July 20, 1937. A. SCHOOREL 2,087,554

LOCK CONSTRUCTION

Filed Oct. 2, 1934

Fig. 1.

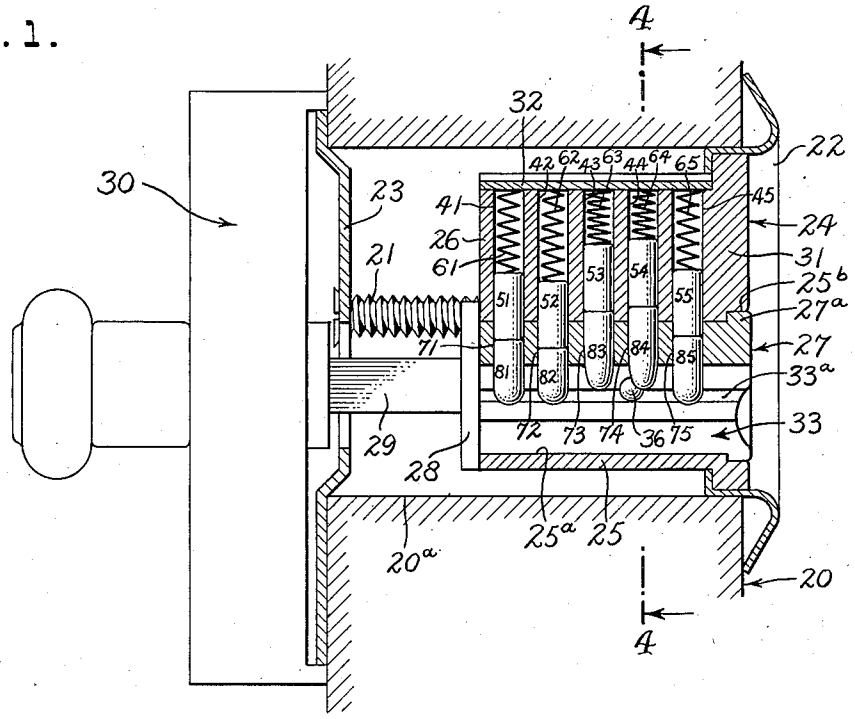


Fig. 3.

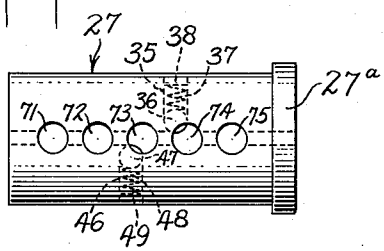


Fig. 2.

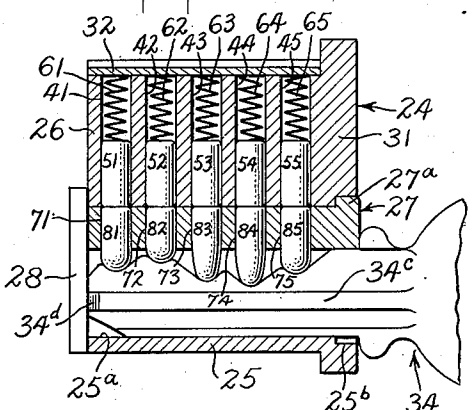


Fig. 4.

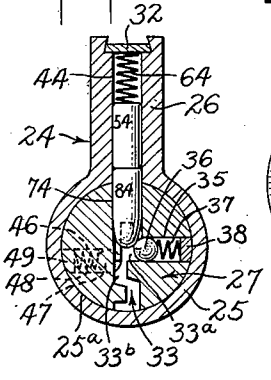
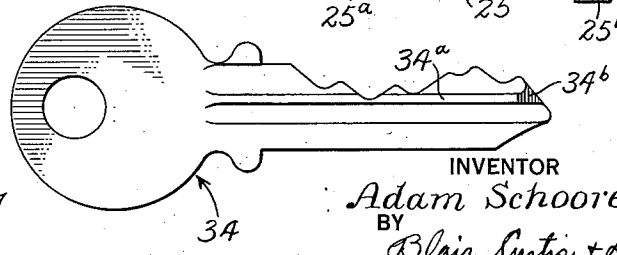


Fig. 5.



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LOCK CONSTRUCTION

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Application October 2, 1934, Serial No. 746,523

16 Claims. (Cl. 70—364)

This invention relates to lock construction and more particularly to the key-controlled or key-operated portion of a lock mechanism.

One of the objects of this invention is to provide a dependable key-controlled lock mechanism which will frustrate in a simple, inexpensive, and efficient manner, attempts to achieve operation of the mechanism or to "pick" it in the absence of the proper key. Another object is to provide a key-controlled mechanism of the above-mentioned character that will be inexpensive to manufacture, capable of ease and speed of assembly, dependable in action, and in general foolproof. Another object is to provide a key-controlled tumbler-type of key mechanism in which appropriate alinement of tumblers, to achieve actuation of the lock mechanism is impossible unless with the aid of the proper key therefor. Another object is to provide key-controlled lock mechanism of the above-mentioned character which will give a wide range of combinations or changes of key shapes or codes. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is shown one of the various possible embodiments of my invention,

Figure 1 is a central vertical sectional view through my lock mechanism, showing the latter in an illustrative installation with respect to a door and suitable bolt or latch mechanism to be operated thereby, the parts being shown in "locked" relation;

Figure 2 is a central sectional view of the lock mechanism per se, like that of Figure 1, showing the various parts as they are positioned by the insertion of the proper key;

Figure 3 is a detached plan view of the key plug or barrel, as the latter would be viewed from above in Figure 2;

Figure 4 is a transverse vertical sectional view as seen along the line 4—4 of Figure 1, and

Figure 5 is a side elevation showing the obverse face or side of the key of Figure 2.

Similar reference characters refer to similar parts throughout the several views in the drawing.

Referring now more particularly to Figure 1, I have there shown in vertical central section a lock mechanism, embodying my invention, related to, for example, a door generally indicated at 20, being fitted or seated in a hole or aperture 20a in the door and suitably secured thereto, as, for example, by screws 21 which act to clamp the door 20 between an annular escutcheon plate 22 on the front face of the door and a plate 23 on the rear face of the door. The lock mechanism includes a casing or center housing generally indicated at 24 preferably in the form of a solid casting appropriately shaped to provide a substantially cylindrical lower portion 25 (see also Figure 4) and an upwardly and lengthwise extending portion 26, these portions being preferably cast as a unit or integrally with a front circular or disk-like face plate 31 (Figure 1) with which the escutcheon plate 22 interfits or coacts.

The cylindrical housing portion 25 is bored out as at 25a in order rotatably to receive a cylindrical key plug or barrel 27, held in any suitable way against movement in an axial direction relative to the casing 24; for example, the key plug 27 may have a front peripheral flange 27a (Figure 1) seated in a counterbored portion 25b at the front of the bore 25 and at its rear or left-hand end the key plug 27 may have secured to it means, such as a plate-like member 28 of greater radial extent than the key plug itself, parts 27a and 28 thus preventing axial movement of the key plug 27 and thus holding certain of the parts, to be hereinafter described, in appropriate alinement.

The left or rear end of the key plug 27 (Figure 1) has secured to it in any suitable manner a connecting or operating bar 29 which extends through a suitable aperture in the clamping plate 23 and into the casing of the bolt or latch mechanism generally indicated at 30, whereby the bolt or latch of the latter may be placed under the control of the rotatable key plug 27 and the mechanism about to be described.

The casing 24 (Figures 1 and 4) is provided with a suitable number, illustratively five, of tumbler-receiving recesses, preferably in the form of cylindrical bores extending vertically through the upper casing portion 26 (see Figure 4) and opening into the bore 25a in which the key plug 27 is rotatable; in Figures 1 and 2 these tumbler-receiving recesses are indicated at 41, 42, 43, 44 and 45. In these tumbler recesses are slidably received suitable tumblers, preferably in the form of cylinders, sometimes called tumbler pins or pins, and illustratively and preferably they are of the same axial length; in Figures 1 and 2 they are indicated at 51, 52, 53, 54 and 55, and between their upper ends and any suitable closure, such as the plate 32, of the upper ends of the tumbler-

receiving bores or recesses 41, 42, 43, 44 and 45, there are interposed respectively the springs 61, 62, 63, 64 and 65, the latter acting to urge their respective tumblers in a downward direction and hence out through the lower ends of the recesses and into the bore 25a in which, however, the key plug 27 is rotatably mounted. These tumbler pins, however, are to coact with or are to be acted upon by certain other parts or devices related to the key plug 27.

The key plug 27 is provided with a key slot generally indicated at 33 (Figures 1 and 4) and in transverse cross-section (Figure 4) it preferably has a shape corresponding to the cross-section of the key, generally indicated at 34 in Figure 5, which is intended for the control of the various parts. Certain features of the key and key slot construction are described later hereinafter.

The key slot 33 (Figures 1 and 4), with the key plug 27 in normal position, extends in general through the median or central vertical plane of the key plug 27, its upper wall terminating sufficiently short of the periphery of the key plug 27. Communicating with the key slot 33, and in fact intersecting the latter, are tumbler-receiving recesses or bores, illustratively five in number and hence corresponding in number with those contained in the casing 24 itself; these tumbler-receiving bores or recesses, indicated (Figures 1 and 2) at 71, 72, 73, 74 and 75, are respectively alined (when the key plug 27 is in normal position) with the tumbler recesses 41, 42, 43, 44 and 45 in the casing 24.

Seated or slidably positioned in the tumbler recesses in the key plug 27 are tumblers or tumbler pins, preferably generally cylindrical in shape and they are indicated in Figure 1 at 81, 82, 83, 84 and 85.

Accordingly, with the key plug 27 in its normal position, as above described, the tumbler recesses 41, 42, 43, 44 and 45 in the casing 24 and the tumbler recesses 71, 72, 73, etc. in the key plug 27 are respectively alined with each other, and the alinement thereof permits either or both of the tumblers in the respectively alined tumbler recesses, to partake of movement therealong as though they were in a single continuous tumbler-receiving recess or channel.

The tumblers 81, 82, 83, 84 and 85 in the key plug 27 are, however, of different lengths, depending upon the contour or coded or serrated edge of the key 34, and any desired permutation or combination of lengths of these tumbler pins may be employed so that, when the key 34, appropriately contoured or coded to suit the particular combination or permutation of lengths employed, is inserted into the key slot 34, the coaction of the springs 61, 62, 63, etc. with the steps or serrations or coded edge of the key 34 positions the upper and lower sets of tumblers substantially as shown in Figure 2, with the junctions of the various pairs of upper and lower tumblers alined with each other and with the upper portion of the cylindrical surface in which the key plug 27 and the casing 24 intersect, thereby permitting rotation of the key plug 27 relative to the casing 24. However, to achieve this alinement, certain other parts are brought into action or coaction.

Referring now to Figures 3 and 4:—Related to one or more of the tumblers in the key plug 27 are certain coacting parts, and as will be later more clearly set forth, these parts may be related so as to coact with different portions of the key either on one side of the latter or the other or on both sides. For purposes of illustration, I have shown (Figures 3 and 4) such coacting mechanism or devices related to the tumbler 84 and/or its tumbler-receiving recess 74 and have positioned such devices on one side of the plane of the key slot 33, and to illustrate how such mechanism or devices may be related to coact with the other side of the key, I have shown such mechanism or devices related to the tumbler pin 83 and/or its tumbler-receiving recess 73. The devices or mechanism related to the parts 74—84 and better shown in transverse cross-section in Figure 4 may first be considered and described.

Accordingly, referring to Figure 4, I provide, as by casting or drilling, or otherwise, an auxiliary bore, recess or channel 35, in the key plug 27, extending in general at about 90° to the axis of the tumbler-receiving recess 74, this channel 35 extending from the outer cylindrical surface of the key plug 27 into communication with both the key slot 33 and the tumbler-receiving channel 74, being displaced somewhat to the left, as viewed in Figure 3, of the axis of the tumbler-receiving recess 74. The channel 35 may conveniently be cylindrical and in it is placed a member, such as a ball 36, preferably of hardened steel, spring-pressed by a spring 37 toward the left, as viewed in Figure 4, and hence into the key slot 33, the outer end of the channel 35 being closed as by a plug 38 which forms an abutment against which the spring 37 may react to give the desired action to the ball 36.

Now the lower end portion of the tumbler 84 in the plug 27 (Figures 4 and 1) is suitably tapered or curved and, with the proper key removed from the key plug 27, the spring 37 (Figures 3 and 4), being stronger than the spring 64, forces the ball 36 to the left, as viewed in Figure 4, or downwardly, as viewed in Figure 3, and the shape of the ball and the curved or tapered shape of the lower end of the tumbler 84, cause these parts to coact as cam-like members to lift tumbler 84 (of the key plug 27) and the casing tumbler 54 above it, thus further compressing the spring 64 which is overcome either by the power-multiplying or wedging action of the ball 36 on the tapered or curved lower end portion of the tumbler 84, or by the greater strength of spring 37 which acts on the ball 36, or by both.

Accordingly, and as is better shown in Figure 1, tumbler 84 in the plug 27 is raised or lifted so as to project out of its plug recess 74 and into the tumbler recess 44 in the casing 24, thus effecting a prevention of rotation of key plug 27 relative to the casing 24 not, however, by the interlocking of these parts by the descent of an upper or casing tumbler (like tumbler 55, for example), but by the projection upwardly and maintenance in that position, of a lower tumbler, such as this tumbler 84.

The channel 35 (Figure 4), moreover, is positioned in such a horizontal plane (with the parts in the position shown in Figure 4) that the ball 36, when thus pressed inwardly by the spring 37, intersects the longitudinally extending and laterally projecting portion 33a of the key slot 33, thus to be projected and held, by spring 37, in the path of movement of the lateral or side rib 34a (Figure 5) of the key 34, the leading edge (the right-hand edge as viewed in Figure 5) of the rib 34a being preferably beveled or tapered off as at 34b. Thus, the member or ball 36, which is thus made to control the position of the tumblers 84 and 54 (Figure 4) may be placed

under the control of a side rib, such as rib 34a of the key 34, for a purpose later to be described.

It will be understood that a mechanism or device like the ball 36 and coacting parts may in a generally similar manner be related to as many other of the tumblers or tumbler recesses in the key plug 27 as may be desired, and it is to be understood that the relation thereof as above described to the parts 74 and 84 is not by way of limitation but by way of illustration.

To show, moreover, how such a mechanism may be related to a tumbler recess and tumbler but on the other side of the key slot 33, reference may again be made to Figures 3 and 4, in which I have shown a channel or bore 46 extending generally at about 90° to the axis of the tumbler recess 73 and provided with a ball 47 pressed against the lower tapered or curved portion of tumbler 83 (see Figure 1) and hence pressed into the key slot 33 from the left-hand side thereof (Figure 4) by a spring 48 abutting against the plug 49 which closes the outer end of the channel 46.

Channel 46, furthermore, intersects not only the key slot 33 but also the tumbler-receiving recess 73 (Figure 3) and the ball 47 therein, under the action of spring 48, acts to wedge or cam or force upwardly the tumbler pin 83 (Figure 1), against the action of spring 53, the latter being thereby compressed; tumbler 83 is thus made to bridge over between the casing 24 and key plug 27 and thus to prevent rotation of the latter.

As is better seen in Figure 4, the channel 46 may be vertically displaced from channel 35 on the other side of the key slot 33, in order thus to bring it into intersection with the opposed lateral extension 33b of the key slot 33, and thus to bring the ball 47 into the path of movement of a rib 34c (Figure 2) that is on the other side of the key 34 from the side on which the above-described rib 34a is. Rib 34c may be beveled off at its forward or leading end or edge, as at 34d (Figure 2) and thus the member or ball 47 may be placed under the control of another side or lateral rib of the key. The above-mentioned relative vertical displacement need not, of course, be adhered to if the two side ribs of the key are not in substantial vertical displacement from each other and it will also be understood that, if two or more of such mechanisms or devices as the spring-pressed ball 36, are on the same side of the key slot, they may be positioned to be acted upon or controlled by the same side rib of the key or by different side ribs vertically displaced from each other in which latter case the devices are similarly vertically displaced so that each is positioned in the path of its appropriate side projection or rib on the key as the latter is inserted into the key slot.

With the parts in "locked" position and the key withdrawn, they assume the respective positions shown in Figures 1, 3 and 4 and already above described, the remaining tumbler pins, illustratively the pairs 51—81, 52—82, and 55—85 (Figure 1) being projected downwardly and held in downward position by the springs 41, 42 and 45, respectively, thus positioning the upper tumbler pins 51, 52 and 55 in bridging relation with respect to the key barrel or plug 27 and the casing 24. Accordingly, rotation of the key plug 27 is prevented (see now Figure 1) by the thus achieved positions of tumbler pins 51, 52, 73, 74 and 55.

With this construction, so-called "picking" or unauthorized actuation (without the proper key) of the mechanism is dependably and reliably precluded. For example, an instrument inserted into the key slot 33 through the right-hand end thereof as viewed in Figure 1 is so inserted in the endeavor to bring the various tumblers into the alinement already above-described and shown in Figure 2 in which case, tumblers 85, 82 and 81 have to be lifted by such implement but any attempts to lift tumblers 81 or 82 (assuming that tumbler 85 has already been lifted or raised) results in causing the instrument or implement itself to further raise tumblers 83 or 84 or both (thus more securely fixing the locking action thereof) and, furthermore, results in positively blocking any descent of either tumbler 83 or tumbler 84 or both, the inserted implement (not to mention the devices 36 and 47 (being otherwise in a position to obstruct the downward movement of the tumblers 83 or 84 necessary to bring them out of locking position.

Furthermore, any such effort to aline the tumblers is complicated and made more difficult by the necessity not merely of raising some of the tumblers and lowering others but also of controlling the devices 47 and 36, and thus, to pick the lock, it is vital to achieve success in at least three different fields or categories, namely, (1) raising one or more tumblers to proper position, (2) lowering one or more tumblers to proper position, and (3) controlling one or more mechanisms or devices, such as the ball 36, a virtual impossibility without the aid of the proper key.

When, however, the proper key is inserted (see Figure 2) several ingenious coactions take place. Firstly, it is to be noted that the side rib or ribs of the key enter the key slot and, referring now to Figure 4, the side rib 34a, when the key is driven home, forces the ball member 36 to the right against the action of its spring 37, thus withdrawing the ball 36 out of coacting relation with respect to the tumbler pin 84 and thus freeing the spring 64 from domination by spring 37; accordingly, spring 64 causes the descent of tumblers 54 and 84 to a position determined or permitted by the particular portion of the key that is coded for that purpose and hence to the position of alinement as shown in Figure 2. Thus, tumbler pin 84, theretofore in locking position, is moved out of such position and is brought entirely within the tumbler recess 74.

In like manner, any other device or devices that have achieved and maintained a raising of a lower tumbler pin are actuated by the same or any other side rib on the key and are caused to permit a descent of the lower tumbler into the key plug. For example, the other side rib 33b (where such an opposed side rib is employed) causes the ball 47 to be moved to the left, as viewed in Figure 4, against the action of its spring 48, thus removing the ball 47 from coacting relation to the tumbler pin 83 (Figure 1), and thus removing the spring 63 from the domination of spring 48; accordingly, spring 63 forces tumblers 53 and 73 downwardly, as viewed in Figure 1, to a position as determined by a properly dimensioned or shaped upper edge of the key 34, of course appropriately coded for that purpose, the key limiting such descent to a point such that the junction of the tumblers 53 and 83 is coincident with the junction of the tumbler recesses 43 and 73.

With respect to such other tumblers as, in locking position, are forced by their casing springs downwardly and outwardly of the casing tumbler recesses and into the tumbler recesses in the key

plug, such as the tumblers 51, 52 and 55, the upper coded or stepped edge of the key 34 is appropriately shaped, with respect to the lengths of the lower tumblers 81, 82 and 85, respectively, to raise the latter and hence their respective upper and spring-opposed tumblers to respective positions such that the junctions of the pairs of tumblers fall respectively in line with the junctions of the casing and key plug tumbler-receiving recesses and into the respective positions better shown in Figure 2.

Whereupon, all of the tumblers having been appropriately alined, the key plug 27 may be rotated by the key 34 and the bolt or latch mechanism 30 (Figure 1) actuated.

Withdrawal of the key from the position shown in Figure 2 results in actions substantially the reverse of those just described. Springs 61, 62 and 65 (Figure 1) are made to cause the locking descents of tumblers 51, 52 and 55, respectively (into the positions shown in Figure 1) and springs 37 and 48 (Figure 4) acting upon the ball devices 36 and 47, respectively, are freed to bring about a raising of the tumblers 83 and 84 into locking position (the positions shown in Figure 1).

With this construction, not only is it possible to frustrate attempts to pick the lock mechanism, as already above described, but I am enabled to achieve a wide range of change of permutations or combinations and in fact wider ranges or changes than have heretofore been possible. For example, I am enabled to permutate or make combinations out of factors which include the following:— (1) The number of tumblers or tumbler pins whose locking action is by downward movement (such as tumbler 51, for example), (2) the number of tumbler pins whose locking action is by upward movement (such as tumbler pin 84, for example), (3) the order of sequence, in a direction lengthwise of the key slot, of these two differently acting tumblers or sets of tumblers, (4) the lengths or dimensions of either or both of these tumblers, (5) the dimension, shape, or position of the side rib on the key that is to control the ball device or devices, (6) the number of such side ribs, (7) positioning such side ribs or projections or one or both sides of the key, and (8) the total number of pairs or sets of tumblers, and other factors. With a given number of tumblers or sets of tumblers, illustratively the five shown by way of illustration in the drawing, a far greater number of "key changes" may be achieved than has heretofore been possible.

It will thus be seen that there has been provided in this invention a key-controlled lock construction in which the various objects above noted, together with many thoroughly practical and unique advantages are achieved. It will be seen that the construction may be inexpensively embodied in practical form, is thoroughly dependable in action, and is thoroughly foolproof.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

I claim:—

1. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, at least one of said plug tumblers having related thereto a member carried by said key plug and exposed through a side of said key slot for engaging the plug tumbler and a spring acting to force said member against the plug tumbler and cause the latter with its associated casing tumbler to be held in raised position against the action of the casing spring and in a position to cause the plug tumbler to project into the tumbler-receiving recess in the casing.

2. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing rotatably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, there being adjacent at least one of said plug tumbler-receiving recesses a channel opening into the key slot, a cam-like member in said channel and exposed to the lower end of the plug tumbler, a spring acting upon said cam-like member and causing the latter to force the plug tumbler upwardly in its recess and into the tumbler-receiving recess in the casing juxtaposed thereto and against the action of the spring in the latter, whereby at least one plug tumbler acts to lock the plug against rotation and one or more casing tumbler acts to lock the plug against rotation.

3. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, at least one of said plug tumblers having a cam-like portion and said plug having spring-pressed means, controllable by way of said key slot, acting against the cam-like portion of said plug tumbler to raise and hold the latter, against the action of the casing spring, in a position to extend into the tumbler-receiving recess of the casing that forms a counterpart to the recess in which said plug tumbler slides.

4. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein

against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, thereby to cause said casing tumblers to interlock the plug and the casing, and means controlled by the key insertable into said key slot acting, in the absence of said key, to cause at least one of said plug tumblers to be moved and held, against the action of its associated casing tumbler and spring, in a position to extend from its plug recess into the casing recess.

5. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, said plug tumblers having lengths such that, when the properly shaped key is inserted into said key slot, the junctions between casing tumblers and their respective plug tumblers are alined with the junctions of the casing and plug tumbler-receiving recesses, and means made inoperative by a portion of the proper key inserted into said key slot for normally holding a plug tumbler in a raised position such that the junction between said plug tumbler and its associated casing tumbler is in the casing recess of the latter.

6. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, said plug tumblers having lengths such that, when the properly shaped key is inserted into said key slot, the junctions between casing tumblers and their respective plug tumblers are alined with the junctions of the casing and plug tumbler-receiving recesses, and means controlled by a side face of the proper key insertable into said key slot and made ineffective thereby for normally maintaining the junction between a plug tumbler and its related casing tumbler inside of the casing recess of the latter.

7. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, said plug tumblers having lengths such that, when the properly shaped key is inserted into said key slot, the junctions between casing tumblers and their respective plug tumblers are alined with the junctions of the casing and plug tumbler-receiving recesses, and a plurality of means, at least one on one side of the key slot and at least another on the other side of the key slot, and made ineffective by the respective side face portions of the proper key insertable into said slot, for normally holding at least a corresponding plurality of plug tumblers in such raised positions that they project into their associated tumbler-receiving recesses in the casing.

8. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, said key slot having a longitudinally but laterally projecting extension, means movably mounted within said key plug and exposed through said lateral key slot extension into engagement with a plug tumbler and acting normally to hold said tumbler in a position such that it projects into its associated tumbler-receiving recess in the casing, said means being adapted to be made ineffective by a side projection on the proper key insertable into said key slot and riding into said lateral key slot extension and thus into engagement with said means.

9. In lock construction, in combination, a key plug having a key-receiving slot and a plurality of radially extending tumbler-receiving recesses communicating with the slot, tumblers within said recesses, a casing movably mounting said key plug and having a plurality of tumbler-receiving recesses opening against the key plug and adapted to mate respectively with the tumbler-receiving recesses in the latter, a tumbler in each of said casing recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, and spring-actuated means acting upon at least one plug tumbler and overcoming the spring related to its associated casing tumbler for normally holding the plug tumbler in a position such that it extends also into the casing tumbler-receiving recess, said means having a part exposed to said key slot to be made ineffective upon the insertion of the proper key into the key slot.

10. In lock construction, in combination, a key plug having a key-receiving slot and a radially extending tumbler-receiving recess communicating with said slot, a tumbler within said recess, a casing movably mounting said key plug and having a tumbler-receiving recess opening against the key plug and adapted to be normally alined with said first-mentioned tumbler-receiving recess, a tumbler in said casing recess, a spring in said casing recess and tending normally to move the tumbler therein in a direction toward said key plug, a channel in said key plug communicating with said key slot in line with the tumbler-receiving recess in the plug, the tumbler in the latter having its lower end tapered, a ball member in said channel, a spring for pressing said ball member into said key slot and against the tapered end of said plug tumbler, said spring and ball member acting to move and to hold said plug tumbler

in a position such that its upper portion projects into the tumbler-receiving recess in the casing and against the action of the spring in the latter.

11. In lock construction, in combination, a key plug having a key-receiving slot and a radially extending tumbler-receiving recess communicating with said slot, a tumbler within said recess, a casing movably mounting said key plug and having a tumbler-receiving recess opening against the key plug and adapted to be normally alined with said first-mentioned tumbler-receiving recess, a tumbler in said casing recess, a spring in said casing recess and tending normally to move the tumbler therein in a direction toward said key plug, and means controllable by a key inserted into said key slot for normally overcoming the action of said spring and for lifting said plug tumbler to a position such that it projects also into the tumbler-receiving recess in the casing.

12. In lock construction, in combination, a key plug having a key-receiving slot and at least two radially extending tumbler-receiving recesses communicating with the slot, a tumbler within each of said recesses in the plug, a casing movably mounting said key plug and having two tumbler-receiving recesses opening against the key plug and with which the tumbler-receiving recesses in the key plug are normally alined, a tumbler in each of said casing recesses, a spring in each of the latter tending to move its casing tumbler and related plug tumbler, when said recesses are alined, in a direction toward the plug and to a distance sufficient to cause the casing tumbler to project also into the tumbler-receiving recess in the key plug, and means responsive to the insertion of a key into said key slot and made ineffective thereby for overcoming the action of one of said springs and for moving and holding the plug tumbler in a position such that it normally projects also into the tumbler-receiving recess in the casing.

13. In lock construction, in combination, a key plug having a key-receiving slot and at least two radially extending tumbler-receiving recesses communicating with the slot, a tumbler within each of said recesses in the plug, a casing movably mounting said key plug and having two tumbler-receiving recesses opening against the key plug and with which the tumbler-receiving recesses in the key plug are normally alined, a tumbler in each of said casing recesses, a spring in each of the latter tending to move its casing tumbler and related plug tumbler, when said recesses are alined, in a direction toward the plug and to a distance sufficient to cause the casing tumbler to project also into the tumbler-receiving recess in the key plug, and spring-pressed means exposed to said key slot, thereby to be made ineffective by a proper key inserted into the key slot, acting against one of said plug tumblers and overcoming the action of the spring normally acting upon it through a casing tumbler for moving and holding said plug tumbler into the tumbler-receiving recess in the casing.

14. In lock construction, in combination, a casing having movably related thereto a key plug having a key slot therein, said casing having a plurality of tumbler-receiving recesses and said key plug having a plurality of tumbler-receiving recesses adapted, upon relative movement between the key plug and the casing, to register, tumblers in said casing recesses, tumblers in said plug recesses, and key-controlled means normally and in the absence of the key causing at least one of said first-mentioned tumblers to project into its key plug recess and at least one of said plug tumblers to project into its casing recess.

15. In lock construction, in combination, a casing having movably related thereto a key plug having a key slot therein, said casing having a plurality of tumbler-receiving recesses and said key plug having a plurality of tumbler-receiving recesses adapted upon relative movement between the key plug and the casing, to register, tumblers in said casing recesses, tumblers in said plug recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, thereby to cause said casing tumblers to interlock the plug and the casing, whereby, upon the insertion of the proper key into said key slot, said springs and said key may coact to bring the junctions between casing tumblers and their respective plug tumblers in alinement with the junction between the key plug and the casing, and means controlled by an appropriate portion of the proper key insertable into said key slot and acting, in the absence of said key, to cause a number less than all of said plug tumblers each to be moved and held, against the action of its associated casing tumbler and spring, in a position to bring the junction between said plug tumbler and its said associated casing tumbler inside of the casing recess for the latter, whereby the junction between the remaining plug and casing tumblers remains, in the absence of said key, inside the plug-tumbler recess or recesses.

16. In lock construction, in combination, a casing having movably related thereto a key plug having a key slot therein, said casing having a plurality of tumbler-receiving recesses and said key plug having a plurality of tumbler-receiving recesses adapted upon relative movement between the key plug and the casing, to register, tumblers in said casing recesses, tumblers in said plug recesses, springs in said casing recesses adapted to press the tumblers therein against the tumblers in said key plug and into the tumbler-receiving recesses in the latter, thereby to cause said casing tumblers to interlock the plug and the casing, whereby, upon the insertion of the proper key into said key slot, said springs and said key may coact to bring the junctions between casing tumblers and their respective plug tumblers in alinement with the junction between the key plug and the casing, and means controlled by the proper key insertable into said key slot and acting, in the absence of said key and against the action of said springs, to cause said plug tumblers and their respective casing tumblers to be moved and held in respective positions such that the junctions between plug tumblers and casing tumblers are within the respective casing recesses of the latter.

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