Jan. 31, 1933. C. A. HAUBROE 1,895,849

KEY CUTTING MACHINE

Filed Aug. 29, 1932 2 Sheets-Sheet 1

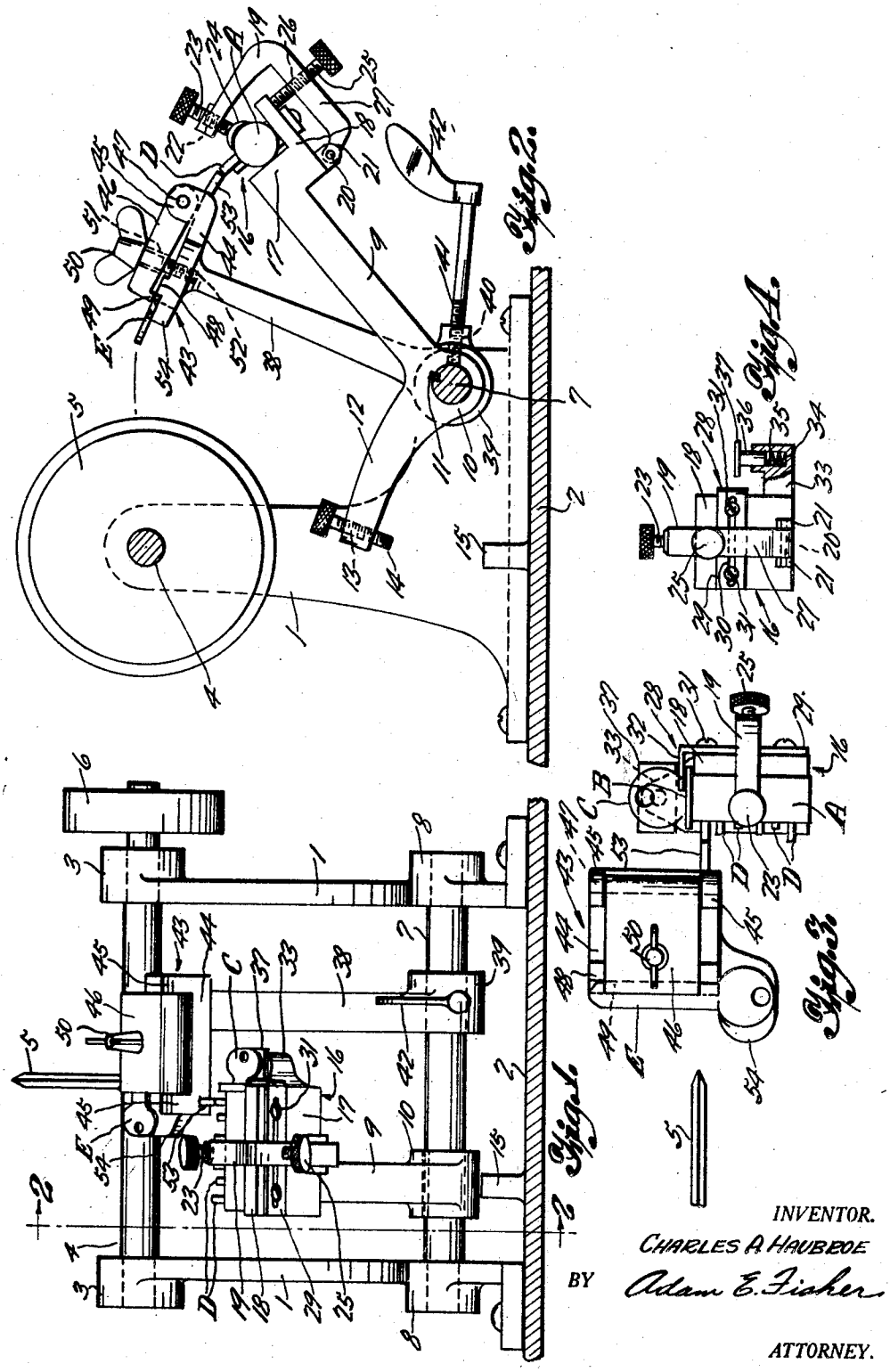


Fig. 2.

Fig. 4.

Fig. 3.

Fig. 5.

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Fig. 7.

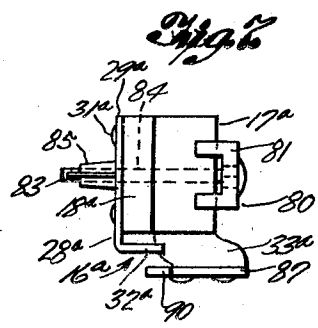
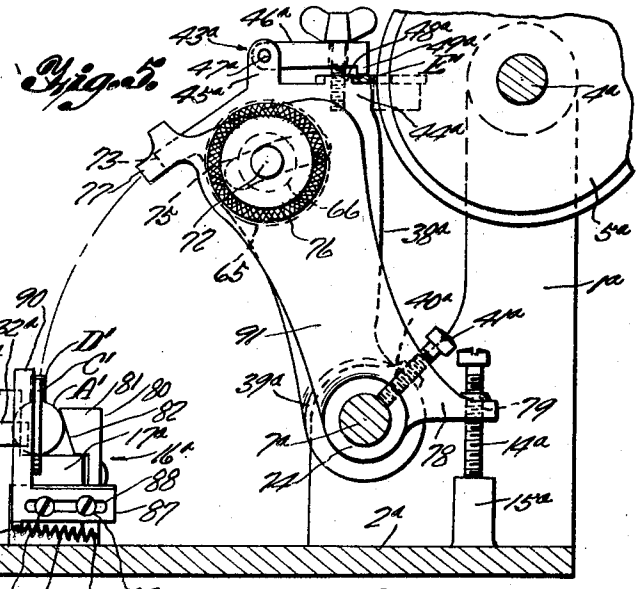


Fig. 5.



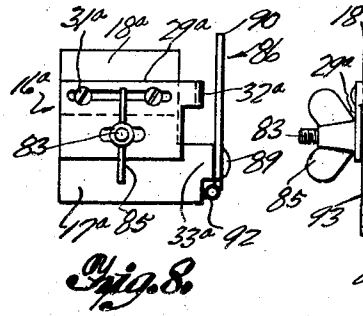


Fig. 8.

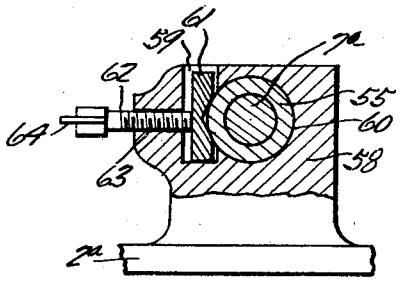


Fig. 9.

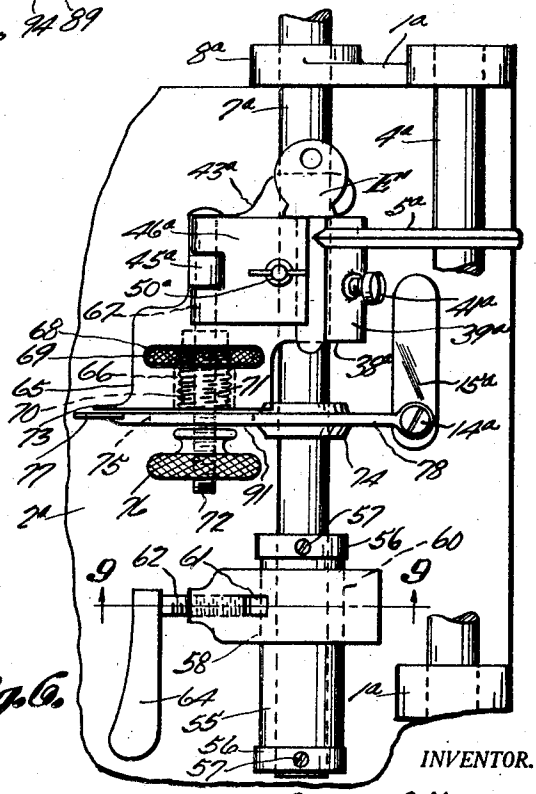


Fig. 6.

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UNITED STATES PATENT OFFICE

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KEY CUTTING MACHINE

Application filed August 29, 1932. Serial No. 630,851.

My invention relates to improvements in key cutting machines, and the main object is to provide a simple and efficient machine by the use of which a key may be readily cut to fit any cylinder lock.

Another object is to provide a machine which measures the protrusion of the tumblers of a lock cylinder when an uncut blank is put in the cylinder and thus determines the depth, location and number of cuts necessary to cut a key to fit the cylinder, the machine requiring no pattern or code to fit a key to any cylinder lock.

Another object is to provide a machine of this kind, embodying a supporting seat in which the lock cylinder into which an uncut blank has been inserted, is clamped, a blank carrier adapted to swing toward and away from a cutting wheel, the blank carrier having a finger or fingers to engage the outer periphery of the cylinder, a stop whereby a key blank in the blank carrier will just touch the cutting edge of the cutting wheel when said finger rests against the cylinder, and a means for moving the blank carrier forward toward the cutting wheel until the finger rests on the end of one of the protruding tumblers, whereby the key blank may be swung forward against the cutting wheel and cut to a depth or distance equal to the protrusion of the tumbler from the cylinder.

With these and other objects in view, the invention resides in the novel construction and arrangement of parts as hereinafter set forth and claimed, reference being had to the accompanying drawings, wherein

Figure 1 is a side elevation of the machine showing a lock cylinder with inserted blank and a blank arranged for cutting.

Figure 2 is a section along the line 2—2 in Figure 1.

Figure 3 is a plan view of the blank carrier and cylinder carrier or seat alone showing the finger on the blank carrier in engagement with the end of a plunger in the lock cylinder, this view showing also a part of the cutting wheel to indicate its relative position.

Figure 4 is a side elevation of the cylinder seat alone.

Figure 5 is a vertical cross section through a modified form of my invention.

Figure 6 is a plan view of the structure shown in Figure 5, a part of the base being broken away.

Figure 7 is a plan view of the cylinder seat alone.

Figure 8 is a side view of the cylinder seat.

Figure 9 is a section along the line 9—9 in Figure 6.

Referring now with more particularity to the drawings, the embodiment of my invention shown in Figures 1 to 4, comprises a pair of bearing posts or ends 1 set up in spaced relationship on a base 2 and having bearings 3 at their upper ends through which a cutter shaft 4 is journaled carrying the cutting wheel or rotary file 5. This shaft may be driven in any suitable manner as for instance by a motor driven belt (not shown) trained over the pulley 6. The cutting wheel 5 is supported at some distance above the base 2 and a carrier shaft 7 is journaled in bearings 8 on the ends 1 below and some distance outwardly of the shaft 4, as shown in Figure 2. A cylinder carrier arm 9, having a hub 10, is mounted by this hub on the shaft 7 and is secured rigidly thereto by a key 11. Extending from the hub 10 and at an obtuse angle from the arm 9, is a stop leg 12 having a threaded bore 13 at its end through which is secured a stop screw 14 adapted to impinge on a rest 15 extended upward from the base 2 beneath the shaft 4, the arrangement being such that the cylinder carrier arm 9 may be swung toward the cutting wheel 5, turning the shaft 7, but this movement will be limited by the stop screw 14 striking the rest 15, as will be understood. A cylinder carrier or seat designated generally at 16 is provided on the free end of the arm 9 and comprises a base 17 and a back 18 extended at right angles from the margin of the base 17 remote from the cutting wheel 5, the said seat being formed integrally with or secured to the arm, as desired. A lock cylinder A of conventional form is adapted to rest in the corner or recess formed at the junction of the base 17 and back 18, and is secured therein by an L-shaped clamp arm 19 pivoted at

one end at 20 between ears 21 formed on the back 18 and extended upwardly alongside the back and over the seat and having a threaded socket 22 in its end. A clamp screw 23 is threaded through this socket 22 and has a cupped or recessed rotatable clamp plate 24 at its end, which may be pressed against the cylinder A by turning the screw to hold the cylinder in place. An additional clamp screw 25 is threaded at 26 through the back portion 27 of the clamp arm and bears against the back 18 of the seat 16, the result being to draw the cylinder A tight against the back 18. A gauge 28 is provided, comprising a tang 29 having a longitudinal slot 30 and slidably mounted on the back 18 by screws 31 passed through the said slot and threaded in the back, the said gauge being thus adjustable longitudinally on the back of the seat, as will be understood. The gauge 28 has an end 32 turned inwardly over the base 17 of the seat 16 from one end of its tang 29, and this end 32 is so disposed that the cylinder A may have its key receiving end B (usually flanged as shown) butted against this end to determine and set the position of the cylinder on the seat. In addition, the seat 16 has an extension 33 projected endwise from its base 17 and having a socket 34 formed in its outer end to receive an expansion coil spring 35 and the plunger 36. The plunger 36 has a flat pressure plate 37 on its upper end, the function of which is to bear upward, under the influence of the spring 35, against the underside of the handle or head of a key blank C inserted in the cylinder A. The cylinder A is thus held against rotation in the seat and, as shown in the drawings, the position assumed by the cylinder mounted in the seat, is such that the tumbler pins D therein extend or point toward the cutting wheel 5. Normally these pins D lie flush at their outer ends with the periphery of the cylinder A, and are of different length in conventional manner. When an uncut key blank, as C, is inserted in the cylinder, it will strike the inner ends of the pins D and will force the same outward until their inner ends are flush with the key-way in the cylinder. The result is that these pins project different distances from the periphery of the cylinder as in Figure 3, due to their differences in length, and these distances are directly proportional to the depth of the cuts necessary in the key for the key to fit the cylinder, as will be understood.

A blank carrier arm 38 is provided, having a hub 39 at one end by which it is pivotally mounted on the shaft 7 alongside the arm 9, and having a radially extended threaded socket 40 through its hub to receive a locking screw 41, which is provided at its outer end with a wing 42 to facilitate its adjustment without the use of tools. A blank clamp designated generally at 43 is provided on the free end of the arm 38, and comprises a base plate 44 formed integrally with the arm and disposed at right angles thereto and having spaced apertured hinge ears 45 formed on its margin remote from the cutting wheel 5, between which a clamp plate 46 is hinged by a pin 47. The base plate 44 has a rib 48 extended longitudinally along its upper face at some distance from its margin, thus providing a guide for a key blank E when the same is placed on the base plate with its edge lying against the rib, as shown in Figure 2. The key blank E may be secured in this position by the clamp plate 46 which has a lip 49 extended longitudinally along the underside of its free margin and adapted to engage and bear against the blank. The clamp plate is pressed tightly on the key blank by a wing screw 50 passed loosely through an aperture 51 in the clamp plate and threaded at 52 in the base plate. A finger 53 is formed on the rear margin of the base plate 44 at the end nearest the cylinder carrier arm 9 and extends rearwardly therefrom as shown. A rest 54 is extended laterally from the base plate 44 at its forward edge to support the handle or head of the key blank E placed in the clamp. It will be noted in Figure 1, that the cylinder seat 16 and the clamp 43 are offset laterally and oppositely from their respective supporting arms 9 and 38, whereby the clamp 43 may pass alongside of the seat 16 and between this seat and the cutting wheel 5, as shown in Figure 3.

In the operation of cutting a key to fit a lock, an uncut key blank C is placed in the lock cylinder A and the cylinder is placed in the seat 16 with its end B abutting against the end 32 of the gauge 28 and with the head of the blank engaged by the pressure plate 37. The protruding tumbler pins D thus extend in a direction toward the cutting wheel 5 as aforesaid, and the cylinder A is then locked in this position by the clamp screws 23 and 25. An uncut key blank E is then placed in the clamp 43 and secured in place by the wing screw 50. It will be noted in Figure 3 that the key blanks C and E are turned in opposite directions, that is, the blank C has its lock entering end turned toward the left of the machine as viewed in Figure 1, while the blank E has its end turned toward the right. The locking screw 41 being loosened, the blank carrier arm 38 is adjusted so that the finger 53 engages the periphery of the lock cylinder A and the screw 41 is tightened, locking the arm 38 to the shaft 7. The whole assembly supported by the arms 9 and 38 is then swung toward the cutting wheel 5 until the edge of the wheel just touches the exposed and overhanging edge of the blank E in the clamp 43. The stop screw 14 is then adjusted to engage the rest 15 and thereafter limits the movement of the parts toward the cutting wheel. The

parts being then swung back clear of the cutting wheel, the locking screw 41 is loosened and the arm 38 swung forward and moved laterally on the shaft 7 until the finger 53 engages the tumbler pin D nearest the outer end of the lock cylinder, as shown in Figure 3. The screw 41 is then again tightened and the assembly swung toward the cutting wheel 5. The clamp 43 has now been set forward towards the wheel a distance equal to the protrusion of the tumbler pin D against which the finger 53 rests, and the blank E will thus move into the rotating wheel 5 and be cut on its exposed edge to a depth equal to this protrusion, as will be understood. This cut being finished, the screw 41 is again loosened and the clamp 43 and arm 38 moved sidewise on the shaft 7 until the finger 53 engages the tumbler pin D next in order, and the screw 41 is again tightened and another cut made. The operation is repeated until the last tumbler pin is reached, after which the cuts are rounded off and the blank E removed and is now a completed key to fit the cylinder A. The cuts proceed in regular order along the length of the key blank E in the proper position and spacing because of the opposite positioning of the key blanks C and E as aforesaid and as will be readily apparent in Figure 3. The operations necessary in cutting and completing a key are simple, rapid and easily performed.

Referring to the embodiment of my invention shown in Figures 5 to 9, the base 2*a* has bearing ends 1*a* through the upper parts of which is journaled the shaft 4*a* carrying the cutting wheel 5*a*. A shaft 7*a* is journaled and, in this case, also slidably mounted through a bearing 8*a* in one end 1*a* and across the base 2*a*. A bearing sleeve 55 is journaled on the other end of the shaft 7*a* and is locked against axial movement thereon by collars 56 secured by set screws 57 to the shaft at each end of the collar. This sleeve 55 is slidably and rotatably mounted in a bearing block 58 on the base 2*a* and the shaft 7*a* is thus slidably supported at each end below and to one side of the shaft 4*a*. The bearing block 58 has a recess 59 communicating with the bore 60 through which the sleeve 55 extends and a clamping dog 61 is slidably mounted in this recess and may be pressed against the sleeve to lock the shaft 7*a* against axial movement by means of a locking screw 62 threaded through a hole 63 communicating with the recess 59 as shown, the said screw 62 having a wing 64 for its convenient adjustment. The shaft 7*a* may, of course, rotate freely in the sleeve 55 at any longitudinal adjustment.

The blank carrier arm 38*a* has a hub 39*a* at one end by which it is rotatably and slidably mounted on the shaft 7*a* and this hub has a threaded socket 40*a* to receive a locking screw 41*a*. At its free end the arm 38*a* has a key blank clamp designated generally at 43*a* and comprising the base 44*a* and the clamp plate 46*a* hinged thereto by a pin 47*a* passed through a hinge lug 45*a*. The base 44*a* has a rib 48*a* to act as a stop and rest for the key blank E′ and the clamp plate 46*a* has a depended lip 49*a* to engage the blank, the said clamp plate being drawn tight against the blank by a wing screw 50*a* identically as described hereinbefore. This clamp arrangement is similar to the clamp 43 previously described. Adjacent its free end, the arm 38*a* has a laterally extended shoulder or boss 65 through which extends a relatively large bore 66 opening at the outer or end face of the boss and communicating at its inner end with a reduced axially aligned bolt hole 67. Adjacent the inner end of the bore 66, a recess 68 is cut opening out through the upper and lower sides of the boss 65 and a tapped thumb nut 69 is disposed in this recess and threaded on a threaded adjusting screw 70 disposed in the bore 66. The arrangement is such that the screw 70 may be extended or retracted from the outer end of the bore 66 by rotating the thumb nut 69, as will be understood. The screw 70 has an axially extended bore 71 aligned with the bolt hole 67 and adapted to freely receive a clamping bolt 72 passed through the said hole 67 and bore 71 and extending at its end from the adjusting screw 70 as shown. A finger 73 is extended from the outer end of the boss 65 at a point remote from the cutting wheel 5*a*.

A depth gauge arm 91 having a hub 74 is journaled and slidably mounted by this hub on the shaft 7*a* alongside the arm 38*a* and has its outer end disposed alongside the boss 65 on the blank carrier arm 38*a*. This outer end of the arm 91 has an arcuate slot 75 cut on a radius centered on the center of the shaft 7*a* and this slot 75 is adapted to freely receive the extended end of the clamp bolt 72 to limit the swinging movement of this arm 91 relative to the arm 38*a*. The depth gauge arm 91 may be locked in any adjusted position by a knurled lock nut 76 threaded on the end of the clamp bolt 72 and adapted to draw the end of the arm 91 up tight against the end of the adjusting screw 70. The arm 91 may also be adjusted laterally toward or away from the end of the hub 65 by turning the thumb nut 69 and retracting or extending the adjusting screw 70, it being of course also necessary to first loosen and then tighten the lock nut 76 in making this adjustment. The end of the depth gauge arm 91 also has a finger 77 disposed and extended alongside the finger 73 on the boss 65. Extended from the hub 74 of the depth gauge arm 91 is a stop leg 78 having a threaded aperture 79 in its outer end to receive a stop screw 14*a* similar to the aforesaid stop screw 14 and which is adapted to contact a rest 15*a* ex-

tended upward from the base 2*a* to limit the movement of the arms 38*a* and 91 toward the cutting wheel 5*a*.

The cylinder carrier or seat designated generally at 16*a* is in this embodiment mounted on the base 2*a* outwardly of the shaft 7*a* and comprises a horizontally disposed base 17*a* and a vertically extended back 18*a* on the margin of the base remote from said shaft 7*a*. The lock cylinder A′ in which an uncut key blank C′ has been inserted is placed in the seat exactly as hereinbefore described and is held therein by a clamp designated generally at 80 and comprising the U-shaped clamp arm 81 with angularly undercut faces 82 adapted to engage the lock cylinder A′ and the clamp screw 83 extended from this arm 81 through a passage 84 cut laterally across through the base 17*a*. A wing clamp nut 85 is threaded on the outwardly extended end of the screw 83 and is adapted to draw the clamp arm 81 tight against the cylinder A′ and thus hold the same rigidly in place. A gauge 28*a* is provided, comprising a longitudinally slotted tang 29*a* adjustably secured on the back 18*a* by screws 31*a* and having its end 32*a* turned inwardly over the end of the chair to adjust and hold the lock cylinder A′ longitudinally in its seat 16*a*. In lieu of the pressure plate arrangement 37 of the seat 16 in the previously described embodiment, a vertical gauge 86 is provided, comprising a tang 87 having a longitudinal slot 88 and adjustably mounted on a shoulder or extension 33*a* extended from the base 17*a* by screws 89 passed loosely through this slot and threaded in the shoulder or extension. A key engaging leg 90 is extended vertically upward from the tang 87 and by arranging the lock cylinder A′ in the seat 16*a* until the head or handle of the key blank C′ bears flat against the edge of this leg 90, the cylinder will be held against rotation with its tumbler pins D′ extended upward in correct position. The leg 90 is normally pulled into engagement with the key by a retractile coil spring 92 secured at 93 to the tank 87 and at 94 to the extension 33*a* and stretched between these points.

In the use of this embodiment of my machine, an uncut key blank as C′ is inserted in the lock cylinder A′ to which it is desired to fit a key and the cylinder is placed in the seat 16*a* with the protruding tumbler pins D′ extending upwardly. A key blank E′ is then placed in the clamp 43*a* as shown, and secured by tightening the wing screw 50*a*. The thumb nut 69 and lock nut 76 are then loosened and the arms 38*a* and 91 swung downward until the ends of the two fingers 73 and 77 both engage the end of the tumbler pin D′ nearest the key receiving end of the cylinder A′. The lock nut 76 and the lock screw 41*a* are then tightened and the arms 38*a* and 91 swung toward the cutting wheel 5*a* and the stop screw 14*a* adjusted until the projecting edge of the key blank E′ just touches the edge of the cutting wheel when said screw 14*a* engages the rest 15*a*. The parts are then again swung down toward the cylinder seat 16*a* and the lock nut 76 is loosened and the thumb nut 69 turned until the finger 77 on the arm 38*a* will clear the end tumbler pin D′ whereupon this finger is moved downward into engagement with the periphery of the lock cylinder A′, this being the relative position of the fingers 73 and 77 shown in Figures 5 and 6. The lock nut 76 is then again tightened and the parts swung toward the now rotating cutting wheel 5*a* and the arm 38*a* being set forward of the depth gauge arm 91, the blank E′ will be cut to a depth equal to the distance between the ends of the fingers 73 and 77 and the protrusion of the tumbler pin D′. To make the next and following cuts, the operation is repeated and both the arms 38*a* and 91 moved laterally of the base to a position where the fingers 73 and 77 will engage the pins by adjusting the shaft 7*a* longitudinally and locking it by the clamping dog 61 engaging the sleeve 55, as will be understood.

Further details of the operation of my invention will be readily apparent to those skilled in the art to which it pertains, and the simplicity, efficiency and relative low cost of the machine as described, will be obvious. It will be further understood that the fundamental principle of determining the depths and positions of the cuts necessary in a key by measuring the protrusion of the tumbler pins from a lock cylinder into which a blank has been inserted may be employed in machines constructed in many ways and using sliding as well as swinging feeds as herein described, and such variations are considered within the scope of my invention.

While I have herein set forth certain preferred embodiments of my invention, it is understood that I may vary from the same in minor structural details, so as best to construct a practical device for the purposes intended, not departing from the spirit of my invention and within the scope of the appended claims.

I claim:

1. In a key cutting machine, a rotatable cutting wheel, a lock cylinder seat to receive a lock cylinder in which an uncut key blank is inserted, a blank clamp movable toward and away from the cutting wheel, a key blank in the clamp, and means for limiting the distance to which the clamp may be moved toward the cutting wheel by the protrusion of the tumbler pins from the lock cylinder.

2. In a key cutting machine, a rotatable cutting wheel, a lock cylinder seat, a lock cylinder mounted on the seat from which

lock cylinder the tumbler pins are extended by a key blank inserted in the cylinder, a blank clamp movable toward and away from the cutting wheel and adapted for engagement with the tumbler pins and lock cylinder, whereby the protrusion of the said tumbler pins controls the cutting of a key blank in the clamp.

3. In a key cutting machine, a rotatable cutting wheel, a lock cylinder seat, a lock cylinder mounted on the seat from which lock cylinder the tumbler pins are extended by a key blank inserted in the cylinder, a blank clamp movable toward and away from the cutting wheel and adapted for engagement with the tumbler pins and lock cylinder, whereby the protrusion of the said tumbler pins controls the cutting of a key blank in the clamp, and means for clamping a lock cylinder in the said seat.

4. In a key cutting machine, a rotatable cutting wheel, a lock cylinder seat, a hinged blank carrier arm adapted for movement between the lock cylinder seat and the cutting wheel, a clamp on the blank carrier arm adapted to receive a key blank for cutting by the cutting wheel, and means on the blank carrier arm cooperating with a lock cylinder in the lock cylinder seat to regulate the depth and position of cuts made in the key blank.

5. In a key cutting machine, a rotatable cutting wheel, a lock cylinder seat, a lock cylinder mounted in the seat and having its tumbler pins projected by an uncut key blank, a hinged blank carrier arm adapted for movement between the lock cylinder seat and the cutting wheel, a clamp on the end of the blank carrier arm adapted to receive a key blank in position for cutting by the cutting wheel, and a finger on the end of the blank carrier arm adapted to engage the lock cylinder and the tumbler pins projecting therefrom.

6. In a key cutting machine, a rotatable cutting wheel, a lock cylinder seat, a lock cylinder mounted in the seat and having its tumbler pins projected by an uncut key blank, a hinged blank carrier arm adapted for movement between the lock cylinder seat and the cutting wheel, a clamp on the end of the blank carrier arm adapted to receive a key blank in position for cutting by the cutting wheel, a finger on the end of the blank carrier arm adapted to engage the lock cylinder and the tumbler pins projecting therefrom, and means for laterally adjusting the blank carrier arm to bring the said finger into engagement with any of the tumbler pins from end to end of the lock cylinder.

7. In a key cutting machine, a rotatable cutting wheel, a shaft below and to one side of the cutting wheel, a cylinder carrier arm secured to the shaft, means for limitng the movement of the cylinder carrier arm toward the cutting wheel, a cylinder seat on the outer end of the cylinder carrier arm, a blank carrier arm pivotally and adjustably mounted on the shaft alongside the cylinder carrier arm, means for locking the blank carrier arm to the shaft, a clamp on the outer end of the blank carrier arm adapted to hold a key blank, and a finger extended from the clamp and adapted to engage a lock cylinder or the tumbler pins thereof as mounted in the lock cylinder seat.

8. In a key cutting machine, a rotatable cutting wheel, a shaft below and to one side of the cutting wheel, a cylinder carrier arm secured to the shaft, means for limiting the movement of the cylinder carrier arm toward the cutting wheel, a cylinder seat on the outer end of the cylinder carrier arm, a blank carrier arm pivotally and adjustably mounted on the shaft alongside the cylinder carrier arm, means for locking the blank carrier arm to the shaft, a clamp on the outer end of the blank carrier arm adapted to hold a key blank, and a finger extended from the clamp and adapted to engage lock cylinder or the tumbler pins thereof as mounted in the lock cylinder seat, the said lock cylinder seat and clamp being offset from the cylinder carrier arm and blank carrier arm, whereby the clamp may extend and move laterally between the lock cylinder seat and the cutting wheel.

9. In a key cutting machine, a supporting base and ends, a rotatable cutting wheel, a longitudinally adjustable and rotatable shaft extended between the ends and disposed below and to one side of the cutting wheel, a lock cylinder seat mounted on the base outwardly of the said shaft, a blank carrier arm adjustably mounted on the shaft and adapted for swinging movement between the lock cylinder seat and cutting wheel, a key blank holding clamp on the end of the blank carrier arm, a finger extended from the outer end of the blank carrier arm and adapted to engage the projecting tumbler pins of a lock cylinder in the seat, a depth gauge arm pivotally and slidably mounted on the shaft alongside the blank carrier arm, means for adjusting the said depth gauge arm forwardly, rearwardly or laterally of the blank carrier arm, means for limiting the movement of the depth gauge arm toward the cutting wheel, and a finger extended from the outer end of the depth gauge arm alongside the said finger on the blank carrier arm.

In testimony whereof I affix my signature.

CHARLES A. HAUBROE.