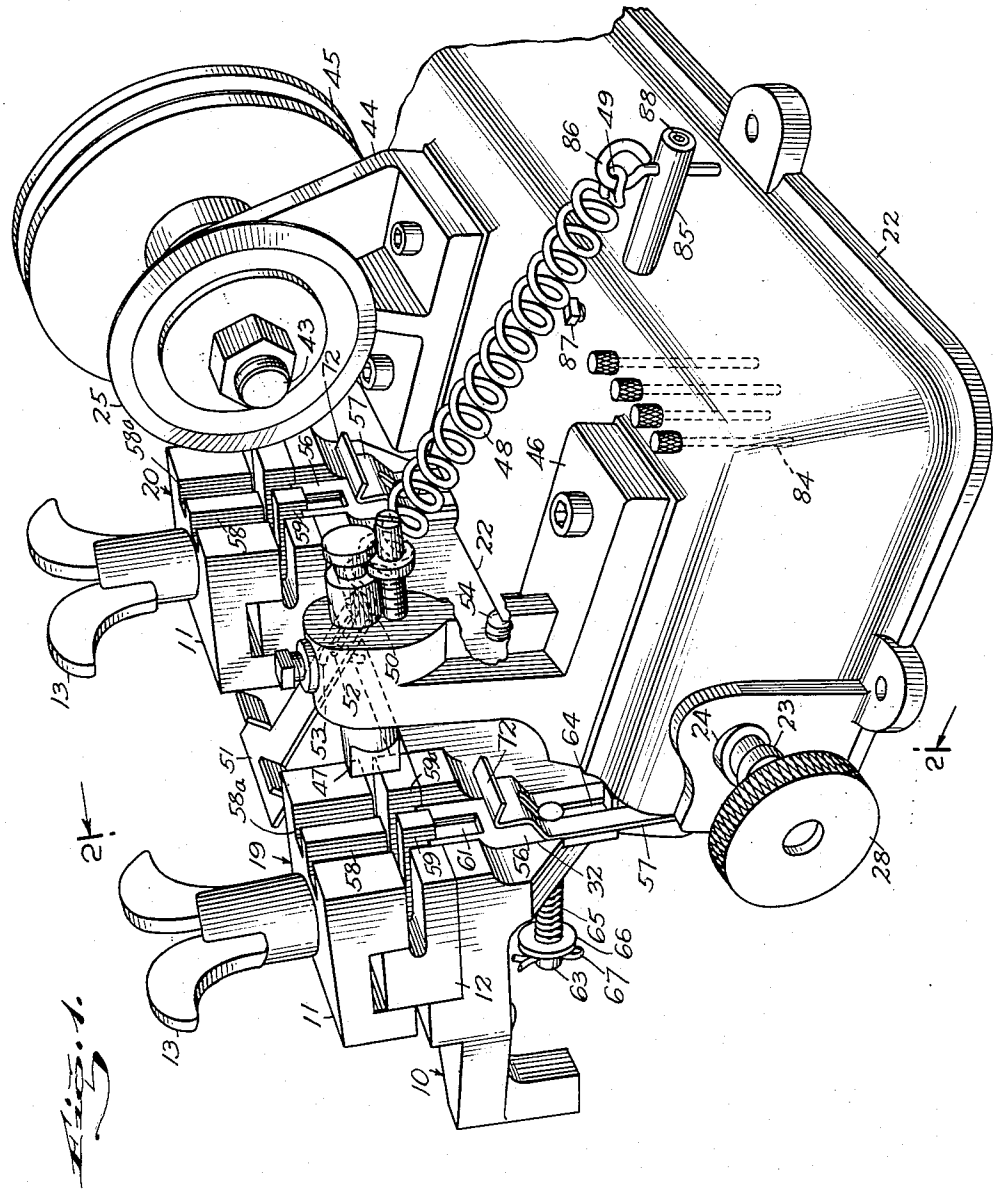
July 6, 1954 B. MAY 2,682,809

KEY CUTTING MACHINE

Filed Jan. 18, 1952 3 Sheets-Sheet 1



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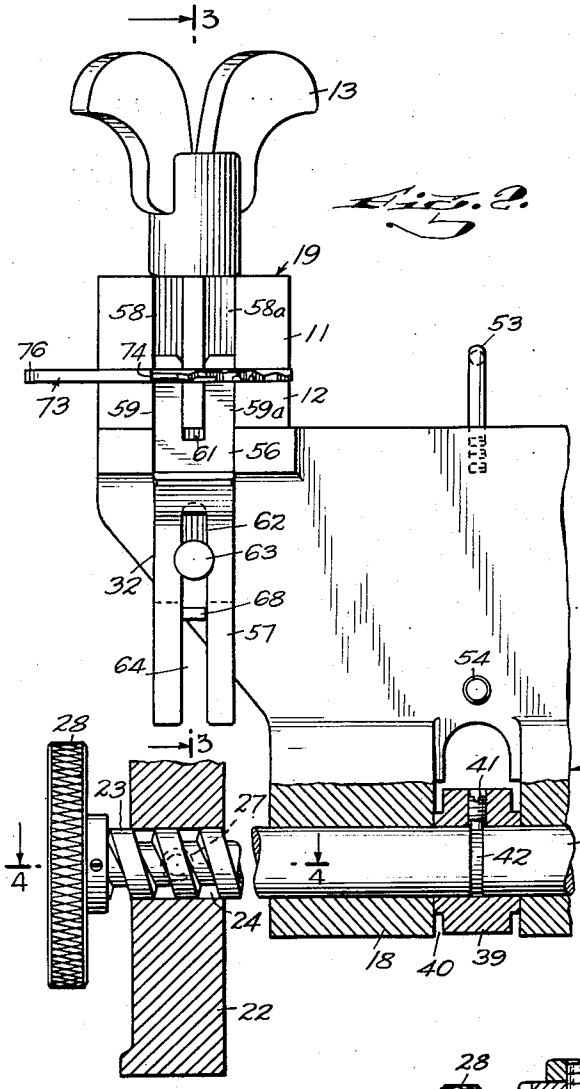

Fig. 2.

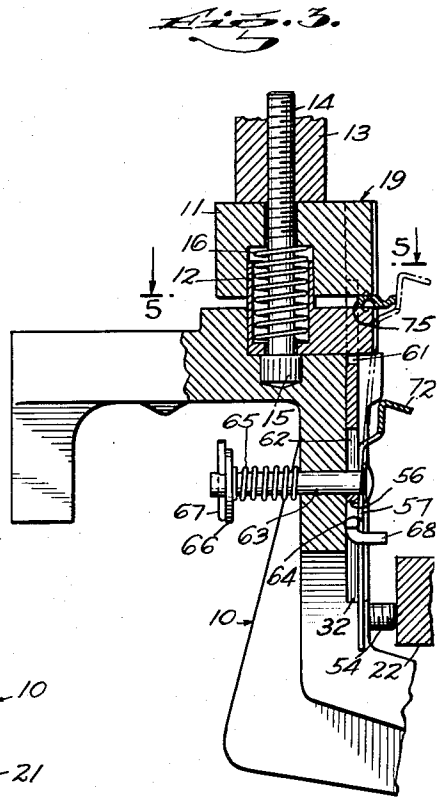

Fig. 3.

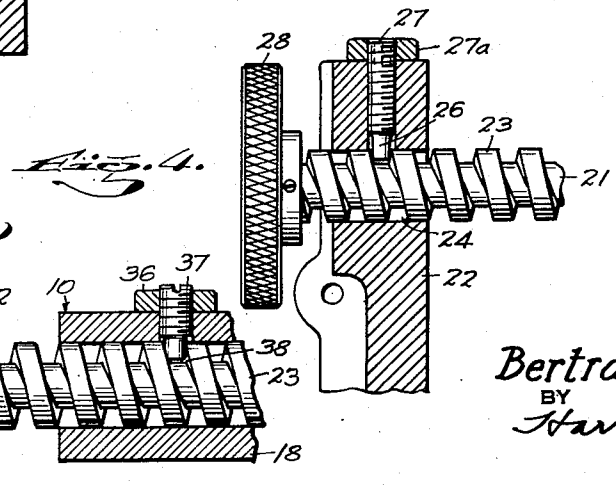

Fig. 4.

Fig. 10

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Fig. 5.

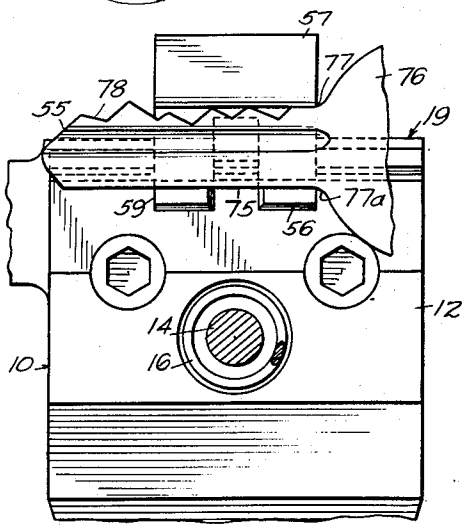
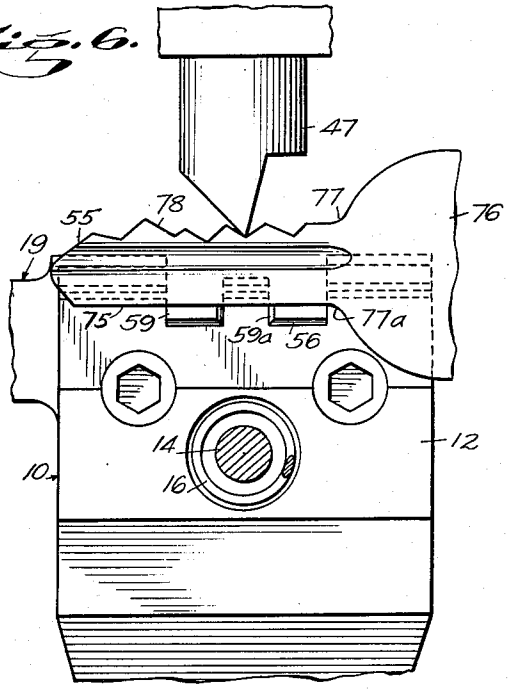


Fig. 6.



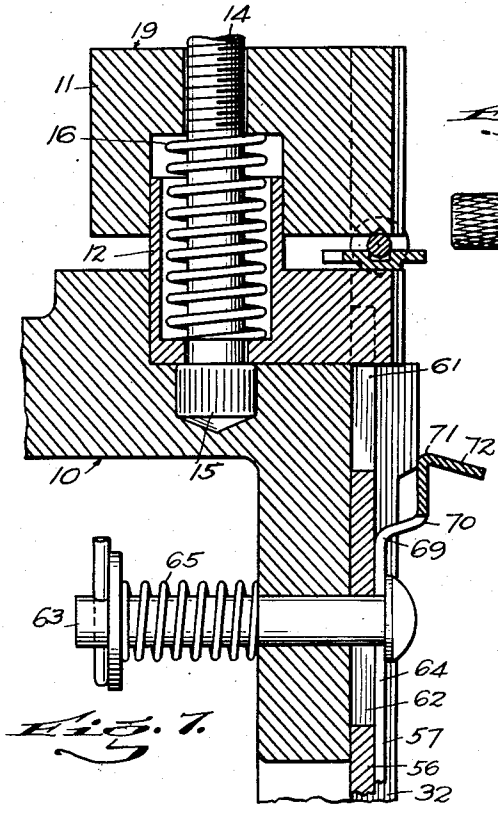


Fig. 8.

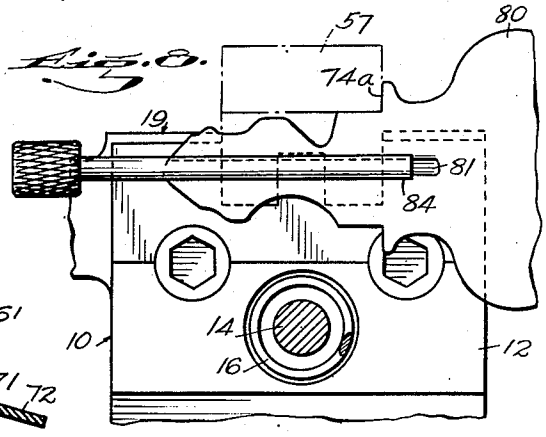
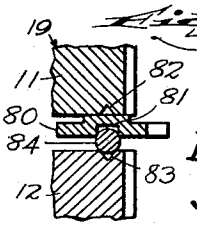


Fig. 7.

Fig. 9.



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KEY CUTTING MACHINE

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Application January 18, 1952, Serial No. 267,099

7 Claims. (Cl. 90—13.05)

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This invention relates to machines for cutting cylinder keys and particularly to the clamping, positioning and feeding means for the pattern key and the blank key.

The invention contemplates, among other things, the provision of means to position accurately in the machine and in proper relation to each other ready for the cutting operation, any of the commonly used types of cylinder keys and the corresponding blank key regardless of whether or not the key is provided with position controlling shoulders between the head and the shank of the key, or whether the key is of the usual type wherein notches are cut on one edge only, or of the double bitted variety wherein notches are cut on both edges; to enable corresponding points of the pattern key and of the blank key which is to be cut to be positioned apart a distance precisely equal to the pitch of the machine, that is, the distance between the cutter and the guide which follows the outline of the pattern key; to prevent tilting of the pattern key or the blank key in the holding vises therefor; to hold properly keys of different widths, lengths and shapes; to permit the edge of the blank key to be moved over the cutter repeatedly in both directions; and to enable cutting of the blank key at substantially constant pressure which is adjustable to compensate for differences in the key materials and to meet different conditions and thereby to attain uniform and dependable results.

The various objects of the invention will be clear from the description which follows and from the drawings, in which

Fig. 1 is a perspective view of the machine.

Fig. 2 is a fragmentary vertical sectional view of the key-holding vise and of the vise-feeding means, taken on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary vertical sectional view of the key holding and positioning means taken on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary horizontal sectional view of one form of the vise feeding means, taken on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary horizontal sectional view of the vise block and the key positioning means, showing said means operative to position a single bitted pattern key devoid of locating shoulders, the section being taken on the line 5—5 of Fig. 3.

Fig. 6 is a similar view of the same, but with the guide in the operative position and with the upper positioning slide removed to an inoperative position.

Fig. 7 is a fragmentary vertical sectional view of the vise and of the auxiliary pin means for positioning a double bitted pattern or blank key in the vise.

Fig. 8 is a horizontal sectional view similar to Figs. 5 and 6 of the vise block with the movable jaw removed and a double bitted key in place with its positioning pin, showing in dash-dot lines, the upper slide in the position assumed thereby when used to position a shouldered key.

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Fig. 9 is a fragmentary view, similar to Fig. 7, of the double bitted pattern or blank key in reversed position ready for the cutting of the edge of the blank key opposite to that shown exposed for cutting in Fig. 7.

Fig. 10 is a fragmentary horizontal sectional view, similar to Fig. 2, of a modified form of the means for operatively connecting the lead screw to the vise block to impart longitudinal movement to the block when desired.

In the practical embodiment of the invention shown by way of example, the vise block 10 carries the movable vise jaw 11 for the blank key and the similar movable jaw for the pattern key vise. Each of the vises is tightened by suitable means as by the wing nut 13 operating on the upstanding vise stud 14, the head 15 of which is fixed in any suitable manner, as by knurling and a forced fit, in the vise block. The spring 16 on the vise stud normally urges the movable vise jaw 11 against the nut 13.

The lower end 18 of the block, together with the vises 19 and 20 carried thereby, are pivotally mounted for oscillation as a unit on the lead screw shaft 21, which is revolvably mounted in the frame 22 of the machine, as best seen in Fig. 2. The lead screw 23 on the outer end of the shaft 21 passes through the unthreaded bearing hole 24 of the frame, and when operatively connected to the vise block in any suitable manner, serves when rotated, to impart longitudinal movement to said block. As shown in Fig. 4, the set screw 27 carried by the frame 22 is provided with an end part 26 normally fitted into the screw thread of the lead screw by the insertion thereof in the recess between adjacent projecting threads. The set screw 27 is normally held in its adjusted position in the frame by a suitable check nut 27a, whereby rotation of the lead screw causes longitudinal movement thereof through the hole 24 of the frame.

For obtaining uniform movement of the vise block and better control of the feed of the blank key past the revoluble cutter 25 and to attain more uniform cutting pressure than could be attained by direct manual movement of the block, longitudinal movement of the lead screw is imparted to the vise block by the insertion of the inner end of the set screw 41 (Fig. 2) into the annular groove 42 around the shaft 21, on the rotation of said set screw in the proper direction to move it inwardly. The set screw 41 is screw threaded into the collar 39 which is set on the shaft around the groove 42 and into the slot 40, the slot being made in the lower end part

18 of the vise block, and the sides of the collar preferably engaging the sides of said slot. Longitudinal movement of the vise block relatively to the shaft 21 is prevented when the set screw 41 is in the groove 42, the set screw serving as a key operatively connecting the shaft to the collar 39, and through the collar connecting the shaft to the vise block 10 for longitudinal movement of the shaft, collar and block as a unit, while permitting relative rotation of the lead screw shaft within the end part 18 of the block. The hand wheel 28 on the end of the shaft 21 facilitates rotation of the lead screw shaft when desired.

In that form of the operative connection between the lead screw and the block shown in Fig. 10, the set screw 35 is screwed into and mounted in the frame 22 and projects into the annular groove 34 in the lead screw shaft, being held in its adjusted position in said groove or recess by the check nut 33. Consequently, only rotational movement of the lead screw relatively to the frame 22 is permitted, longitudinal movement being prevented by said set screw 35. The second set screw 37 is screwed radially into the vise block and enters and is fitted to a recess 38 between consecutive projecting screw threads of the lead screw, being held in its adjusted position in the vise block by the check nut 36. On the rotation of the lead screw through the hand wheel 28, the set screw 37 moves longitudinally in the recesses of the thread of the lead screw and causes similar movement of the vise block in which it is carried. In this form of the invention, the collar 39 is omitted, and the arrangement of the set screws of Figs. 2 and 4, is in effect, reversed.

The cutter 25 is revolubly mounted opposite the vise 20 for the blank key in any suitable manner, as by means of the drive shaft 43 having its bearing in the bracket 44 on the machine frame and carrying the pulley 45 driven by a suitable belt from any suitable source of power. Opposite the key-carrying vise 19 is the bracket 46 adapted to carry adjustably the key notch follower or guide 47 of the usual type intended to enter the notches in the operative edge of a pattern key and thereby to determine the angular position of the vise block and to limit the extent of the oscillatory stroke thereof toward the cutter. The spring 48 pulls the block toward the cutter and guide, one end 49 of the spring being secured to a fixed part of the machine such as the frame and the other end 50 (Fig. 1) passing through a suitable hole in the finger grip member 51. Through the slot 52 in said member is passed the fixed pin 53 upstanding from the vise block (Fig. 2).

A stop pin 54 (Figs. 1, 2 and 3) is adjustably secured in the vise block to project toward the frame 22 and is so located as to engage said frame and thereby to limit the maximum oscillatory stroke of the vise block toward the cutter and guide. Consequently, the blank key may be fed repeatedly and dependably back and forth past the cutter 25 as many times as may be desired to complete the cutting of the blank key. The stop pin 54 prevents movement of the vise block toward the cutter little more than is necessary to cut the deepest notch of the key. Therefore, if the guide 47 moves off the bevelled end edge 55 of the pattern key on excessive movement of the vise block toward the right as viewed in Fig. 6, so that the guide no longer engages the pattern key, then on the return stroke of the vise block toward the left, the guide 47 can only engage the bevelled end edge 55 smoothly to move the vise block into position so that the cutting operation may continue smoothly.

As has been indicated, it is important in the cutting of cylinder keys that the distance between corresponding points of the blank key and the pattern key be the correct pitch equal to the distance between the cutter and the guide. The positioning means for the blank and pattern keys in the respective vises 19 and 20 is therefore an important feature of the invention. Said positioning means being identical for the blank and pattern keys, the description of one will suffice for both, said means being adapted for the proper location of shouldered or shoulderless cylinder keys, while used in connection with pairs of identical pins for positioning double bitted keys. As best seen in Figs. 2 and 7, the positioning means comprises a pair of slides 56 and 57 of the same width, which are mounted in superimposed relation for movement lengthwise of each other and for yielding lateral movement at the jaws of each of the vises 19 and 20. The movable jaw 11 is provided with the parallel spaced grooves 58 and 58*a* for the reception of the slides, respective continuations 59 and 59*a* of said grooves being provided in the stationary jaw 12. Said grooves 59 and 59*a* merge at the lower ends thereof into the single groove 32 in the vise block. The headed stud 63 passes through the elongated opening 62 in the under slide 56, said opening being aligned with and spaced from the slot 61 in said slide. Said stud 63 also passes through the slot 64 of the upper slide 57 and is mounted in the vise block for lateral movement therein, the head of the stud bearing against the slide 57. On and carried by the stud, is the spring 65 abutting at one end against the vise block and at the other end against the washer 66 pressed by the spring against the cotter pin 67 passing through the stud, whereby the stud is forced to hold the slides in any position into which the slides may have been moved. An end projection or lug 68 (Fig. 3) on the lower end of the under slide 56 is bent to project through the slot 64 of the upper slide 57 to permit the slide 56 to be easily gripped at the lug and manipulated. The upper end of the slide 57 has three bends 69, 70 and 71 (Fig. 7) therein providing an L-shaped offset member 72 by means of which the upper slide may be manipulated and which is intended to press upon a key inserted between said member 72 and the under slide 56. By the proper manipulation of said slides, it becomes possible accurately to position any type of cylinder key in the respective vises.

As shown for example in Fig. 2, a single bitted key 73, provided with shoulders 74 between the head 76 and the shank of the key, may be positioned by the use of the under slide 56 only. After such shouldered key has been inserted into the vise 19 between the jaws 11 and 12 with the slide 56 in its uppermost position in the grooves 58 and 58*a* as shown in Figs. 2 and 3, the pattern key 73 is moved until its flat or unnotched edge 75 is in contact with the face of the under slide 56 and the shoulder 74 thereof is in contact with the adjacent edge of said slide as viewed in Fig. 2. The head 76 of the key may project out of the vise, but the corner formed between the shoulder 74 and the edge 75 of the shank of the key fits against the under slide 56, which thereby holds the key in the proper posi-

tion and without danger of tilting. The blank key having been similarly positioned in the vise **20**, it is obvious that the distance between the shoulders of the pattern key and the blank key is precisely the distance between the corresponding edges of the respective under slides **56** of the vises **19** and **20**. Such distance being made equal to the required pitch when the vise block is made, the distance between the keys is necessarily exactly equal to the pitch of the machine when the keys have been positioned in the vises with the respective shoulders thereof against the slides **56** as above described.

Should the pattern key be of the type shown in Figs. 5 and 6 wherein no shoulders are provided, but a fillet **77** replaces the shoulders, then both slides **56** and **57** are employed to position the pattern key in the vise therefor, but only the under slide **56** remains in position during the cutting operation. The under slide **56** is pulled into its raised position as in Fig. 2 and there is held by the spring-pulled stud **63**, and the key is inserted into the vise and held loosely therein, after which the upper slide **57** is raised and moved laterally against the action of the spring **65** to clear the notched edge **73** of the key, the upper slide **57** being then released to permit the spring **65** acting through the upper slide to press the opposite edge **75** of the key against the face of the under slide **56**. The head of the key is then pushed longitudinally toward the slides until the fillets **77** and **77***a* thereof engage the slides **57** and **56** respectively, whereafter the vise is tightened to clamp the key in the thus determined position. Regardless of the lack of shoulders on the key, it is nevertheless properly held because of the pressure exerted by the spring-pressed slide **57** which forces the key edge **75** into contact with the face of the slide **56**. Similarly, when the blank key is clamped in its vise **20** in a similar manner, the pitch is exactly correct because the upper slide **57** engages the fillet **77** and the under slide engages the fillet **77***a* of the blank key at those points precisely corresponding to the respective points on the pattern key engaged by the slides of the vise **19**. During the cutting operation, the slide **57** obviously should be removed out of the way to permit the use of the guide **47** as shown in Fig. 6.

This is done merely by pushing said slide downwardly to the limit permitted by the stud **63** operating in the slot **64** of the slide.

For double bitted keys such as **80** shown best in Fig. 8, the slide **57** together with an auxiliary pin **84** are used to position the pattern key or blank key, the pin being used in connection with the usual groove **81** provided in such keys and with a preferably, though not necessarily, V-shaped longitudinal groove **82** in the under face of the movable jaw **11** and a similar groove **83** in the upper face of the stationary vise jaw **12** (Fig. 7). The greatest operative depth of the groove is preferably less than the diameter of the preferably cylindrical pin **84**, whereby part of the lateral surface of the pin may project out of the groove and enter the groove **81** of the key and either the groove **82** of one vise jaw or the groove **83** of the other vise jaw to position the key transversely. As shown in Fig. 7, the under slide **56** is moved downwardly in the groove **32** of the vise block to a position below the key and is not used for double bitted keys. The upper slide **57** however, engages the shoulder **74***a* of the key, where such shoulder is present, or if a fillet replaces the shoulder, the slide **57** positions the

key longitudinally in the manner described in connection with Figs. 5 and 6. After the pattern or blank key has been clamped in its properly located position in the vise with the pin **84** in the groove **82**, the slide **57** is moved to an inoperative position as in Fig. 7 and the cutting operation performed.

When not in use, the pins **84** are mounted in suitable holes in the machine frame **22** as shown in Fig. 1, each of the pins having an enlarged head, knurled for easy gripping.

When the cutting operation on one edge of the blank key has been completed, the key and pin **84** are reversed front face to back face from the position of Fig. 7 without changing the relative positions thereof. In the reversed position shown in Fig. 9, the pin is in the groove **83** and the opposite edge of the blank key is exposed for cutting. It is assured that the blank key and the pattern key are in exactly corresponding longitudinally and transversely located positions in the respective vises therefor when the reversal of both blank and pattern keys is performed and when the upper slides **57** are employed for positioning the keys. The transverse location is assured by reason of the contact of the pin with the walls of the key groove **81** and jaw groove **83** along two spaced apart parallel longitudinal lines in each groove throughout the operative length of the pin **84**.

When the keys have been positioned and clamped, the spring holder **51** is engaged with its fixed pin **53** to draw the vise block toward the cutter **25** and the guide **47** until the cutter engages an edge of the blank key in the usual manner. On the rotation thereof, the cutter cuts into the projecting edge of the blank, permitting the spring **48** to draw the vise block closer to the cutter, until the guide **47** contacts the edge **73** of the pattern key, whereon the cutting action is completed. The vise block is then fed across the cutter as many times as are necessary to cut additional notches in the blank key corresponding to the pattern key.

For complete hand control of the feeding movement, the set screw **41** is removed from its groove **42**. However, if better control or "semi-automatic" operation of the feed is desired, the set screw **41** is screwed into the recess or groove **42** and the hand wheel **28** is rotated at the desired speed. The spring **48** is thereby permitted to exert an even and substantially constant pressure on the vise block and hence the cutting pressure is reasonably constant, but may be adjusted by proper manipulation of the stud **85**, which is held in adjusted position in the frame **22** by the set screw **87**. A suitable set screw **88** operating axially in the stud **85** holds the eye pin **86**, which engages the end **49** of the spring, in vertically adjusted position (Fig. 1).

Or, in that form of the invention shown in Fig. 10, the inner end of the set screw **37** is withdrawn from the recess or groove **38** between consecutive screw threads of the lead screw, when manual control of the vise block movement is desired. When the set screw is so withdrawn, the vise block becomes disconnected from the lead screw and is independently movable.

It will now be seen that I have provided a simple and efficient means for positioning accurately and dependably in a key cutting machine, cylinder keys of various types including double bitted keys, by the engagement of positioning means with a selected part of the key; that the pitch and distance between the blank key and

the pattern key are accurately controlled by such means; that an efficient feed at substantially constant cutting pressure has been provided which optionally may easily be rendered inoperative; that the clamped and positioned keys may be fed back and forth repeatedly and smoothly; that the various objects of the invention have been attained and that the invention is designed to meet the severe requirements of practical use.

While a certain specific embodiment of the invention has herein been shown and described, various obvious changes may be made therein without departing from the spirit of the invention defined by the appended claims.

I claim:

1. In a key cutting machine for cutting double bitted keys, a pair of spaced vises each comprising a pair of jaws, each jaw having a flat face adjacent the flat face of the other jaw and having a groove therein arranged lengthwise of and in the flat face, and means for locating a key in and transversely of each of the jaws comprising a pin of greater thickness than the operative depth of the groove in either jaw and having a portion entering the groove of a jaw and in contact with the walls of the groove along two spaced apart parallel longitudinal lines throughout the operative length of the pin, thereby to locate the pin in a definite position in the groove, said pin having an opposite portion entering the groove of a longitudinally grooved key having an enlarged head and in contact with the walls of the key groove along two spaced apart parallel longitudinal lines, whereby the key is definitely located in a direction transversely of the key and relatively to either jaw when the pin is in the groove of a jaw and in the key groove.

2. The key cutting machine of claim 1, the pin being cylindrical, and means adapted to engage part of the key adjacent the enlarged head for locating the key longitudinally of the jaws, said last mentioned means remaining operative when the key is reversed front face to back face while maintaining the enlarged head at the same end of the jaws, and the pin remaining in the key groove and entering the groove of the other jaw when the key is reversed as aforesaid with the pin as a unit.

3. In a key cutting machine, a key vise comprising a pair of jaws, and means for locating a key longitudinally in the jaws comprising a slide having a slot therein, one of the jaws having a transverse groove therein of the width of the slide, the groove being open to receive the slide for slidable movement in the direction of the length of the groove, and means for yieldingly and tiltably mounting the slide on the jaw comprising a headed stud passing loosely through the slot of the slide and through the transverse groove of the jaw and having an end part projecting laterally beyond the jaw, and a spring around the projecting part of the stud urging the stud to move longitudinally thereof and laterally of the jaw, normally to press upon and to maintain the slide in the groove, the slide being tiltable about the stud in a direction perpendicular to the length of the groove and against the action of the spring to withdraw an end portion of the slide laterally out of the groove.

4. The key cutting machine of claim 3 and means for positioning a key transversely of either jaw comprising a cylindrical pin, each jaw having a longitudinal groove therein perpendicular to the aforesaid transverse groove and of lesser operative depth than the diameter of the pin, the walls of the longitudinal groove being shaped to engage the pin inserted thereinto along two spaced apart parallel lines longitudinally of the pin and of the longitudinal groove.

5. In a key cutting machine, a vise jaw having a first groove therein, a slotted slide movable longitudinally of and in the groove, means for mounting the slide on the jaw for movement of at least part of the slide laterally out of the groove in a direction perpendicular to and during the longitudinal movement of the slide comprising a spring-pulled stud passing through the slide, the groove and the jaw, said jaw having a second groove therein perpendicular to and spaced from the first groove, a cylindrical key-locating pin adapted to enter, and to engage the wall of, the second groove along two longitudinal parallel lines and to enter the groove of a longitudinally grooved key thereby to locate the key transversely relatively to said second groove, and a second vise jaw cooperating with the first mentioned jaw and having a longitudinal groove therein parallel to the second groove, the walls of the longitudinal groove being arranged to receive the pin therebetween and to engage the pin along parallel longitudinal lines tangent to the pin and said walls when the key and the pin as a unit are reversed upside down and front to back.

6. A key cutting machine for cutting double bitted keys varying in sizes and shapes, each key having a longitudinal groove in a face thereof, said machine comprising a single rotatable cutter, a pair of identical vises movable as a unit to carry one vise across the cutter, each vise comprising a pair of jaws for clamping and positioning a double bitted key between the jaws, each jaw having a clamping face adjacent the clamping face of the other jaw of the vise, the clamping face having a longitudinal groove therein, and a pin movable relatively to the jaw and of uniform cross sectional shape having a longitudinal portion thereof entering the groove of one jaw and contacting the walls of said one groove along two spaced apart longitudinal lines, the pin being of sufficient thickness to enable the opposite longitudinal portion thereof to project out of the groove in said one jaw, the pin projecting out of the groove in said one jaw beyond the face of the jaw and toward the other jaw, the projecting portion of the pin entering the longitudinal groove of the key and being in contact with the walls of the last-mentioned groove along two spaced apart longitudinal lines regardless of the rotated position of the pin relatively to the jaw and the key, the pin entering the groove of said other jaw while remaining in the groove of the key when the pin and the key as a unit are reversed front to back and upside down.

7. The machine of claim 6, the pin being cylindrical and the groove in the jaw being triangular in cross section.

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