as to permit innumerable combinations of a great number of master keys, all different, each one of which will operate the lock designed for the key.

In explaining the operation of the device, it may first be assumed that the parts are in the position shown in Figs. 1 and 17 with the primary key 1 inserted in the lock. The plates contained by the inner or primary barrel are alined as shown in the figures mentioned, and do not engage in the grooves or slots 30 in the outer or master barrel 29, so that turning the key turns the primary barrel and contained plates, and with it the finger 33, turning the lock bolt 34, as indicated by the dotted lines in Fig. 17. When the key is withdrawn, assuming that the parts are in the positions shown in Figs. 1 and 17, the several plates in the slot 25, actuated by the different key faces, slide back and forth in the slot or slots 30, permitting the key to be withdrawn. This, however, positively throws the various plates out of alinement and beyond the face of the barrel 23 at one or both sides (*i. e.* positively disturbs them) so that they engage with the master barrel 29. Their weight may be insufficient to cause them to drop down and engage in only one opening, depending, of course, on the manner of installation of the lock, but if any do remain as left by the key, for example, as shown in Fig. 2, they will engage in the slots or grooves and lock the barrel 23 against rotation. It should be noted at this time that the plates 42 are in the groove 44, so that the master barrel 29 is prevented from rotating. When the key is again inserted, they slide back and forth in the slot, depending, of course, upon the contour of the key and plates employed, until the key reaches its final position, at which point all of the plates are alined at their ends, as indicated in Figs. 1 and 17, conforming to the contour of the primary barrel 23. This permits the barrel 23 to be positively moved or rotated again, permitting the latch to be turned or positively turning it, depending upon the lock upon which employed. In inserting or withdrawing the keys, the movement of each plate is determined by the kind of plate used and the particular form of key.

When it is desired to open the lock with the master key, a key similar to the key 49 shown in Figs. 9 and 10, the same, of course, depending upon the plates used, is inserted and forced through the primary barrel into engagement at the end of the key with the plates 42 (see Figs. 7 and 8). This key slides the plates in the primary barrel back and forth, but, of course, since the same are not formed to aline with this type of key, the same will take positions substantially as shown in Fig. 7. The plates 42, however, being formed to be alined by the master key, will be moved substantially in the position shown in Fig. 7, and will disengage with the end 43 at the recess 44, so that the master barrel 32, and its end 29, can and will be rotated when the key is turned. However, the plates in the primary barrel in engagement with the key, and with the slots 30 in the master barrel, cause the primary barrel to be rotated with the master barrel, and with it the finger 33, shifting the latch bolt 34.

From the above it will be seen that any number of locks may be constructed, each controlled by an individual and different key, but which locks may be constructed to all be operable or controlled by a master key.

This is of great importance where the locks are employed in locker systems or the like, where the users of the lockers each have their individual keys, and where it is desired that a trusted attendant, in case of necessity, shall be able to enter any one of the lockers by means of a master key. It is not necessary for the attendant to have duplicate primary keys for each lock, which, in the case of many lockers, or locks, would be inconvenient, expensive, and generally most unsatisfactory.

In Figs. 5 and 6, a modified key is shown, it being understood that the keys shown in the drawings are only for illustration, as there is practically no limit to the number of different keys, varying in minute details, which may be constructed, and a very minute variation between two keys is sufficient to prevent the use of two different keys for the same lock. In Figs. 14, 15 and 16, three other forms of keys are shown, modified in cross sectional contour. These figures illustrate how the keys may be modified in other ways than by merely modifying the undulations in the keys shown in Figs. 3 to 6. The form shown in Figs. 15 and 16 shows how the number of different plates may be increased in a lock by providing more faces on each side for engagement with the plates.

From the preceding description it will be seen that, in the construction shown, the lock comprises a plurality of coöperating parts, each of which may be controlled by a different key, as for example, a primary barrel, with its plates arranged to be controlled by a primary key independent of the master key, and a master barrel and different plates arranged to be controlled independently of the primary barrel and its plates, and the primary key.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same within the scope of the appended claims without departing from the spirit of my invention; hence I do not wish to be understood as limiting myself to the exact form, construction, arrangement, and combination of parts herein shown and described, and uses mentioned.

What I claim as new and desire to secure by Letters Patent is:—

1. In a lock, the combination of a suitable casing, a primary barrel and a master barrel arranged in said casing with their longitudinal axes coinciding, and key actuated means carried by each of said barrels for independently controlling the operation thereof.

2. In a lock provided with suitable latching means, the combination of a suitable casing, a primary barrel and a master barrel arranged in said casing with their longitudinal axes coinciding, one of said barrels operatively connected with the latching means of the lock, and key actuated means carried by each of said barrels and independently of each other for controlling the operations thereof.

3. In a lock, the combination of a suitable casing, a barrel rotatably arranged therein, key actuated means carried thereby for engaging the casing, a second barrel contained within said first mentioned barrel and provided with key actuated means carried thereby and independent of said first key-actuated means for engaging said first barrel.

4. In a lock, the combination of a suitable casing, a barrel rotatably arranged therein, key actuated means carried thereby for engaging the casing, a second barrel contained within said first mentioned barrel, provided with key actuated means carried thereby for engaging said first barrel, each of said key-actuated means independent of the other and a latch bolt operatively connected with one of said barrels.

5. In a lock, the combination of a suitable casing, a plurality of sets of plates arranged one in back of the other in said casing, separable containers for said plates, a suitable key for each set of plates, a latch bolt, and means for operatively connecting said bolt with one of said containers.

6. In a lock, the combination of a suitable casing, a barrel rotatably arranged therein, a plurality of plates carried by said barrel and independently slidable into engagement with the casing, a second barrel contained within said first barrel, a plurality of plates carried by said second barrel and independently slidable into engagement with the other barrel, and means for actuating the plates of either barrel.

7. In a lock, the combination of a suitable casing, a barrel rotatably arranged therein, a plurality of plates carried by said barrel and independently slidable into engagement with the casing, a second barrel contained within said first barrel, a plurality of plates carried by said second barrel and independently slidable into engagement with the other barrel, means for actuating the plates of either barrel, a latch bolt, and means for operatively connecting said latch bolt with said second barrel.

8. In a lock, the combination of a suitable casing, a primary barrel and a master barrel arranged with their axes coinciding and contained therein, means for releasing said barrels or preventing the movement thereof, as desired, comprising a plurality of slidable plates carried by each barrel, the plates in one barrel being independent of the plates in the other barrel and means for actuating said plates.

9. In a lock, the combination of a suitable casing, a primary barrel and a master barrel contained therein, means for releasing

said barrels or preventing the movement thereof, as desired, comprising a plurality of slidable plates carried by each barrel, each plate having a suitably formed key-way therein, means for actuating said plates, comprising a key for each barrel, one key constructed to operatively actuate the plates in one barrel, and the other key constructed to extend through the plates in one barrel and operatively actuate the plates in the other barrel, a latch bolt, and means for operatively connecting the same with one of said barrels.

10. In a lock, the combination of a suitable casing, a barrel rotatably arranged therein, key actuated means carried thereby for engaging the casing, a second barrel contained within the casing, and provided with key actuated means carried thereby for engaging said first mentioned barrel, and a suitably formed key for each key actuated engaging means, each key operative only upon its respective engaging means.

11. In a lock, the combination of a suitable casing, a barrel rotatably arranged therein, key actuated means carried thereby for engaging the casing, a second barrel contained within said first mentioned barrel and provided with key actuated means carried thereby for engaging said first mentioned barrel, a suitably formed key for each key actuated engaging means, each key operative only upon its respective engaging means, a latch bolt, and means for operatively connecting the same with one of said barrels.

12. In a lock, the combination of a plurality of suitably formed keys, a casing part, a barrel rotatably arranged therein, key actuated means carried thereby for engaging the casing, a second barrel arranged within the casing and partially contained within the first barrel and provided with key actuated means for engaging said first barrel, each of said key actuated engaging means releasable only by its particular key.

13. In a lock, the combination of a suitable casing, a primary barrel and a master barrel arranged in said casing with their longitudinal axes coinciding, and key actuated means carried by said barrels for controlling the operations thereof, including a plurality of suitably formed slidable plates arranged for engagement with their respective keys.

14. In a lock, the combination of a suitable casing, a primary barrel and a master barrel arranged in said casing with their longitudinal axes coinciding, key actuated means carried by said barrels for controlling the operations thereof, including a plurality of suitably formed slidable plates arranged for engagement with their respective keys, a support for said casing, a latch bolt carried by said support, and means for operatively connecting said latch bolt with said primary barrel.

15. In a lock, the combination of a suitable casing, a primary barrel and a master barrel contained therein, one of said barrels contained within the other, means for actuating said barrels, or preventing the movement thereof as desired, comprising a plurality of slidable plates carried by each barrel, each plate provided with a key-way therein, means for actuating the plates of either barrel as desired, a suitable latch bolt, and means for operatively connecting the same with one of said barrels.

16. In a lock, the combination of a suitable casing, a primary barrel and a master barrel contained therein, means for actuating said barrels, or preventing the movement thereof as desired, comprising a plurality of slidable plates carried by each barrel, each plate provided with a key-way therein, means for actuating the plates of either barrel as desired, comprising a key for each barrel, one of said keys movable through the plates of one barrel to operatively actuate the plates in the other barrel, a suitable latch bolt, and means for operatively connecting the same with said primary barrel.

17. In a lock and in combination, a suitable casing, a plurality of movable parts arranged in said casing, each provided with a suitable opening therethrough, the opening in one part in alinement with the opening in the other, suitably formed keys longitudinally movable into said parts, means in common for said parts for centering said keys when inserted in the parts, and means coöperating with the keys for locking said casing and parts against movement relative to each other, comprising a plurality of plates slidable in the parts, each provided with a key-way therein, substantially corresponding in contour to the keys.

18. In a lock, a plurality of coöperating parts comprising a plurality of retaining members, each having a slot formed therein, a plurality of plates arranged in each of said slots, and movable to permit the same to be substantially contained within the retaining devices, a suitable casing for said retaining devices and plates, a portion of said plates slidable in their slot a distance sufficient to engage the casing, and a portion of said plates slidable in their slot a distance sufficient to engage the retaining member for said other plates, each of said plates formed with a suitable key-way therein, in combination with a coöperating key for each set of plates, each formed with a face departing from a straight line, and of a size to pass through the key-ways of the plates, and positively move its respective plates out of engaging position.

19. In a lock, a plurality of coöperating

parts, comprising a plurality of slotted members, a set of plates arranged in the slot in each of said members, said plates each provided with a key-way and of a length to permit the same to be substantially contained within their respective retaining devices, a suitable casing for said retaining devices and said plates, one set of plates slidable in its retaining member a distance sufficient to engage the casing, and the other sets slidable a distance sufficient to engage the other retaining member, in combination with a coöperating key for each set of plates, each of said keys formed with a face departing from a straight line, and of a size to pass through the key-ways in said plates, and positively and independently move the same in or out of operative positions.

20. In a lock, the combination of a plurality of coöperating parts, a plurality of plates carried by one part and independently slidable into engagement with another part, a plurality of plates carried by said last mentioned part and slidable into engagement with the third part, and a key for each set of plates, each key having a plurality of independent faces provided with a plurality of undulations therein, each of said plates formed to operatively engage with its respective key at a desired face.

21. In a lock, the combination of a plurality of coöperating parts, a plurality of plates carried by one part and independently slidable into engagement with another part, a plurality of plates carried by said last mentioned part and slidable into engagement with the third part, a key for each set of plates, each key having a plurality of independent faces provided with a plurality of undulations therein, each of said plates formed to operatively engage with its respective key at a desired face, a latch bolt, and means for operatively connecting said latch bolt with one of said coöperating parts.

22. In a lock, the combination of a suitable casing, a cylindrical barrel rotatably mounted therein, a second barrel arranged within said first mentioned barrel, a plurality of sets of plates, one for each barrel, each set comprising a plurality of plates transversely movable through its respective barrel, each of said plates formed with an opening therein, a key for each set of plates, each provided with means for engaging its respective plates, one key movable through all of the plates into operative engagement with its respective set of plates, a latch-bar, and means for operatively connecting the same with one of said barrels.

23. In a lock, the combination of suitable locking mechanism, including a plurality of series of members, each constituting independently controlled locking elements arranged one in back of the other, and a suitable key for each of the series of members in each element, whereby one series may be operatively controlled separately from the other.

24. In a lock, the combination of a plurality of suitable keys, and locking mechanism, including a plurality of independent locking elements arranged one in back of the other, each element consisting of a series of locking members, each series constructed to independently operatively co-act only with its respective key for which it is constructed.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

EMIL A. CHRISTOPH.

Witnesses:
ROY W. HULL,
CHARLES I. COBB.