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KEY SEAT CUTTING MACHINE.

No. 589,011. Patented Aug. 31, 1897.

FIG. 4

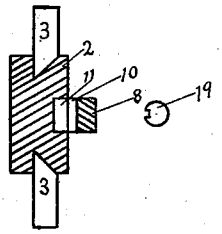


FIG. 5

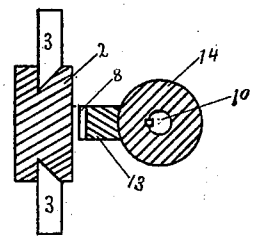


FIG. 3

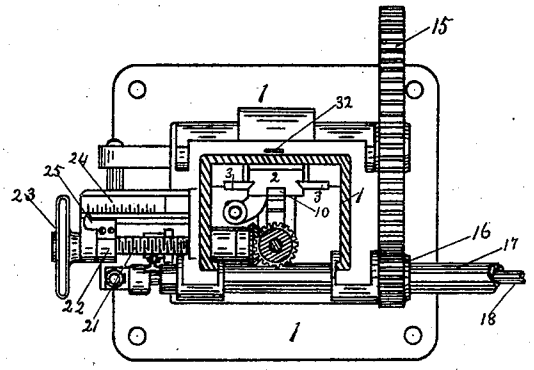


FIG. 1

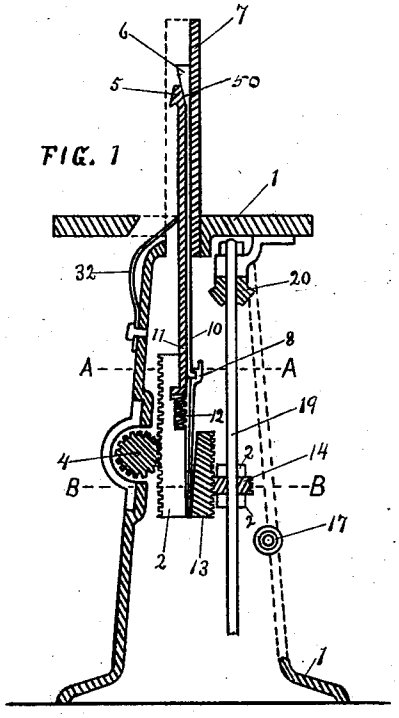
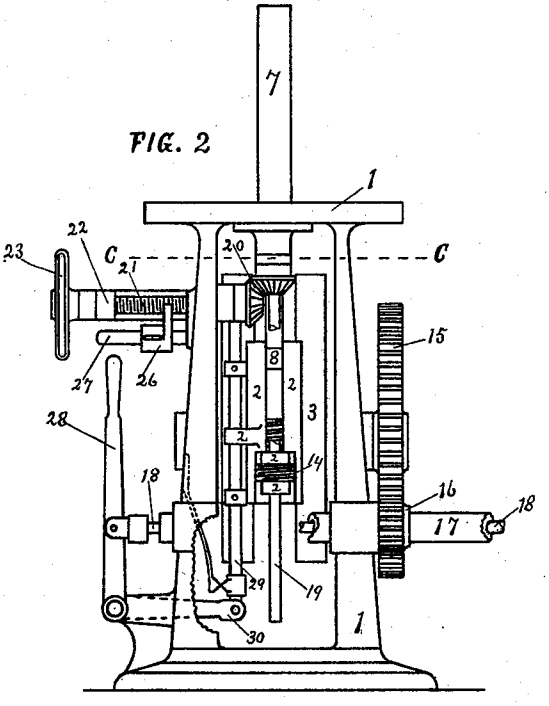


FIG. 2



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FIG. 6

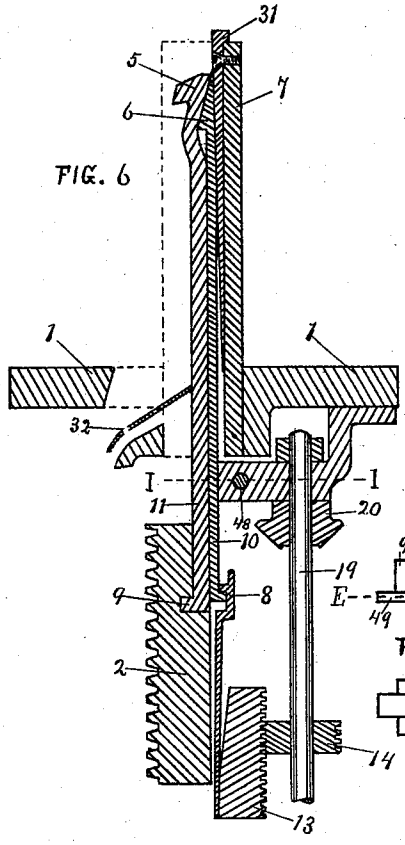


FIG. 7

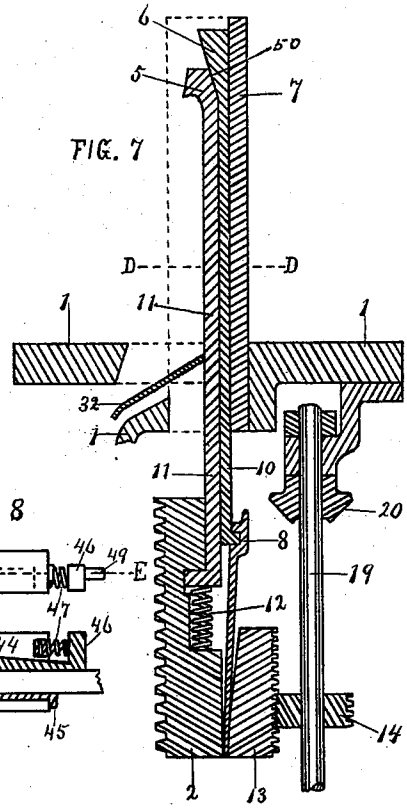


FIG. 8

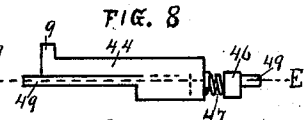


FIG. 9

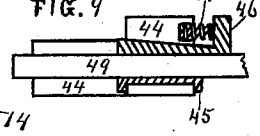


FIG. 10

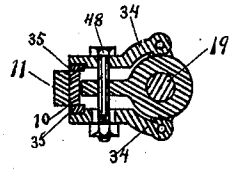
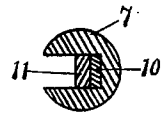


FIG. 11



FIG. 12



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FIG. 13

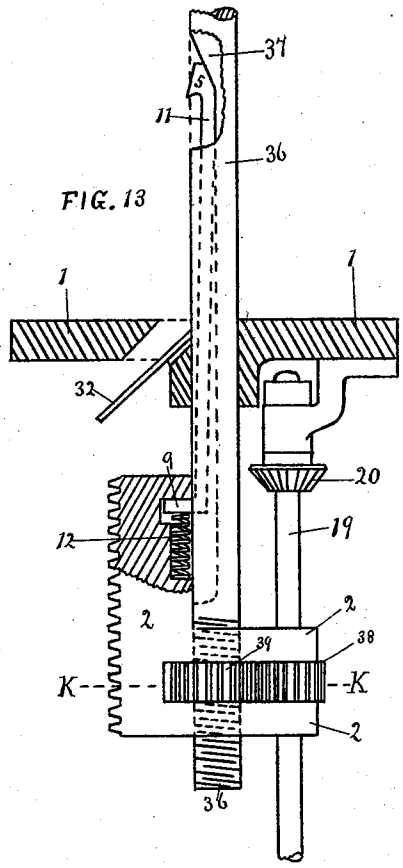


FIG. 14

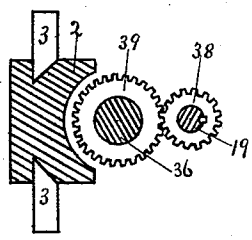


FIG. 15



FIG. 16

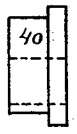


FIG. 17

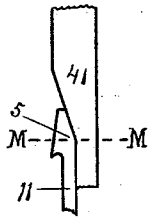


FIG. 18

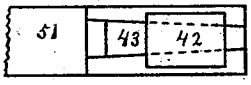


FIG. 19

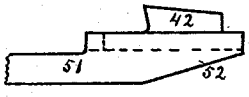


FIG. 20

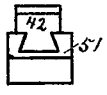


FIG. 21



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KEY SEAT CUTTING MACHINE.

No. 589,011. Patented Aug. 31, 1897.

FIG. 22

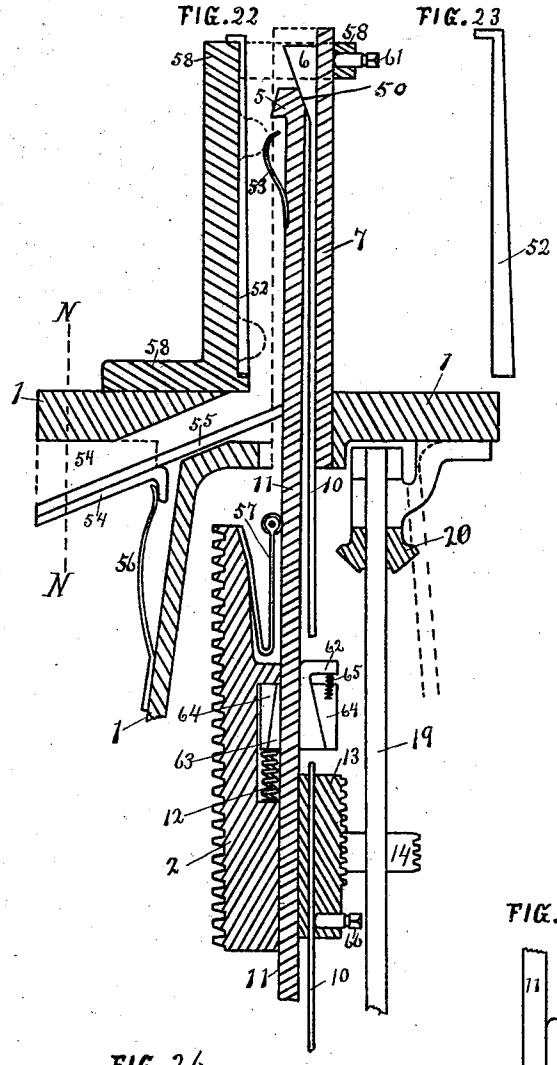


FIG. 23

FIG. 24

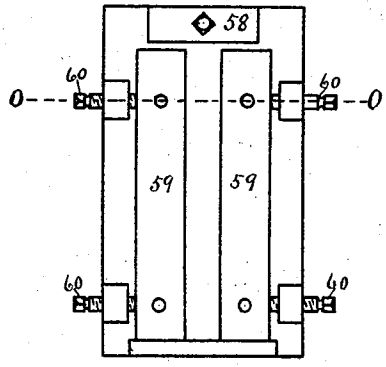


FIG. 25

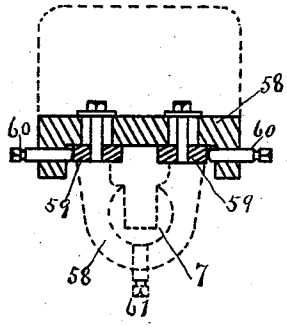


FIG. 26

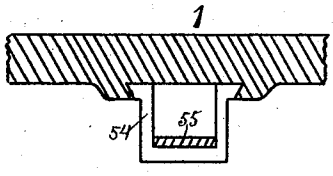


FIG. 27

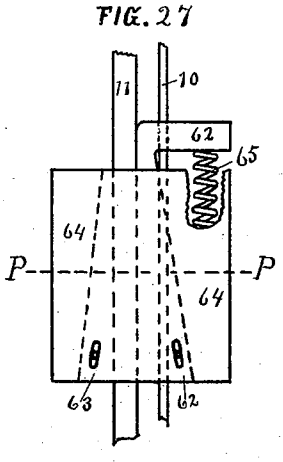
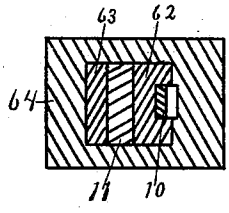


FIG. 28



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UNITED STATES PATENT OFFICE.

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KEY-SEAT-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 589,011, dated August 31, 1897.

Application filed September 17, 1895. Serial No. 562,799. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MERRILL, a citizen of the United States, residing at Saginaw, county of Saginaw, and State of Michigan, have invented new and useful Improvements in Key-Seat-Cutting Machines, of which the following is a specification.

My invention relates to improvements in key-seat-cutting machines similar in purpose to the one upon which United States Letters Patent were issued September 11, 1888, No. 389,243, and the one described in my application for United States Letters Patent filed February 23, 1895, Serial No. 539,425.

The objects of my improvements are to furnish a machine having a fewer number of parts and much simpler and cheaper in construction and which will do the work for which it is intended with greater rapidity and ease of manipulation, the special objects being, first, to provide a new form of post which holds and guides the cutting-tool and feeding device and also centers and holds the piece which is being key-seated; second, to provide an improved mechanism for feeding the tool into the cut and supporting it while cutting; third, to provide improved forms of cutting-tools and means for fastening them to the reciprocating cross-head; fourth, to provide improved forms of mechanism for automatically relieving the tool on the back stroke; fifth, to provide an improved device for disposing of the chips; sixth, to provide an improved form of vise for holding keys to be planed.

These several improvements are more fully hereinafter described, and specifically set forth in the claims, and are illustrated by the mechanism shown in the accompanying drawings, in which—

Figure 1 is a vertical side elevation, partly sectional. Fig. 2 is a rear elevation. Fig. 3 is a plan, partly sectional. Fig. 4 is a section of the operating parts of the machine on the line A A, Fig. 1. Fig. 5 is a section of the operating parts of the machine on the line B B, Fig. 1. Figs. 6 and 7 are elevations, partly sectional, of some of the principal operating parts of the machine. Fig. 8 is an elevation, and Fig. 9 is a plan, partly sectional, on the line E E, Fig. 8, showing a device for holding small tool-bars. Fig. 10 is a section on the line 1 1, Fig. 6, showing the feed-bar 10 and its friction-clamp. Fig. 12 is a cross-section on line D D, Fig. 7, showing the post, tool-bar, and feed-bar. Fig. 11 is a section showing a rectangular form of post. Fig. 13 is an elevation, partly sectional, of another form of feed-bar and operating device. Fig. 14 is a cross-section on line K K, Fig. 13. Figs. 15 and 16 are plan and elevation of a bushing. Fig. 17 is an elevation showing portions of another form of tool-bar and feed-bar. Fig. 21 is a cross-section on the line M M, Fig. 17. Figs. 18, 19, and 20 are three views of another form of tool-bar and tool. Fig. 22 is an elevation, partly sectional, of a modified form of cross-head and device for holding the tool-bar and wedge-bar, representing also a key-holding vise attached to the table. Fig. 23 is an elevation of a wedge which may be inserted in the key-holding vise as a back-support to the key while being planed. Fig. 24 is an elevation of the key-holding vise. Fig. 25 is a cross-section on the line O O, Fig. 24. Fig. 26 is a cross-section on the line N N, Fig. 22. Fig. 27 is an enlarged elevation of clamp for holding the tool-bar 11. Fig. 28 is a cross-section on the line P P, Fig. 27.

The same numbers refer to the same parts in the different figures.

1 represents the frame.

2 is a cross-head reciprocated by the pinion 4, which is driven by gears 15 and 16 by means of a double friction-clutch, (not shown,) which may be on the extended end of the driving-shaft 17 and which may be operated by the shifter-rod 18 through the levers 28 and 30 and the tappet-rod 29. The tappet-rod may be operated by the cross-head in the usual manner. The tool-bar 11 is driven by the cross-head 2, as shown in Fig. 4, and held in the cross-head by the feed-bar 10 and spring-hook 8. Two lugs on the cross-head 2 embrace the screw 14 on each side. (Shown more clearly in the modified construction in Fig. 13, where the lugs of the cross-head embrace the pinion 38.) The screw 14 is reciprocated on the splined shaft 19 and engages with the feed-rack 13. To the feed-rack 13 is fastened the spring-hook 8, engaging with the feed-bar 10, which has on its upper end

the feed-wedge 6, abutting against the wedge-shaped surface of the tool 5. The spring-hook 8 is used for convenience, but the feed-bar 10 may be fastened to the feed-rack 13 in any other suitable way. When the splined shaft 19 is rotated by means of the miter-gears 20 and the hand-wheel 23 on the screw-shaft 21, the feed-rack 13 is moved downward, drawing with it the feed-bar 10 and wedge 6, thereby pushing forward the tool 5. The tool cuts only on the downstroke, and to relieve it automatically on the upstroke I use the device shown in Figs. 1, 7, and 13 or the other device shown in Fig. 6. In the first form, as shown in Figs. 1, 7, and 13, the tool-bar 11 has a slight vertical motion in the cross-head 2, the hook 9 withstanding the strain of the cutting-pressure on the downstroke, but during the upstroke, if the tool 5 catches or drags in the key-seat, it is thereby pushed downward against the spring 12, and on account of the inclination of the feed-wedge 6 it thus automatically relieves itself. At the end of the upstroke the spring 12 lifts the tool-bar 11 into the proper position to begin the next stroke, the wedge 6 having been meanwhile drawn down to feed the tool forward for the next chip.

In the other device for relieving the tool (shown in Fig. 6) the inclination of the wedges is reversed and the wedge 6 is pushed upward by the spring-hook 8 to feed the tool 5 forward. The notch in the spring 8 being vertically wider than the thickness of the hook end of the feed-bar 10 allows a small amount of slack motion to the feed-bar 10.

By means of the clamping device shown in Fig. 10 the clamps 34, having on their inner ends suitable friction-plates 35, are clamped by the bolt 48 against the feed-bar 10, thus holding it so that at the end of each stroke the feed-bar slips in the notch of the spring-hook 8 to the extent of its slack motion. Thus when the tool is at the lower end of the stroke and begins to go upward the feed-bar 10 is held back by the clamp, and the tool 5 is thereby relieved from the pressure against the cutting edge. At the beginning of the downstroke the feed-bar is again held by the clamp, and the tool is pulled down against the wedge 6, thus pushing it forward into the proper cutting position.

It is obvious that the tool-bar 11 in Fig. 7 might be hooked into a recess in the cross-head, the recess being slightly wider than the hook 9 to allow slack motion. Then the clamp shown in Fig. 10 might have longer jaws to clamp the tool-bar 11 instead of the feed-bar 10. In this case the spring 12 would be omitted, and the tool would be relieved on the upstroke by the friction-clamp.

In operation the piece which is to be key-seated is placed over the post 7. If the hole in the piece is larger than the post 7, bushings similar to those shown in Figs. 15 and 16 may be used to hold the piece in its proper position with reference to the post and cutting-tool. If the piece being operated upon is heavy, it needs no fastening. If it is quite light, it may need to be held down by hand or by a clamp or set-collar above it on the post 7. At first the wedge 6 is in such a position that the tool 5 is inside the groove of the post and will not cut, as shown in the drawings. To make it cut, the hand-wheel 23 is turned, turning the splined shaft 19 and the screw 14, thereby moving the feed-rack 13, the feed-bar 10, and the wedge 6, so as to push forward the tool 5. At each upstroke the tool is automatically relieved either by its own friction or by the friction-clamp, as previously explained. The spring 32 is attached to the frame and has its upper end the exact width of the tool-bar 11 and of the groove in the post 7. The opening in the top of the frame or table 1 is also of the same width as the groove in the post 7, so that all the chips fall on the spring 32 and slide down it, being entirely prevented from falling inside the frame of the machine. The spring 32 serves also to hold the tool-bar 11 back against the feed-wedge 6, so that it may not fall forward and catch on the top of the piece being key-seated. The spring 32 by its friction also assists in pulling downward the tool-bar 11 against the spring 12 during the upstroke. A modified form of device for this same purpose is shown in Figs. 22 and 26, in which 54 is a spout sliding in a dovetailed groove on the under side of the table 1.

To the spout 54 is attached the tongue 55, which is pushed against the tool-bar 11 by the spring 56, the tongue 55 being closely fitted in the groove of the post 7 and also in the opening of the table 1, so as to prevent the chips from falling inside the frame. I have also used the spring 57, attached to the cross-head 2, as shown in Fig. 22, which serves to hold back the tool-bar 11, it being understood that the clamps 64 can move laterally a slight amount, and the tool-bar 11 is also fitted loosely in the cross-head 2, so that the upper end of it can move freely forward except as held back by the springs 56 or 57. In some classes of work I also use the spring 53, attached to the tool-bar 11 near its upper end. This spring projects slightly in front of the edge of the tool 5 and in operation slides against the face of the key-seat which is being cut. This spring yields as the tool is pressed forward by the wedge 6 and prevents the tool from catching on the end of the hub.

The shaft 21 in Figs. 2 and 3 is threaded to receive the nut 22, to which is fastened the pointer 25, which moves along the scale 24, thus indicating the amount the tool is fed forward. The taper of the wedge 6 being in the ratio of one to four and the screws 14 and 21 being of equal pitch, one inch on the scale indicates one-quarter inch feed of the tool. On the rod 27 is the collar 26, which may be clamped to form a stop for the nut 22, so that when it is desired to key-seat a number of duplicate pieces to the same depth the stop

26 may be set after the first one is finished, and then all the others will be cut to the same depth.

In Fig. 6 the wedge 31 is inserted in the groove of the post 7 behind the feed-bar and is made of a taper corresponding to the taper of the key-seat which is to be cut. When the wedge 31 is removed, the key-seat will be straight or of the same depth at each end.

The devices shown in Figs. 8 and 9 are intended to be used for holding very small tool-bars, say one-half inch or less in width. The holder 44 corresponds in size with the lower end of the tool-bar 11, being inserted in the cross-head in place of the regular tool-bar 11. The holder 44 has inserted in it the two hardened-steel jaws 45 and 46 with their inner faces roughened. The jaw 46 has a wedge-shaped portion, and the action of the spring 47 serves to clamp firmly the small tool-bar 49, which while cutting pulls in the direction to more firmly clamp itself. To loosen it, it is only necessary to drive it slightly in the opposite direction.

A modified form of clamp for holding the tool-bar is shown in Figs. 22, 27, and 28. This modification is intended to be used when it is desired to use an extra long large tool-bar 11 in connection with a longer post 7 for the purpose of key-seating very long hubs. By using this clamping device the tool-bar 11 may be of indefinite length and may be adjusted to cut a key-seat in a hub considerably elevated above the table, as in wide-faced pulleys which have two hubs. In this device the clamp 64 is inserted in the cross-head 2 and is acted upon by the spring 12, as before mentioned, and has in it two steel jaws 62 and 63 with their inner faces roughened and hardened to clamp the tool-bar 11. The jaw 62 is pushed upward by the spring 65. On account of the wedge shape of the jaws the tool-bar 11 cannot be pulled upward, but is released by pushing it downward, and by pushing down the jaw 62 the tool-bar may be removed. The feed-bar 10 passes loosely through a slot in the clamp 64 and the jaw 62, the feed-bar 10 being fastened in the proper position by a set-screw 66 in the feed-rack 3.

Figs. 18, 19, and 20 show the upper portion of another form of tool-bar 51, having a taper dovetailed slot 43, into which is fitted the cutting-tool 42. The greater the pressure against the cutting edge the more firmly it is held. Tools of different widths can be used and one can be quickly knocked out with a hammer and another inserted. The end of the tool-bar has the inclined surface 50 in Figs. 1, 7, and 22 to fit against the feed-wedge 6.

Figs. 17 and 21 show portions of another form of tool-bar and feed-bar 41 which may be used for slotting. In this form the feed-bar is made rectangular, and as there is no spindle to support it it is made heavier, and the upper end is extended beyond the wedge equal to the length of the stroke of the machine, that it may not come out of the slot which is being cut. In operation with this style of tool the cutter is fed forward as far as the wedge will admit, and if it is desired to go farther a backing-piece may be inserted behind the feed-bar in the slot which is being cut, thus cutting it to any desired width.

Figs. 13 and 14 show a reciprocating spindle 36, grooved to admit the tool-bar 11 and having in it a wedge-shaped portion 37. To feed the tool forward, the spindle 36 is moved downward by means of the gears 38 and 39, the latter being threaded internally to engage with the external screw on the lower end of the spindle 36. It is operated by the shaft 19, as previously explained, the tool being relieved on the upstroke the same as before. In this construction the spindle 36 is extended above the tool equal to the length of the stroke.

Figs. 24, 25, and 22 show different views of a key-holding vise which may be attached to the table of the machine, the upper end of the vise having a perforated projection to receive the top end of the post 7, to which it may be clamped by set-screw 61. The body of the vise has attached to it the steel jaws 59, actuated by the set-screws 60. Between the jaws 59 may be inserted a key which is to be planed. Behind the key and between the jaws may be inserted a taper-piece 52, corresponding to the desired taper of the key. This arrangement makes a very rigid construction, since the upper ends of the post and vise are attached together and cannot spring apart while the tool is cutting.

I am aware that it is not new to use a stationary grooved post with the cutting-tool operating in the groove similar to that shown in United States Patent No. 131,293, in which the tool goes only one way through the key-seat, being removed from the hub and reinserted for each chip taken.

I am also aware of the patent of Williams, No. 10,873, dated May 2, 1854, which machine has no reciprocating feed wedge or device for automatically relieving the tool on the upstroke, and is therefore practically inoperative.

In my construction the feed-wedge is attached to the cross-head and moves with the tool while cutting instead of being stationary, as in the patent cited.

The peculiar arrangement of the cutting and feeding device of my invention admits of the widest range of work being done, it being entirely practical to cut key-seats in holes only one-half inch in diameter of any reasonable length, and also do the largest work ever required. As each piece of work is chucked by its bore it is not necessary to face the ends of the hubs, thereby saving expense, and in practical operation piece after piece can be put on the post, key-seated, and removed without stopping the motion of the tool, thereby giving a capacity much greater than the ma-

chines have as formerly made, as shown in the Patent No. 389,243, first cited, and in my former application, as cited, in both of which it is necessary to fasten the work to the table, which usually consumes more time than is required to cut the key-seat.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a key-seat-cutting machine having a longitudinally-grooved post for centering and holding the work, the combination of the tool 5 and the supporting-wedge 6 immediately behind the tool 5, with the tool-bar 11 and the feed-bar 10 for connecting them to the reciprocating cross-head, substantially as, and for the purpose set forth.

2. In a machine for cutting key-seats, the combination of the stationary grooved post 7, having in the post-groove the simultaneously-reciprocating tool 5 and supporting-wedge 6, with means for imparting a slight reciprocating motion to the wedge 6, separate from its conjoint motion with the tool 5, substantially as, and for the purpose set forth.

3. In a machine for cutting key-seats, the combination of the tool-bar, and feed-bar having a feed-wedge at one end and attached by a slip-joint at its other end to a reciprocating cross-head, with means for intermittently reciprocating the feed-bar in the cross-head for the purpose of relieving the tool on the back stroke, substantially as described.

4. In a machine for cutting key-seats, the combination of a feed-bar having a feed-wedge at one end, and the tool-bar attached by a slip-joint to the reciprocating cross-head, with means for intermittently reciprocating the tool-bar in the cross-head, for the purpose of relieving the tool on the back stroke, substantially as described.

5. In a key-seat-cutting machine of the class described, the cross-head 2, having attached to it the tool-bar 11 and the tool 5, in combination with the feed-rack 13 having attached to it the feed-bar 10 and wedge 6, with mechanism for moving the feed-rack on the cross-head, substantially as, and for the purpose set forth.

6. In a machine for cutting key-seats, the combination of a pair of simultaneously-reciprocating tool and feed bars, with a friction-clamp attached to one of them to retard it at the beginning of each stroke for the purpose set forth, substantially as described.

7. In a key-seat-cutting machine the combination of a supporting-frame, a reciprocating cross-head having attached to it the tool-bar and the feed-bar, with a friction-clamp attached to the supporting-frame substantially as, and for the purpose set forth.

8. In a machine for cutting key-seats, the combination of a reciprocating cross-head having attached to it a tool-bar and feed-bar, with mechanism for checking at the beginning of each stroke of the cross-head the motion of the tool-bar, for the purpose of relieving and setting the tool, substantially as described.

9. In a machine for cutting key-seats the combination of a reciprocating cross-head having attached to it a tool-bar and a feed-bar, with mechanism for checking at the beginning of each stroke of the cross-head the motion of the feed-bar, for the purpose of relieving and setting the tool, substantially as described.

10. In a machine for cutting key-seats the tool-bar 11, attached by slip-joint to the reciprocating cross-head, in combination with the spring 12 and the hook 8, substantially as, and for the purpose set forth.

11. In a machine for cutting key-seats, the combination of a stationary grooved post 7 and reciprocating tool-bar 11, the tongue 55, and the chip-spout 54, substantially as, and for the purpose set forth.

12. In a machine for cutting key-seats the combination of a grooved post 7, the reciprocating tool-bar 11, and the feed-bar 10, with the wedge 31 inserted behind the feed-bar 10 in the groove of the post 7 substantially as, and for the purpose set forth.

13. In a key-seat-cutting machine the combination of the supporting-frame 1, the spring 56, the tongue 55 and the chip-spout 54 arranged substantially as, and for the purpose set forth.

14. In a key-seat-cutting machine the combination of a reciprocating cross-head, a pair of wedge-shaped clamping-jaws attached to the cross-head, and the tool-bar held by the clamping-jaws, substantially as described.

15. In a key-seating machine, the combination of a supporting frame or table, a grooved post, a cutting-tool in the post-groove, and a vise attached by its lower portion to the table, and by its upper portion to the post, substantially as set forth.

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Witnesses:
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