June 12, 1923.

1,458,217

F. E. BEST

KEY CUTTING MACHINE

Filed Jan. 18, 1921

FIG. 1

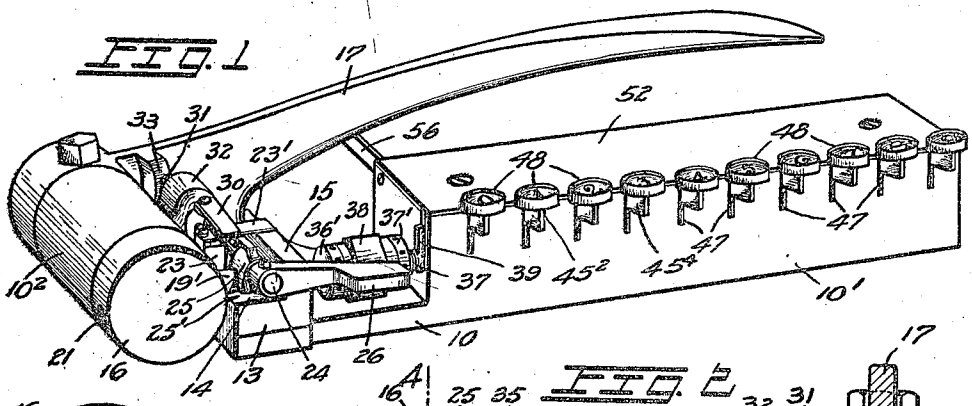


FIG. 2

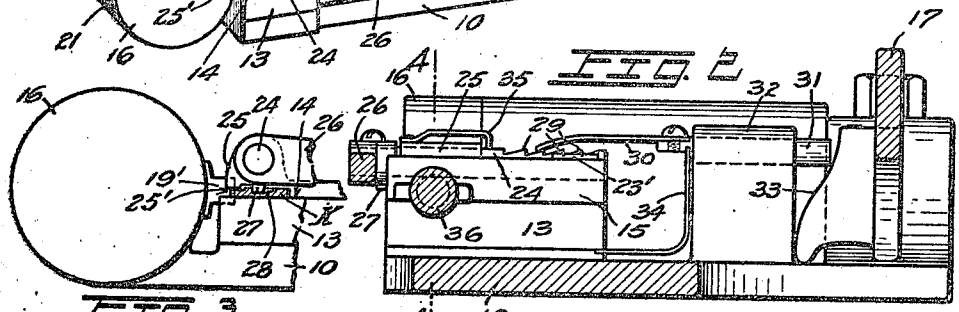


FIG. 3

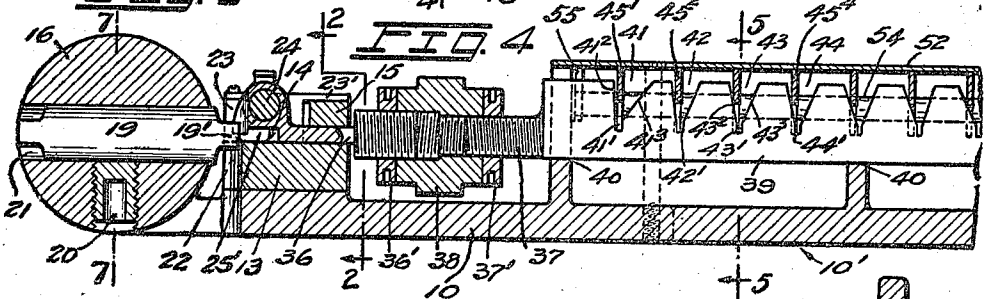


FIG. 4

FIG. 5

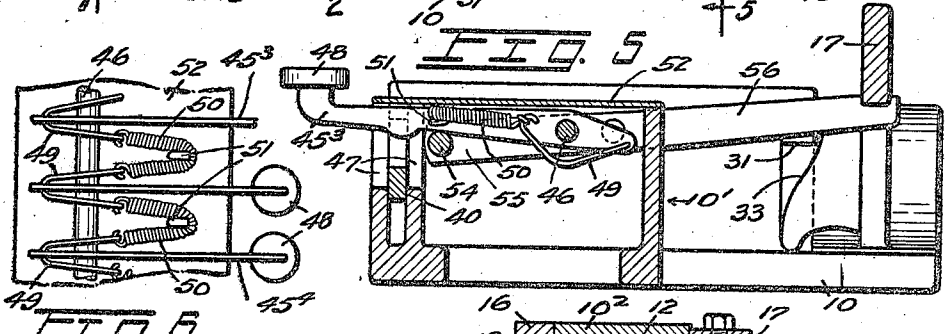


FIG. 6

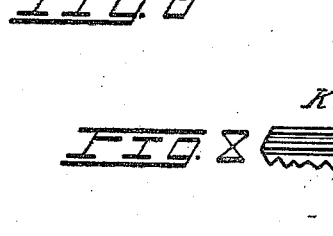


FIG. 7

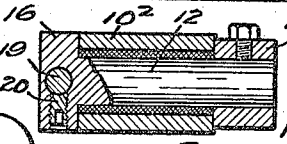


FIG. 8

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UNITED STATES PATENT OFFICE.

FRANK ELLISON BEST, OF SEATTLE, WASHINGTON, ASSIGNOR TO FRANK E. BEST, INC., OF SEATTLE, WASHINGTON, A CORPORATION OF WASHINGTON.

KEY-CUTTING MACHINE.

Application filed January 18, 1921. Serial No. 438,105.

To all whom it may concern:

Be it known that I, FRANK ELLISON BEST, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Key-Cutting Machines, of which the following is a specification.

This invention relates to machines for producing bits in keys for cylinder or pin tumbler locks.

The object of my invention is to provide an efficient machine of this character with particular reference to ease, rapidity, and accuracy of work and to the provision of visual devices for regulating predeterminately the progressive cutting actions of the machine.

With these ends in view, the invention consists in the novel construction, adaptation and arrangement of parts as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a perspective view of a key cutting machine embodying the present invention. Fig. 2 is a transverse vertical section of the same, said section being taken through 2—2 of Fig. 4. Fig. 3 is an end elevation of Fig. 2 with a key blank shown in section. Fig. 4 is a longitudinal section through 4—4 of Fig. 2. Fig. 5 is a transverse section through 5—5 of Fig. 4. Fig. 6 is a detached fragmentary underside view of the cover for the casing member. Fig. 7 is a section through 7—7 of Fig. 4. Fig. 8 is a side elevational view of a key illustrative of the character of work performed by the machine shown in the preceding views.

The frame of the machine, formed preferably of cast metal, comprises a bed member 10 having at one end a casing member 10^1 and at its other end a bracket box 10^2 for a transversely arranged rock shaft 12. Rigidly secured to the frame bed between said casing and box members is a die block 13 affording a table 14 upon which the work, such as a key blank K Fig. 3, is supported at one side of a guide element 15 of the block.

The rock shaft 12 is provided in front of the box 10^2 with a head element 16 and has secured to its rear end an operating lever 17.

The cutting of notches or gullets in a key blank is effected by means of a tool 19 secured, as by a set screw 20, within a socket 21 of the shaft head 16, said tool having a protruding nose or bit 19^1 which coacts with a shearing edge provided at the table surface 14 and above a groove 22 in the die 13.

Slidably mounted upon the table to travel longitudinally thereof is a carriage 23 provided with a lateral extension 23^1 which bears upon the table element 15. This carriage 23 carries a feed rod 24 which is journaled in the carriage for limited rotary movements. Said feed rod also extends through a guideway provided in the head 25 of a setting bar, per se, whereby lateral movements are imparted to the carriage and feed rod. Secured to the front end of the feed rod is an arm 26 which is equipped with a spur 27 adapted to engage in a slot or recess 28 provided in key blanks, Figs. 3 and 8, to couple the same with said feed rod when the arm 26 is brought into the horizontal position in which it is shown in Figs. 1, 2 and 3. The feed-rod is formed with a series of ratchet teeth 29 disposed to be at the top of the rod when the arm 26 thereof occupies the above mentioned horizontal position.

Engageable with the successive ratchet teeth of the feed-rod for the purpose of imparting step-by-step feed movements thereto is a pawl 30 which is secured to an end of a plunger 31 (Fig. 2) extending through a guide 32 of the machine frame.

The plunger, in turn, is actuated by a cam element 33 of the operating lever 17 when raising the same to advance the feed-rod subsequent to the withdrawal of the tool from the work in each cycle of the machine's operation.

When the cam 33 is brought down with the operating lever during a cutting action of the machine a spring 34 (Fig. 2) serves to retract the plunger 31 and pawl 30 for re-engagement with the feed-rod. The feed-rod is, however, normally prevented from rearward movement by means of a catch or

detent 35 connected to the head 25 of the aforesaid setting bar.

To restore the feed-rod and the carriage 24 to its rearmost position to receive a blank for cutting, the operator through the medium of arm 26 rotates the feed rod sufficiently to cause the series of ratchet teeth thereon to be removed from below the detent 35, whereupon the carriage and feed-rod are manually pushed back.

The before mentioned setting bar is disposed at right angles to the axes of the rock shaft 12 and said feed-rod 24.

For the purpose of regulating the effective length of the setting bar to properly position the head 25 thereof upon the table 14, such rod is desirably formed of two axially aligned members 36 and 37 which are connected together by an adjusting-nut 38 engaging screw threads of different pitches upon the respective bar parts. Lock nuts 36^1 and 37^1 may advantageously be used to secure said adjusting nut against accidental movement.

The head 25 forms a portion of the bar member 36 and is provided with a neck 25^1 which extends through a guide slot, see Fig. 4, provided in the block element 15.

The bar member 37 includes a vertically arranged plate element 39, hereinafter designated as the "notch plate" which is seated in guidways 40 of the casing member 10^1 of the machine frame. Said notch plate is formed or provided in its upper portion with a series of notches denoted respectively by 41, 42, 43, 44, etc. As shown in Fig. 4, these notches are formed of substantially V-shaped upper portions which respectively communicate at their apexes with narrow vertical slots 41^1, 42^1, 43^1, 44^1, etc. The slots are disposed in spaced relations which successively increase by distances apart of, for example, one eightieth (1/80) of an inch.

As shown in Fig. 4 the left hand sides 41^2, 42^2, 43^2, 44^2, etc., of the various notches are of progressively increasing inclinations while the opposite sides 41^3, 42^3, 43^3, 44^3, etc., are or may be similarly inclined, but equal, at least, to the slope of the most inclined of the opposing sides.

Operable within the respective notches is a series of finger keys in the nature of levers which are denoted by 45^1, 45^2, 45^3, 45^4, etc., which are disposed at equal distances apart when the associated notches are arranged as above explained.

Said levers are fulcrumed to a supporting rod 46 in the casing 10^1 and extend through guide slots 47 provided in the front wall of the casing.

The outer ends of the shifting levers are provided with finger engaging extremities 48 which are designated by characters such as "0," "1," "2," "3," etc. By depressing any one of said levers to cause the same to primarily engage one or the other of the sides of the respective notch shifts the setting bar in, one longitudinal direction of the other, and eventually depositing the selected lever within the associated slot to accordingly lock the setting bar in its adjusted position. For yieldingly retaining the shifting levers in their idle positions in the upper portions of the respective notches and also in their locked positions within the slots, I preferably employ a system of spring devices such as illustrated in Figs. 5 and 6. More particularly, each of the levers is connected to the rear of the fulcrum rod 46 by means of a stirrup 49 with the ends of helical extensible springs 50 located between the adjacent levers, see Fig. 6, said springs engaging intermediate their respective lengths about hook shaped lugs or attachments 51 depending from the cover 52 of the casing 10^1.

The spring connections, moreover, are such that when a lever occupies the elevated idle position in which it is represented in Fig. 5 the axis of the respective spring and the associated stirrup connection with a lever lies below the center of the fulcrum rod 46. When a lever is in its depressed or bar locking position the connection between the stirrup and the lever is brought above the fulcrum axis resulting in the tension of the springs exercising, in an obvious manner, a downward pressure of the lever against the bottom of the slot therefor.

In order to automatically withdraw the shifting levers from their locking engagement within the respective slots, I provide a tripping device comprising a horizontal finger 54 carried by an arm 55 of a lever, whose other arm 56 is encountered by the operating lever 17 in the downward movement thereof at approximately the end of each cutting action of the machine.

The operating lever when in its lowermost position, acting through the medium of the finger 54, temporarily serves to prevent the shifting levers from being operated.

For operating the machine, the lever 26 is first tilted up to rotate the rod 24 sufficiently to withdraw the teeth 29 thereof from engageable positions with the pawl 30, the carriage 23 and said rod are then retracted until arrested by the boss of lever 26 encountering the head 25 of the setting bar. A key-blank K is now placed upon the table surface 14 of the die with its back edge against the rear side of a recess 25^1 provided in said setting bar head. The lever 26 is thereupon restored to its horizontal position to accordingly bring the spur 27 into the blank recess 28, whereby the blank is engaged with the carriage 23 for longitudinal movements therewith. When the lever is swung

downwardly to engage the blank the rod 24 is rotated to revolve the teeth 29 of the same into position to be engaged by the pawl 30 to effect periodical feeding movements to the blank during the operation of the machine.

With the blank thus applied, the operator presses down upon the proper one of the finger keys or levers, as 45^4 for example, which will advance the setting rod 36—37 a suitable distance so that when the cutting tool is brought into action it will cut a notch in the blank of a predetermined depth, as will be indicated by the characters, as "3" for instance, on the finger engaging extremity of the selected finger key.

When the blank is thus set forward, the operator pushes the lever 17 downwardly thereby causing the tool to cut a notch in the blank to a predetermined depth as determined by the shifting of the setting bar as above explained.

In the latter portion of the downward movement of the lever and after the cutting tool has performed its function, said lever engages lever arm 56 to cause the tripping devices to disengage the previously employed finger key from the notch bar 39 unless a second notch of corresponding depth is to be cut in the blank. In such an event the lever 17 is not permitted to engage the lever of the tripping devices.

The lever 17 is then raised resulting in the cam element 33 thereof engaging plunger 31 to thereby act through the medium of the pawl 30 and one of the teeth 29 of the carriage rod 24 to advance the blank into position to have the next notch cut therein.

The machine is manipulated in this manner to produce each of the notches in a blank.

What I claim, is,—

1. In a key cutting machine, the combination with means for setting a blank to have notches cut therein to predetermined depths, and finger actuated keys controlling said means, of mechanism for spacing the notches automatically.

2. In a key cutting machine, the combination with mechanism for cutting notches in a key blank, and including an operating lever, of feeding mechanism rendered operative by said lever for spacing the notches in said blank.

3. In a key cutting machine, the combination with a cutting tool, and a lever for operating said tool, of devices operated by means of said lever for moving a blank automatically in one direction for spacing notches cut by said tool, and selective means for regulating a blank to cut notches therein to predetermined depths.

4. In a key cutting machine, the combination with a cutting tool, and operating mechanism therefor, of a blank carrier, feeding means therefor for spacing notches cut in the blank by said tool, and means for controlling said carrier to afford notches of various predetermined depths.

5. A key cutting machine having a die element, a cutting tool cooperating therewith, a carriage movable longitudinally of die element, means for operating the cutting tool, and means rendered operative by the aforesaid means to impart feeding movements to a blank key through the instrumentality of the carriage and in timed relation with the movements of said cutting tool.

6. A key cutting machine having a die element, a cutting tool cooperating therewith, a carriage movable longitudinally of said die element, a catch provided on said carriage and engageable with a blank, means for operating the cutting tool, and means rendered operative by the aforesaid means to impart feeding movements to the carriage in timed relation with the movements of said cutting tool.

7. In a key cutting machine, a cutting tool, a die cooperating therewith, a carriage mounted upon said die for movements longitudinally thereof, means connected to said carriage for engaging the blank thereto, means for actuating said cutting tool, means influenced by the second named means for imparting intermittent feeding movements to said carriage, and resilient means for effecting the movement of said carriage in the opposite direction.

8. In a key cutting machine, a cutting tool, a die cooperating therewith, said die serving as a table support for a key blank, a carriage mounted upon said die for movements longitudinally thereof, means connected to said carriage for engaging the blank thereto, means for actuating said cutting tool, means influenced by the second named means for imparting intermittent feeding movements to said carriage, and resilient means for effecting the movement of said carriage in the opposite direction.

9. In a key cutting machine, a die, a cutting tool cooperating therewith, means to operate said tool, a carriage provided with ratchet teeth, a pawl therefor, and means affected by the tool-operating means to impart feeding movements to the carriage through the medium of said pawl.

10. In a key cutting machine, a die serving as a table support for a key blank, a cutting tool cooperating with said die, a carriage mounted on said die and including a rotary member having a series of ratchet teeth on one side thereof, a pawl engageable with said ratchet teeth, means to impart reciprocatory motion to said pawl to effect the travel of said carriage, and means carried by said rotary member and engageable with a key blank when the teeth of said

member are in positions to be engaged by said pawl.

11. In a key cutting machine, the combination with the cutting mechanism and means to operate the same, of a blank carrier arranged for movements longitudinally and transversely of the machine, means actuated by the aforesaid means to effect feeding movements to said carrier in one direction, and key operated devices for effecting setting movements of the carrier to selected distances in a direction rectangular to its feeding movements.

12. In a key cutting machine, the combination with the cutting mechanism and means to operate the same, of a blank carrier arranged for movements longitudinally and transversely of the machine, means actuated by the aforesaid means to effect feeding movements to said carrier in one direction, and key operated and controlled devices for effecting setting movements of the carrier in a direction rectangular to its feeding movements.

13. In a key cutting machine, the combination with the machine frame, provided with a key-blank supporting table, of a rock shaft journaled in said frame, a cutting tool secured to said shaft, means to impart rotary movements to said shaft for actuating said tool, means rendered operable by the aforesaid means to impart feed movements to a blank with respect to said cutting tool, a setting bar, and means for controlling said bar to selectively vary the depths of the successive notches produced in the blank by said cutting tool.

14. In a key cutting machine, the combination with the cutting mechanism including an operating lever having a cam element, of a blank feeding device actuated by the cam element of said lever, a setting bar for adjustably moving the blank toward or from said cutting mechanism, said setting bar being provided with a series of notches having sides of progressively increasing angles of inclination, finger keys engageable with the respective sides of said notches for adjustably moving said blank at right angles to the feeding movements thereof, and means actuated by said operating lever for restoring said finger keys into their inoperative positions.

15. In a key cutting machine, the combination with the cutting mechanism, of a series of finger actuated keys and devices controlled thereby for setting a key-blank into positions to have notches cut to various selected extents therein by said mechanism.

16. In a key cutting machine, the combination with the cutting mechanism, of setting devices for positioning a key-blank in selected positions with respect to said cutting mechanism, said devices including a bar having a series of substantially V-shaped notches and slots communicating therewith, and individually operable finger keys engageable with the sides of the respective notches for shifting the bar and engageable in the respective slots for locking the bar in its set positions.

17. In a key cutting machine, the combination with the cutting mechanism, of setting devices for positioning a key-blank in various selected positions with respect to said cutting mechanism, said devices including an extensible bar having a series of substantially V-shaped notches and slots communicating therewith, individually operable finger keys engageable with the sides of the respective notches for shifting the bar and engageable in the respective slots for locking the bar in its set positions, springs for yieldingly retaining the keys in inoperative and locked relations with the bar, and tripping means for automatically disengaging said keys from said bar after each cutting operation of the machine.

18. In a key cutting machine, the combination with the cutting mechanism, of setting devices for positioning a key-blank in various selected positions with respect to said cutting mechanism, said devices including a bar having a series of substantially V-shaped notches and slots communicating therewith, individually operable finger keys engageable with the sides of the respective notches for shifting the bar and engageable in the respective slots for locking the bar in its set positions, and springs for yieldingly retaining the keys in inoperative and locked relations with the bar.

19. In a key cutting machine, the combination with a die, a cutting tool cooperating therewith, means for operating said tool, key-blank setting devices including a longitudinally movable bar, a series of finger-operated keys respectively adapted to shift said bar to different definite distances and enter into locking relations with the bar at the termination of each shifting movement of the bar, and a tripping device operated by said means to release the finger keys from the setting bar after each cutting operation of the machine.

20. In a key cutting machine, the combination with the die, a cutting tool cooperating therewith, and means to actuate said tool, of blank feeding devices including a carriage, operative connections between the tool operating means and said carriage to effect intermittent movements thereto, a setting bar operatively connected to said carriage, and means operating through the medium of said setting bar to cause the carriage to be moved at right angles to the direction of the blank feeding travel thereof.

21. In a key cutting machine, the combina-

tion with a die, a cutting tool cooperating therewith, and means to operate said tool, of a setting bar having a head element seated upon said die for movements transversely thereof, said head having a recess in its underside to accommodate a key-blank, a carriage seated upon the die and connected to said head for movements therewith longitudinally of said bar and also for movements independently of the head in a direction rectangular to the bar, and means to connect a key-blank to said carriage.

Signed at Seattle, Washington, this 12th day of January, 1921.

FRANK ELLISON BEST.

Witnesses:
PIERRE BARNES,
MARGARET G. SUPPLE.