Feb. 12, 1935. H. HANSEN 1,991,151

APPARATUS FOR DETERMINING CODE OF KEYS FOR CYLINDER LOCKS

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Fig. 1.

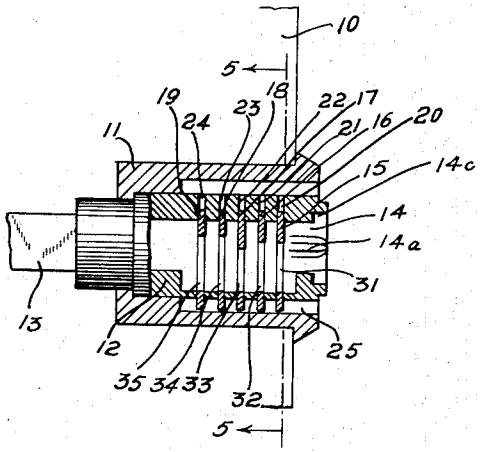



Fig. 2.

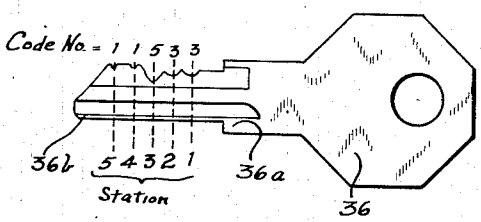



Fig. 3.

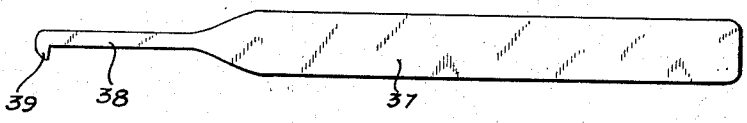



Fig. 4.

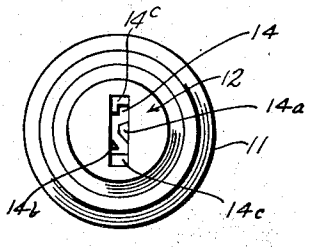



Fig. 5.

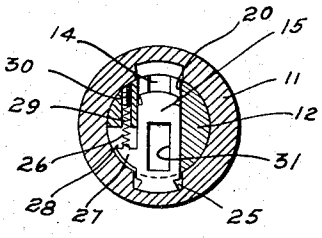



Fig. 7.

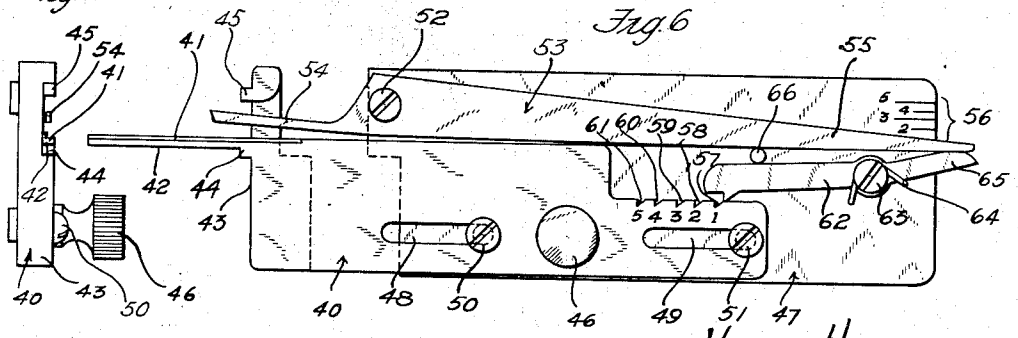



Fig. 6.

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APPARATUS FOR DETERMINING CODE OF KEYS FOR CYLINDER LOCKS

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Fig. 8

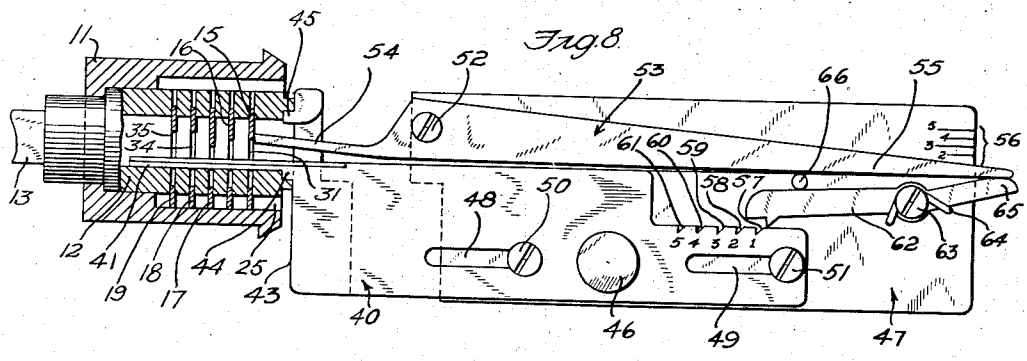



Fig. 9

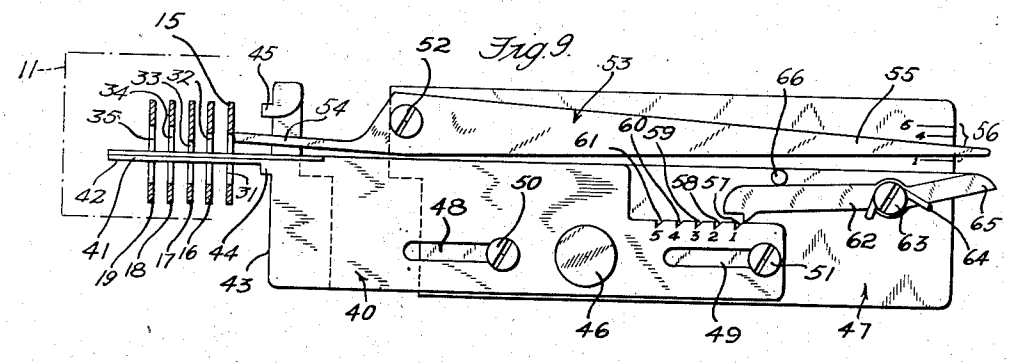



Fig. 10

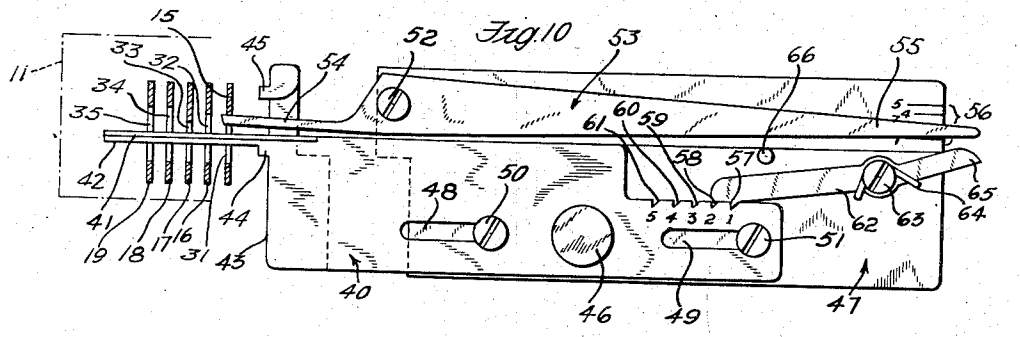
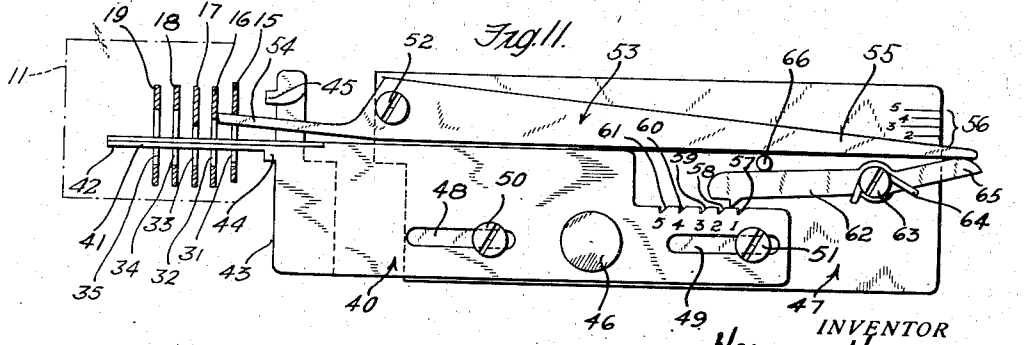



Fig. 11




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# UNITED STATES PATENT OFFICE

1,991,151

## APPARATUS FOR DETERMINING CODE OF KEYS FOR CYLINDER LOCKS

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Application January 3, 1931, Serial No. 506,374

33 Claims. (Cl. 33—174)

This invention relates to an apparatus for determining the code of keys for cylinder locks.

One of the objects of this invention is to provide a simple and practical apparatus for determining the code of the key for operating a cylinder lock so that a key may be made up from a key blank according to the code thus ascertained. Another object is to provide an apparatus of the above-mentioned character that can be manipulated and operated in practice speedily with a high degree of convenience, accurately, and inexpensively. Another object is to provide an apparatus of the above-mentioned character that will be of simple and inexpensive construction, small and compact, thoroughly accurate and dependable in action, and capable of great ease and speed of manipulation. 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, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown a preferred form of the various possible embodiments of the mechanical features of my invention,

Figure 1 is a vertical central sectional view of a cylinder lock mechanism;

Figure 2 is a plan view of a key suited to operate the mechanism of Figure 1;

Figure 3 is a plan view of an implement for preparing the lock mechanism for the application of the apparatus;

Figure 4 is an end elevational view, as seen from the right of Figure 1;

Figure 5 is a vertical cross-section, as seen on the line 5—5 of Figure 1;

Figure 6 is a side elevation of the apparatus employed in my method;

Figure 7 is an end view, as seen from the left of Figure 6;

Figure 8 is a view of the apparatus similar to that of Figure 6, but showing its application initially to the cylinder lock-operating mechanism of Figure 1 in one step of my process, and

Figures 9, 10 and 11 are views similar to that of Figure 8, illustrating a few of the subsequent steps of my method.

Similar reference characters refer to similar parts throughout the several views of the drawings.

As conducive to a clearer understanding of certain features of my invention, it may at this point be noted that locksmiths are frequently called upon to fit a key to a cylinder lock-operating mechanism and according to certain past practice such fitting of a new key has been all too greatly facilitated by the fact that the lock mechanism itself has in many instances been stamped with the code numbers of the corresponding keys. While this has facilitated the work of the locksmith, it has at the same time made all too readily available to unauthorized persons the exact information from which a key to fit that particular lock can be reproduced inasmuch as it is a relatively simple matter to cut the necessary deths of notches in a cylinder key where the code number for that key is known. This deficiency has patricularly made itself felt in the automobile field.

In accordance with certain features of my invention, I avoid the necessity of having to stamp the key code number on the lock mechanism itself and I have provided a method and apparatus for determining the key code number from the lock mechanism so that the flagrant display of the code number on the lock mechanism itself is not at all necessary. In case a new key has to be provided, my invention provides a convenient method and apparatus for determining the code number of the key to suit that lock.

Referring now to the drawings, and more particularly to Figures 1, 2, 4 and 5, I have shown at 10 what may be considered to be a door or the like to which is attached, in any suitable manner, a cylinder lock-operating mechanism which may include a casing 11 within which is rotatably mounted the key cylinder 12, the latter having suitable connection, as by the bar 13, to the bolt or latch mechanism (not shown) itself.

The key cylinder 12 is provided with a key slot 14 (see Figures 1 and 4) which, in end view or in cross-section, may be suitably shaped, as by projections $14^a$, $14^b$, etc., to prevent the insertion therein of a key unless the latter has appropriate longitudinally extending grooves within which these projections are received. Normally the key cylinder 12 is prevented from being rotated to operate the lock or latch mechanism by key-engaging devices or tumblers which may be of any suitable number and which are illustratively shown in the drawings as five in number; these tumblers are shown in Figure 1 at 15, 16, 17, 18 and 19.

Tumblers 15—19 may, insofar as certain features of my invention are concerned, take any suitable or appropriate form, but they are pref-

erably in the form of relatively heavy sheet metal members shaped substantially as is better shown in Figure 5, where member 15 of Figure 1 is plainly shown in plan view. Members of this general character are known in the art as "wafers" and they will hereinafter be thus termed.

Inasmuch as all of the wafers are of identical construction, it will suffice to describe in detail the construction of only one of them, and hence reference may again be made to Figure 5 wherein wafer 15 will be seen to be of a generally rectangular shape slidably received within a slot 20 in the key cylinder 12. The upper and lower ends, as seen in Figure 5, of the wafer 15, are curved to substantially the same radius as that of the key cylinder 12, the longest dimension of the wafer 15 being not greater than the diameter of the key cylinder 12. If, therefore, wafer 15, and with it the remaining wafers of the lock mechanism, is positioned so that its end curved edges coincide with the outer cylinder surface of key cylinder 12, the latter may be rotated with respect to the casing 11. It is, of course, the function of the key thus to position these wafers to permit this rotation to take place.

Normally, however, the lower ends of the wafers are received within a longitudinally extending slot 25 in the casing 11; this relation of the parts is clearly shown in both Figures 1 and 5. Normally, this relation is maintained by means of a spring 26 that forces the wafer 15 downwardly and holds it in the position shown in Figure 5. Spring 26 is preferably a helical spring one end of which bears against and is held by a lateral projection 27 of the wafer 15, this projection 27 being received in a suitable cut away portion 28 in the key cylinder 12, while the upper end of the spring 26 is received within a bore 29 in the key cylinder 12, the spring being held in a suitably compressed state by means of a small screw 30 threaded into the upper end of the bore 29. A similar spring arrangement is, of course, associated with each of the remaining wafers.

As is better shown in Figure 1, wafers 15, 16, 17, 18 and 19 are slidably carried in suitable guideways or slots 20, 21, 22, 23 and 24, respectively formed in the key cylinder 12 and are provided with rectangularly shaped apertures 31, 32, 33, 34 and 35, respectively, these apertures being generally in line with the key slot 14. In Figure 5 the rectangularly shaped aperture 31 of wafer 15 is better shown. These apertures are of varying dimension in the vertical direction, as viewed in Figure 1, and, with all of the wafers pressed downwardly by their respective springs so that the lower edge faces thereof abut against the bottom wall of the slot or channel 25 (Figures 5 and 1) in the casing 11, the upper portions of the wafers present or form projections of varying lengths directed downwardly into the key slot 14 in the cylinder 12. It is by these projecting portions, of different lengths or of different combinations of different lengths (or depths) that a suitably notched key, when inserted into the key slot 14, is to lift all of the wafers throughout the same distance and, moreover, throughout such a distance as will just lift the lower portions of all of the wafers out of the slot or channel 25, thus to permit the key cylinder 12 and lock-operating bar 13 to be rotated with respect to the casing 11.

With a lock having five wafers, as is illustratively shown in Figure 1, a key having five "stations", with a notch of suitable depth at each station, is necessary, and in Figure 2 I have shown in plan view a key 36 with the stations indicated by the numerals 1, 2, 3, 4 and 5.

For purposes of illustration, I have shown a lock construction in Figure 1 in which the wafers are so shaped that, to operate the lock, a key whose code number is 33511 is provided; this means that wafers 15 and 16, corresponding to stations 1 and 2 of the key (see Figure 2) are the same, the wafers 18 and 19 corresponding to stations 4 and 5 on the key are also the same, and that wafers 18 and 19, corresponding to stations 4 and 5, have upper portions projecting into the key slot by a distance of one unit, wafer 17 has an upper portion thus projecting into the key slot 14 by a distance or depth of five units, and wafers 15 and 16 have projecting portions of three units length.

Or, stated differently, in order to lift all of these wafers or disks, as they are sometimes called, throughout the same distance, a key, like that of Figure 2, must be provided in which the notches corresponding to stations 1 and 2 must be three times as deep as the notches corresponding to stations 4 and 5 and the notch corresponding to station 3 must be five times as deep as that of station 4 or 5; in Figure 2 I have shown these notches proportioned in substantially this way with respect to one another.

The units represented by the individual numbers making up the code number of the key may vary depending upon the manufacture or style of lock or the like and purely by way of illustration these units of measure may, for example, be 0.012 inch; that is, referring to Figure 2, the notches of stations 1 and 2 are each 0.036 inch in depth, the depth of the notch of station 3 is 0.060 inch, the depth of the notches of stations 4 and 5 is 0.012 inch. It is to be understood, however, that these units of measure are purely arbitrary and, in fact, vary with the code adopted by any particular lock manufacturer.

Considering now how, in accordance with certain features of my invention, I proceed to determine the code number 33511 of the lock mechanism of Figure 1, I first run into the key slot 14 an implement like that shown in Figure 3; this implement has a handle portion 37, a restricted shank 38, and a downwardly rounded end portion 39. By running this implement back and forth along the key slot 14 so that the end portion 39 rides along the bottom edge of the key slot, all of the wafers 15—19 are positively forced downwardly into their lowermost position. The various springs 29 (Figure 5) should normally force these wafers into their lowermost position but the various parts sometimes "stick", due to various factors that are sometimes hard to eliminate, but, by means of the implement 37—39, I am enabled to insure that all of the wafers are properly positioned for subsequent determination of the depths thereof.

In Figures 6 and 7 I have shown a preferred form of mechanism for thus determining the depths and before considering the manual manipulation and the operation thereof, it might first be pointed out that this mechanism includes a plate-like member 40 provided at its left-hand end with a straight-edged prong 41 whose lower edge face 42 is exactly at right angles to the left-hand end face 43 of the member 40. Projecting to the left from the end face 43 are two vertically spaced projections 44 and 45, these projections having a width in a horizontal direction and being spaced vertically such that they may be snugly received within the right-hand end portion

14c of the key slot 14 (Figure 1). This portion 14c of the slot 14 is of greater vertical dimension than the main portion of the slot 14, as is clearly shown in Figure 1, and it is into this portion 14c of the key slot that the shank portion 36a (Figure 2) of the key 36 fits. The prong 41 is virtually an extension of the lower portion 44 and, moreover, the prong 41 is L-shaped in cross-section (see Figure 7) so that, like the lower portion 36b (Figure 2) of the key 36, it will pass into the key slot with the horizontal portion of its cross-section underlying the projection 14b (Figure 4) and the vertical portion thereof passing to the right of projection 14b in the key slot 14.

In Figure 8 the device or mechanism is shown inserted into the lock mechanism, after the various wafers thereof have been properly positioned by means of the implement shown in Figure 3. By means of a knob-like handle 46 (better shown in Figure 7), the plate member 40 is held in the position shown in Figure 8, with respect to the lock mechanism, the projections 44 and 45 fitting into the enlarged portion 14c of the key slot 14 while the left-hand end face 43 is held squarely in contact with the front face of the key cylinder 12; thus the prong 41 is properly lined up and held lined up with respect to the various parts of the lock mechanism and is thus made to form an accurate datum line with respect to which certain other parts of the mechanism operate.

Plate member 40 has slidably related to it an auxiliary plate member 47, the two plates being arranged in overlapping relation and being secured together for relative sliding movement in any suitable manner; preferably, plate 40 is provided with two longitudinally extending slots 48 and 49 through which extend suitable pins or screws 50 and 51 secured to or threaded into the rear plate member 47. Slots 48 and 49 extend parallel to the prong 41 and hence to the datum plane or line represented by the latter and hence movement of plate 47 relative to plate 40, together with any part or parts carried by plate 47 takes place exactly parallel to this datum plane or line. In Figure 8 (and also in Figure 6) plate 47 is shown in its extreme right-hand position with respect to plate 40.

As above noted, plates 40 and 47 are arranged in overlapping relation and as appears clearly from the drawings, plate 47 is of greater vertical dimension than plate 40 and hence extends above the latter. Positioned above the plate 40 and pivotally secured to plate 47, by a pin or screw 52, is what may be termed a combined gage and adjusting device, generally indicated at 53. Part 53 is provided with a wafer-engaging or gaging portion or gage 54 that extends betwen the vertically spaced projections 44 and 45 (see also Figure 7) and, moreover, is substantially in overlapping relation with respect to the prong 41. Part 53 has an operating or adjusting and indicating arm or portion 55 extending to the right and preferably beyond the right-hand end edge of plate 47.

The right-hand portion of plate 47 bears vertically spaced graduations generally indicated at 56, these graduations being equally spaced and having related thereto appropriate indicia, such as the numbers "1", "2", "3", "4" and "5", reading in an upward direction. For a given type of key, the above-mentioned indicia represent the units of measurement by which the depth of the notches in a key of that type are measured, and these graduations are read off, as will be explained hereinafter, as they are indicated by the upper edge of the operating and indicating arm 55 of part 53.

Movement in a direction toward the left of the plate 47 with respect to plate 40 is made to take place step-by-step and in intervals such that each step moves plate 47 toward the left relative to plate 40 by a distance equivalent to the spacing of the wafers 15, 16, etc., in an axial direction relative to the key cylinder 12 and this step-by-step movement is preferably achieved under the control of the gaging member 53.

The right-hand end portion of plate member 40 is provided with a series of notches 57, 58, 59, 60 and 61, corresponding in number with the number of wafers in the lock mechanism and hence, in the illustrative embodiment shown in the drawings, being five in number. Just as each wafer, therefore, corresponds to a certain "station" on the key, so also does each of these notches, arranged in the form of a ratchet, correspond to a given station on the key. Each notch, moreover, is identified by its station number, and in the drawings the station-identifying indicia "1", "2", "3", "4" and "5" appear adjacent their respective station notches.

Coacting with these ratchet notches is a pawl 62 pivoted to plate 47 by a screw 63 and constantly urged in counter-clockwise direction by a spring 64, the latter thus tending always to force the pawl 62 toward notch-entering position. Pawl 62 has an arm 65 that extends to the right and beyond the right-hand end of plate 47, coming directly underneath and within the plane of movement of the operating portion 55 of part 53. A pin 66 carried by plate 47 acts to limit movement of pawl 62 in clockwise direction and acts also to limit the downward swinging movement of operating portion 55 of the part 53.

The mechanism is related to the lock mechanism in the manner already above-described but with the plate member 47 moved into its extreme right-hand position, as shown in Figure 8, and with operating arm 55 depressed so that gage 54 is in its uppermost position; in this position, arm 55 is at the "1" position of the graduations 56. Pawl 62 is held in uppermost position, against the action of spring 64, due to the engagement of operating arm 55 with arm 65 of pawl 62, there being provided sufficient friction at the pivotal mounting of part 53 so that the latter is held in whatever position it is manually moved.

The operator then attempts to push plate 47 with the parts carried thereby in a direction toward the left, but wafer 15 is in the path of movement of the gage 54 and movement to the left is thus prevented; this indicates to the operator that the first wafer, corresponding to station number "1" on the key, does not bear the code number "1".

Thereupon the operator moves arm 55 upwardly to set it at the indication "2" of the indicia 56, thus lowering the gage 54. He again attempts to move plate 47 to the left but the wafer 15 is of such a shape and "depth" that it still blocks movement of gage 54 and the parts connected thereto. The operator thus knows that the wafer 15 does not correspond to the code number "2".

The operator then resets gage 54 so that the arm 55 is at the indication "3" of the graduations 56, this position being shown in Figure 9, and thus the gage 54 is lowered by another unit

of measurement corresponding to the particular code. Bearing in mind the code of the lock mechanism, as was described in detail hereinabove, and recalling that the code number corresponding to wafer 15 is "3", this resetting positions the gage 54 in substantial alinement with the lower edge of the upper portion of the wafer 15, as is clearly shown in Figure 9. The operator then attempts to move plate 47 to the left, and, in view of the above-mentioned alinement, the plate 47 moves to the left, gage 54 passing through the rectangular opening in wafer 15 and thus by-passing the key-engaging device 15, whereupon further movement is halted by pawl 62 sliding into notch 57 corresponding to station number "1" of the key. The relation of the parts at this stage is fully shown in Figure 10 and from the graduations 56 the operator knows that the code number is "3" and from the notch into which the pawl 62 has passed, he knows that this code number "3" corresponds to station number "1" on the key, the pawl thus acting also as an indicator of the station.

The operator then proceeds in a similar manner to determine the code number of the next station or notch of the key corresponding to wafer 16 and as a first step, starting with the parts in the position shown in Figure 10, he swings operating arm 55 downwardly into the number "1" position, as is indicated by the graduations 56 and as is shown in Figure 11. This operation results in lifting pawl 62 out of notch 57, thus permitting movement of plate 47 and of gage 54 in a direction toward the left until gage member 54 abuts against wafer 16 which, it will be recalled, is shaped like wafer 15 and corresponds to a code number "3" for station or notch number "2" on the key. The operator then repeats the steps outlined above and has the code number of wafer 16 indicated to him by one of the graduations 56 and the station number indicated by one of the notches with which pawl 62 coacts.

These steps are repeated for each succeeding wafer and by successive repetitions of the above-mentioned steps, the operator will find that pawl 62 slides into notch 58 (station "2") when the arm 55 stands at the indication "3", that pawl 62 slides into notch 59 (station "3") when arm 55 indicates "5", and that pawl 62 by-passes notch 60 (station "4") when arm 55 indicates "1" and also by-passes ratchet notch 61 (station "5") when arm 55 stands at indication "1".

Thus, he determines that the code number of the key for this particular lock is 33511, the individual digits of which representing the units of depth of notches corresponding to stations "1", "2", "3", "4" and "5", respectively, of the key. With this information, and knowing the type of key blank to use for the particular type of lock, the locksmith thereupon proceeds to cut the notches of the requisite depth for the corresponding stations of the key, all as will be clear from a consideration of Figure 2.

It will thus be seen that I have provided in my invention an apparatus in which the various objects hereinbefore noted, together with many thoroughly practical advantages, are successfully achieved. It will be seen that the mechanism is simple, compact, and substantially fool-proof and also it will be seen that the apparatus of my invention is well adapted to meet the varying conditions of practical use.

I claim:

1. In a device of the character described, in combination, means having a portion insertable into the key slot of a key cylinder, means supported by and movable with respect thereto, in a direction along the line of the tumblers projecting into the key slot, a gage adjustably carried by said movable means and adapted to be positioned at any one of a plurality of different heights relative to the line of movement of said movable means, indicia for indicating the adjustment of said gage, and means for preventing movement of said movable means with said gage in a direction inwardly of said key slot by a distance greater than the spacing between two successive tumblers in said key cylinder.

2. In a device of the character described, in combination, means having a portion insertable into the key slot of a key cylinder, means supported by and movable with respect thereto in a direction along the line of the tumblers projecting into the key slot, a gage adjustably carried by said movable means and adapted to be positioned at any one of a plurality of different heights relative to the line of movement of said movable means, indicia for indicating the adjustment of said gage, and indicating means for indicating the station of a tumbler by-passed by said gage.

3. In a device of the character described, in combination, a frame member having means adapted to fit into a key slot in a key cylinder without obstructing access to the devices projecting into said key slot and that are intended to be engaged and lifted by a key; a member slidably carried by said frame and related to the latter for movement in a direction lengthwise of said key slot; a gage carried by said slidable member and adapted to enter the key slot and engage any of said devices positioned in advance thereof, said gage being shiftable in a direction transversely of the line of movement of said slidable member to cause said gage to by-pass an obstructing key-engaging device; and indicia for indicating the by-passing height of said gage.

4. In a device of the character described, in combination, a frame member having means adapted to fit into a key slot in a key cylinder without obstructing access to the devices projecting into said key slot and that are intended to be engaged and lifted by a key; a member slidably carried by said frame and related to the latter for movement in a direction lengthwise of said key slot; a gage carried by said slidable member and adapted to enter the key slot and engage any of said devices positioned in advance thereof, said gage being shiftable in a direction transversely of the line of movement of said slidable member to cause said gage to by-pass an obstructing key-engaging device; indicia for indicating the by-passing height of said gage; and means operating upon said slidable member for preventing said gage from by-passing a succeeding key-engaging device.

5. In a device of the character described, in combination, a frame member having means adapted to fit into a key slot in a key cylinder without obstructing access to the devices projecting into said key slot and that are intended to be engaged and lifted by a key; a member slidably carried by said frame and related to the latter for movement in a direction lengthwise of said key slot; a gage carried by said slidable member and adapted to enter the key slot and engage any of said devices positioned in advance thereof, said gage being shiftable in a direction transversely of the line of movement of said slidable

member to cause said gage to by-pass an obstructing key-engaging device; indicia for indicating the by-passing height of said gage; and means for indicating the station of the key-engaging device by-passed by said gage.

6. In a device of the character described, in combination, a frame member having means adapted to fit into a key slot in a key cylinder without obstructing access to the devices projecting into said key slot and that are intended to be engaged and lifted by a key; a member slidably carried by said frame and related to the latter for movement in a direction lengthwise of said key slot; a gage carried by said slidable member and adapted to enter the key slot and engage any of said devices positioned in advance thereof, said gage being shiftable in a direction transversely of the line of movement of said slidable member to cause said gage to by-pass an obstructing key-engaging device; indicia for indicating the by-passing height of said gage; means for causing the movement of said slidable member relative to said frame to take place in steps corresponding each to a key-engaging device in said key cylinder; and indicating means for indicating said steps.

7. In a device of the character described, in combination, a frame member having means adapted to fit into a key slot in a key cylinder without obstructing access to the devices projecting into said key slot and that are intended to be engaged and lifted by a key; a member slidably carried by said frame and related to the latter for movement in a direction lengthwise of said key slot; a gage carried by said slidable member and adapted to enter the key slot and engage any of said devices positioned in advance thereof, said gage being shiftable in a direction transversely of the line of movement of said slidable member to cause said gage to by-pass an obstructing key-engaging device; indicia for indicating the by-passing height of said gage; and means controlled by the position of said gage for causing the movement of said slidable member with the gage carried thereby to take place step-by-step.

8. In a device of the character described, in combination, a frame member having means adapted to fit into a key slot in a key cylinder without obstructing access to the devices projecting into said key slot and that are intended to be engaged and lifted by a key; a member slidably carried by said frame and related to the latter for movement in a direction lengthwise of said key slot; a gage carried by said slidable member and adapted to enter the key slot and engage any of said devices positioned in advance thereof, said gage being shiftable in a direction transversely of the line of movement of said slidable member to cause said gage to by-pass an obstructing key-engaging device; indicia for indicating the by-passing height of said gage; and a pawl carried by said slidable member, said frame having a plurality of notches with which said pawl may coact, one for each key-engaging device in said key cylinder and spaced substantially like said devices are spaced, said pawl riding completely into a notch only upon completion of the by-passing movement of said gage.

9. In a device of the character described, in combination, a frame member having means adapted to fit into a key slot in a key cylinder without obstructing access to the devices projecting into said key slot and that are intended to be engaged and lifted by a key; a member slidably carried by said frame and related to the latter for movement in a direction lengthwise of said key slot; a gage carried by said slidable member and adapted to enter the key slot and engage any of said devices positioned in advance thereof, said gage being shiftable in a direction transversely of the line of movement of said slidable member to cause said gage to by-pass an obstructing key-engaging device; indicia for indicating the by-passing height of said gage; a pawl carried by said slidable member, said frame having a plurality of notches with which said pawl may coact, one for each key-engaging device in said key cylinder and spaced substantially like said devices are spaced, said pawl riding completely into a notch only upon completion of the by-passing movement of said gage; and means responsive to resetting of said gage member for disengaging said pawl from a notch.

10. In a device of the character described, in combination, a pair of members, one of which is adapted to be alined with respect to the key slot in a key cylinder and the other of which is slidably carried by said first mentioned member for movement in a direction lengthwise of the key slot, one of said members having a plurality of notches; a pawl carried by the other of said members and coacting successively with said plurality of notches in the other of said members upon relative sliding movement between said members, there being one notch for each key-engaging device in said cylinder and said notches being spaced similarly as said devices are spaced; and an adjustable gage carried by said slidable member and adapted to project into the key slot to cause any one device in the latter to obstruct movement of said slidable member, said pawl and said notches partaking of relative movement as said slidable member slides relative to the other member and said pawl riding into a notch upon the completion of the relative sliding movement between said members when said gage has been adjusted to by-pass an obstructing key-engaging device.

11. In a device of the character described, in combination, a pair of members, one of which is adapted to be alined with respect to the key slot in a key cylinder and the other of which is slidably carried by said first-mentioned member for movement in a direction lengthwise of the key slot, one of said members having a plurality of notches; a pawl carried by the other of said members and coacting successively with said plurality of notches in the other of said members upon relative sliding movement between said members, there being one notch for each key-engaging device in said cylinder and said notches being spaced similarly as said devices are spaced; and an adjustable gage carried by said slidable member and adapted to project into the key slot to cause any one device in the latter to obstruct movement of said slidable member, said pawl and said notches partaking of relative movement as said slidable member slides relative to the other member and said pawl riding into a notch upon the completion of the relative sliding movement between said members when said gage has been adjusted to by-pass an obstructing key-engaging device; and means for indicating the adjustment of said gage.

12. In a device of the character described, in combination, a pair of members, one of which is adapted to be alined with respect to the key slot in a key cylinder and the other of which is slidably carried by said first-mentioned member for

movement in a direction lengthwise of the key slot, one of said members having a plurality of notches; a pawl carried by the other of said members and coacting successively with said plurality of notches in the other of said members upon relative sliding movement between said members, there being one notch for each key-engaging device in said cylinder and said notches being spaced similarly as said devices are spaced; and an adjustable gage carried by said slidable member and adapted to project into the key slot to cause any one device in the latter to obstruct movement of said slidable member, said pawl and said notches partaking of relative movement as said slidable member slides relative to the other member and said pawl riding into a notch upon the completion of the relative sliding movement between said members when said gage has been adjusted to by-pass an obstructing key-engaging device; and means responsive to a resetting of said gage for disengaging said pawl from the notch which it has entered.

13. In a device of the character described, in combination, a pair of members, one of which is adapted to be alined with respect to the key slot in a key cylinder and the other of which is slidably carried by said first-mentioned member for movement in a direction lengthwise of the key slot, one of said members having a plurality of notches; a pawl carried by the other of said members and coacting successively with said plurality of notches in the other of said members upon relative sliding movement between said members, there being one notch for each key-engaging device in said cylinder and said notches being spaced similarly as said devices are spaced; and an adjustable gage carried by said slidable member and adapted to project into the key slot to cause any one device in the latter to obstruct movement of said slidable member, said pawl and said notches partaking of relative movement as said slidable member slides relative to the other member and said pawl riding into a notch upon the completion of the relative sliding movement between said members when said gage has been adjusted to by-pass an obstructing key-engaging device; and direct-reading graduations for indicating the adjustment of said gage.

14. In a device of the character described, in combination, a member adapted to be alined with a key slot in a key cylinder; a gage adapted to enter said key slot; means guiding said gage for movement relative to said member and providing path of movement for said gage which is in line with the key-engaging devices projecting into said key slot; means mounting said gage for adjustment in a direction so that said gage can be given a position such that it may by-pass a key-engaging device; and indicating means for identifying the station of the device by-passed and also the adjustment of said gage.

15. In a device of the character described, in combination, a member adapted to be alined with a key slot in a key cylinder; a gage adapted to enter said key slot; means guiding said gage for movement relative to said member and providing path of movement for said gage which is in line with the key-engaging devices projecting into said key slot; means for adjusting said gage so that it may by-pass a key-engaging device; means for causing the movement of said gage along said path to take place in steps, one for each key-engaging device; and means controlled by a resetting of said gage for permitting a succeeding step of movement to take place.

16. In a device of the character described, in combination, a member adapted to be alined with a key slot in a key cylinder; a gage adapted to enter said key slot; means guiding said gage for movement relative to said member and providing path of movement for said gage which is in line with the key-engaging devices projecting into said key slot; and means for adjusting said gage so that it may by-pass a key-engaging device.

17. In a device of the character described, in combination, a member adapted to be alined with a key slot in a key cylinder; a gage adapted to enter said key slot; means guiding said gage for movement relative to said member and providing path of movement for said gage which is in line with the key-engaging devices projecting into said key slot; means for adjusting said gage so that it may by-pass a key-engaging device; and step-by-step mechanism controlled by said gage-adjusting means for causing the movement of said gage along said path to take place in successive steps.

18. In a device of the character described, in combination, a member adapted to be alined with a key slot in a key cylinder; a gage adapted to enter said key slot; means guiding said gage for movement relative to said member and providing path of movement for said gage which is in line with the key-engaging devices projecting into said key slot; and indicating means movable manually and adapted to adjust said gage so that it will by-pass an obstructing key-engaging device.

19. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage carried by said second member and adapted upon movement of the latter to enter said key slot along a path such that movement of said gage is obstructed by the key-engaging device or devices projecting into the key slot, and means for manually shifting said gage to cause it to by-pass a projecting key-engaging device.

20. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage carried by said second member and adapted upon movement of the latter to enter said key slot along a path such that movement of said gage is obstructed by the key-engaging device or devices projecting into the key slot, means for manually shifting said gage to cause it to by-pass a projecting key-engaging device, and means responsive to the relative sliding movement between said two members for identifying the station of a key-engaging device by-passed.

21. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage pivoted to said second member and adapted upon movement of the latter to enter said key slot along such a path that any projecting key-engaging devices in the cylinder obstruct movement of said gage, and means responsive to the position of said gage about its pivot after the gage has been moved to just by-pass a key-engaging device for indi-

cating the amount which said device projects into said slot.

22. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage pivoted to said second member and adapted upon movement of the latter to enter said key slot along such a path that any projecting key-engaging devices in the cylinder obstruct movement of said gage, a combined handle and pointer for shifting said pivoted gage to a position such that it by-passes an obstructing key-engaging device, and graduations coacting with said pointer for indicating the amount of displacement of the gage necessary to by-pass an obstructing device.

23. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage pivoted to said second member and adapted upon movement of the latter to enter said key slot along such a path that any projecting key-engaging devices in the cylinder obstruct movement of said gage, a handle for shifting said gage about its pivot so that the gage may by-pass an obstructing key-engaging device, and means controlled by said handle for causing the relative sliding movement between said two members to take place step-by-step.

24. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage pivoted to said second member and adapted upon movement of the latter to enter said key slot along such a path that any projecting key engaging devices in the cylinder obstruct movement of said gage, a handle for shifting said gage about its pivot so that the gage may by-pass an obstructing key-engaging device, and means controlled by said handle for identifying the station of a by-passed key-engaging device.

25. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage carried by said second member and adapted to enter the key slot upon movement of said second member relative to said first member, manually operable means for shifting said gage so that it will by-pass an obstructing key-engaging device projecting into said key slot, and means controlled by said last-mentioned means for indicating the station of a by-passed device.

26. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage carried by said second member and adapted to enter the key slot upon movement of said second member relative to said first member, manually operable means for shifting said gage so that it will by-pass an obstructing key-engaging device projecting into said key slot, and means controlled by said last-mentioned means for causing the sliding movement of said second member relative to said first member to take place step-by-step.

27. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage carried by said second member and adapted to enter the key slot upon movement of said second member relative to said first member, manually operable means for shifting said gage so that it will by-pass an obstructing key-engaging device projecting into said key slot, means controlled by said last-mentioned means for indicating the by-passing height of said gage, and means controlled by said manually operable means for identifying the station of a key-engaging device by-passed by the gage.

28. In a device of the character described, in combination, a member adapted to be alined with respect to the key slot in a key cylinder, a member slidably related to said first member for movement relative thereto in a direction lengthwise of the key slot, a gage carried by said second member and adapted to enter the key slot upon movement of said second member relative to said first member, manually operable means for shifting said gage so that it will by-pass an obstructing key-engaging device projecting into said key slot, and mechanism for causing relative sliding movement between said two members to take place step-by-step, said mechanism being controlled by said manually operable means.

29. In a device of the character described, in combination, a member having a prong-like part adapted to enter and bottom in the key slot in a key cylinder and having means for limiting and fixing the extent of entry of said part into said slot, said member being elongated, a gage, an elongated member, means slidably interrelating said two members for movement of said second-mentioned member in a direction lengthwise of the key slot, means movably mounting said gage onto said second-mentioned member so that, as said second-mentioned member is slid relative to said first-mentioned member in a direction toward the key slot, said gage enters the latter along a path in line with the key-engaging device or devices projecting into the key slot, and indicating means responsive to movement of said gage in a direction toward or away from said prong-shaped part of said first-mentioned member for determining the projection into the key slot of a by-passed key-engaging device.

30. In a device of the character described, in combination, a member having a prong-like part adapted to enter and bottom in the key slot in a key cylinder and having means for limiting and fixing the extent of entry of said part into said slot, said member being elongated, a gage, an elongated member, means slidably interrelating said two members for movement of said second-mentioned member in a direction lengthwise of the key slot, means movably mounting said gage onto said second-mentioned member so that, as said second-mentioned member is slid relative to said first-mentioned member in a direction toward the key slot, said gage enters the latter along a path in line with the key-engaging device or devices projecting into the key slot, and indicating means responsive to movement of said second-mentioned member relative to said first-mentioned member for identifying the station of a key-engaging device by-passed by said gage.

31. In a device of the character described, in combination, a member having a prong-like part adapted to enter and bottom in the key slot in a key cylinder and having means for limiting and fixing the extent of entry of said part into said slot, said member being elongated, a gage, an elongated member, means slidably interrelating said two members for movement of said second-mentioned member in a direction lengthwise of the key slot, means movably mounting said gage onto said second-mentioned member so that, as said second-mentioned member is slid relative to said first-mentioned member in a direction toward the key slot, said gage enters the latter along a path in line with the key-engaging device or devices projecting into the key slot, indicating means responsive to movement of said gage in a direction toward or away from said prong-shaped part of said first-mentioned member for determining the projection into the key slot of a by-passed key-engaging device, and indicating means responsive to movement of said second-mentioned member relative to said first-mentioned member for identifying the station of a key-engaging device by-passed by said gage.

32. In a device of the character described, in combination, a pair of members adapted upon bodily movement in the direction of the key cylinder axis to enter the key slot in a key cylinder, means mounting said members for relative movement with respect to each other in a direction toward or away from each other so as to cause one of said members to by-pass an obstructing key-engaging device projecting into the key slot, said mounting means including means whereby said one member is movable in a general direction lengthwise of the other member, whereby the by-passing of said one member of an obstructing key-engaging device takes place by movement lengthwise thereof relative to said other member, and indicating means responsive to relative movement between said members toward or away from one another for determining the projection into the key slot of a by-passed key-engaging device.

33. In a device of the character described, in combination, a pair of members adapted upon bodily movement in the direction of the key cylinder axis to enter the key slot in a key cylinder, means mounting said members for relative movement with respect to each other in a direction toward or away from each other so as to cause one of said members to by-pass an obstructing key-engaging device projecting into the key slot, said mounting means including means whereby said one member is movable in a general direction lengthwise of the other member, whereby the by-passing of said one member of an obstructing key-engaging device takes place by movement lengthwise thereof relative to said other member, and means responsive to said second-mentioned relative movement between said members for identifying the station of the device by-passed.

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