July 7, 1936. R. W. GRIFFITH 2,046,624

MACHINE FOR USE IN MANUFACTURE OF CYLINDER LOCKS

Filed June 7, 1935 5 Sheets-Sheet 1

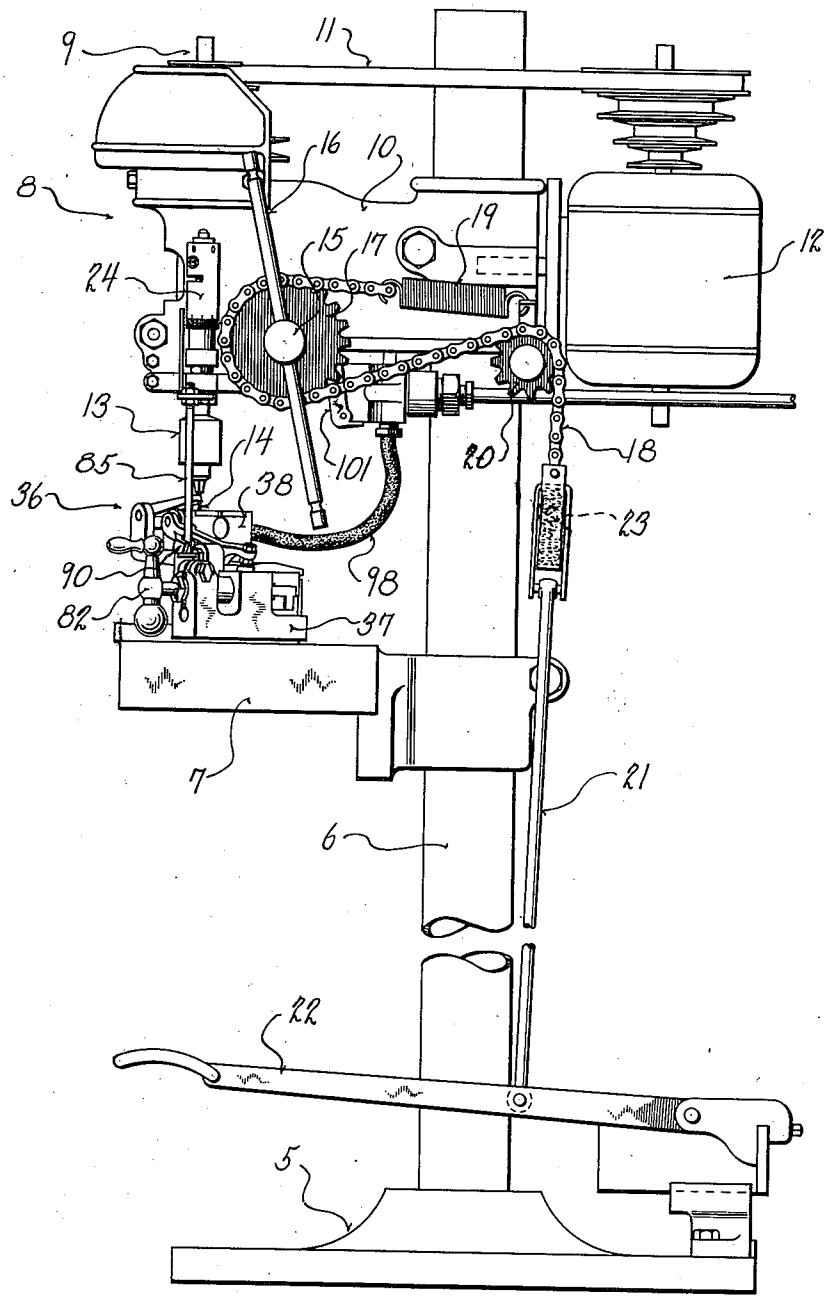


Fig. 1.

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MACHINE FOR USE IN MANUFACTURE OF CYLINDER LOCKS

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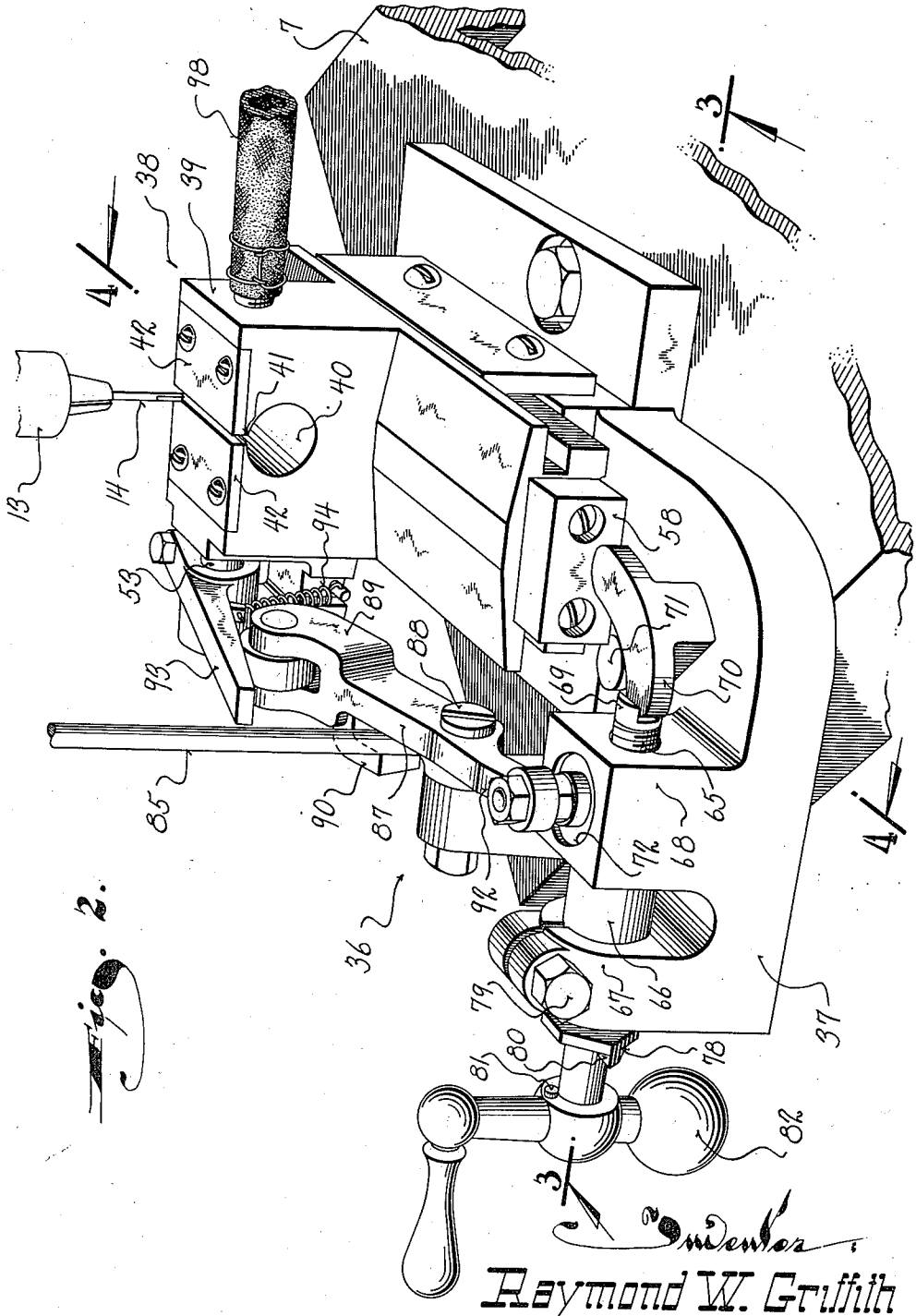


Fig. 2.

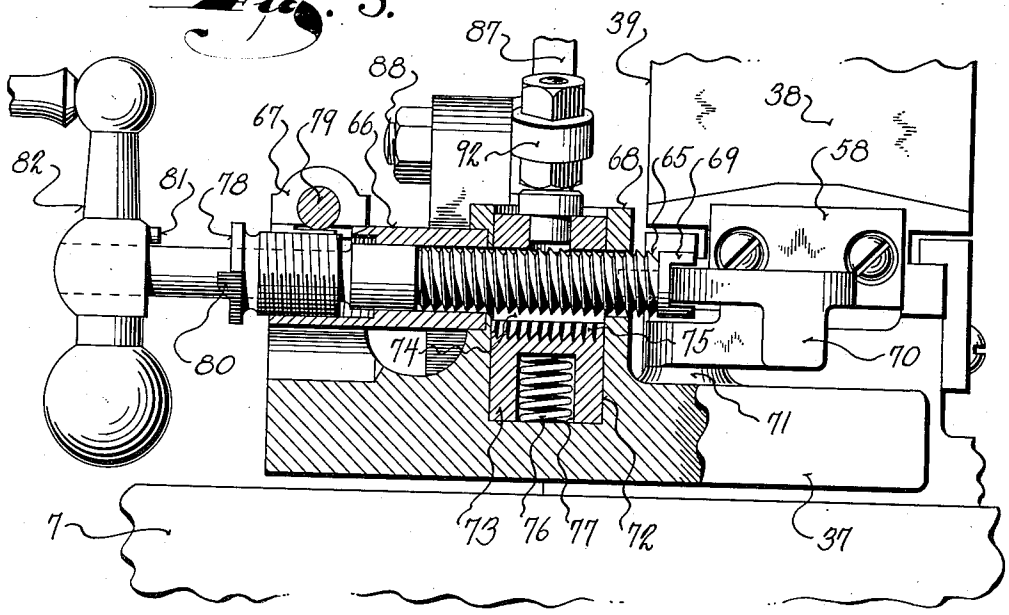
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July 7, 1936. R. W. GRIFFITH 2,046,624

MACHINE FOR USE IN MANUFACTURE OF CYLINDER LOCKS

Filed June 7, 1935 5 Sheets-Sheet 3

Fig. 3.



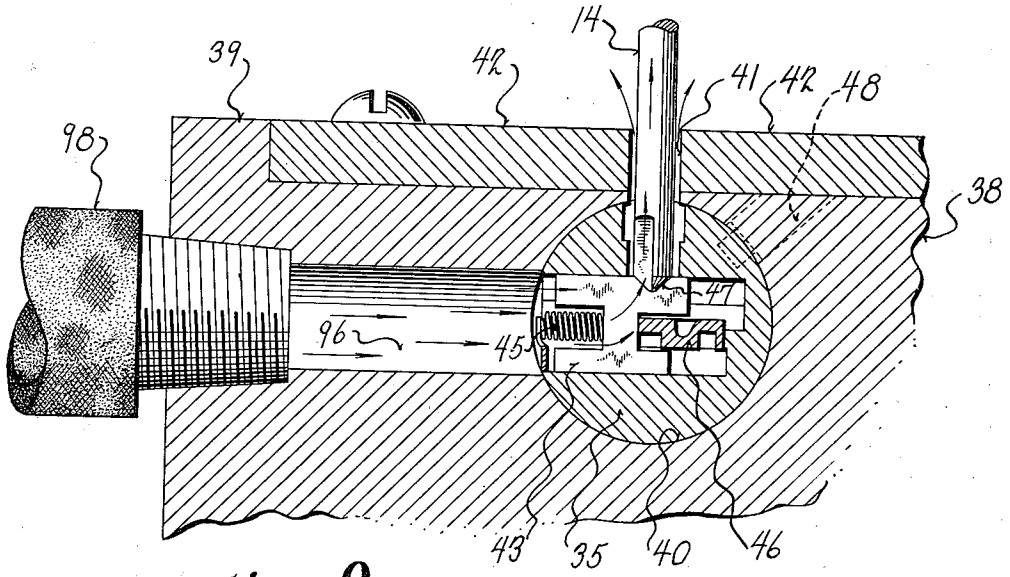


Fig. 9.

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July 7, 1936. R. W. GRIFFITH 2,046,624

MACHINE FOR USE IN MANUFACTURE OF CYLINDER LOCKS

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Fig. 4.

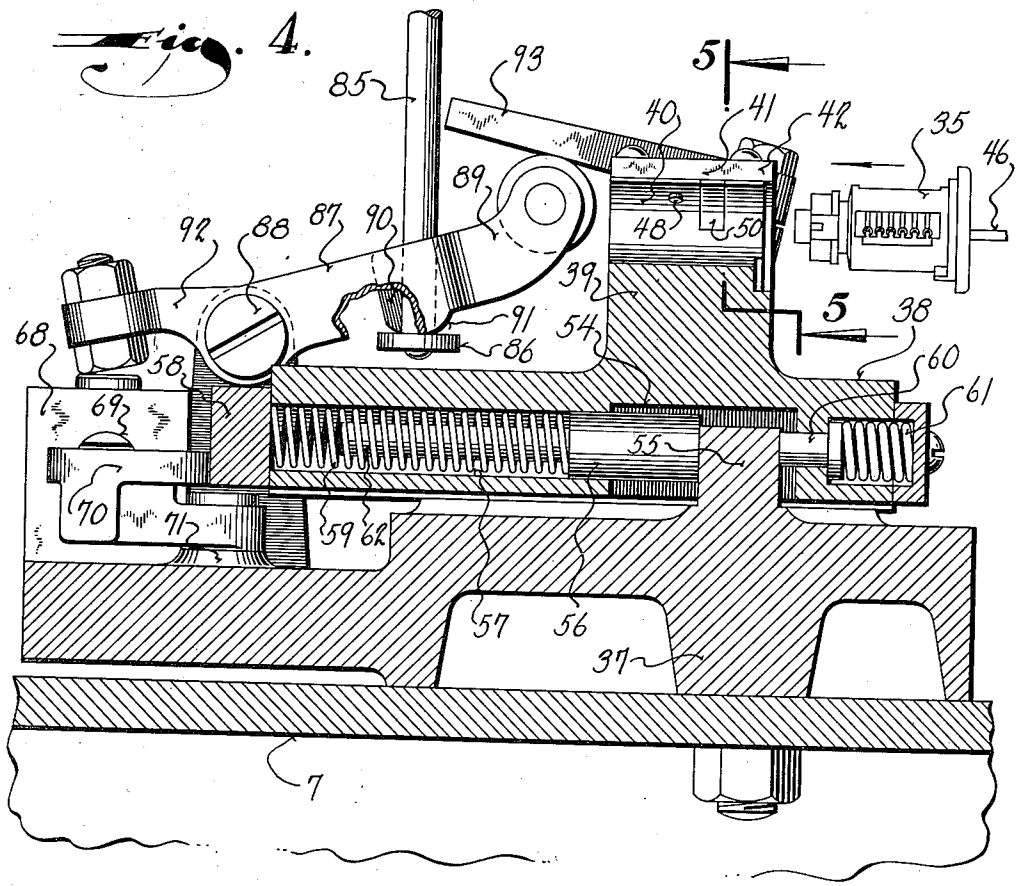
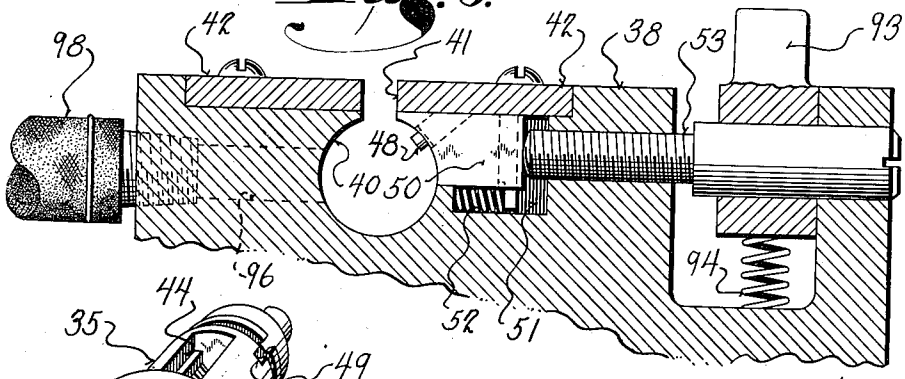


Fig. 5.



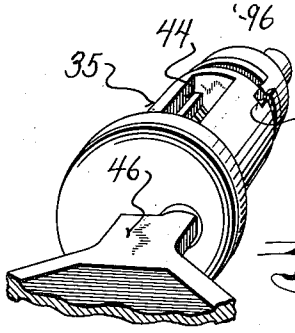


Fig. 10.

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MACHINE FOR USE IN MANUFACTURE OF CYLINDER LOCKS

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Fig. 6.

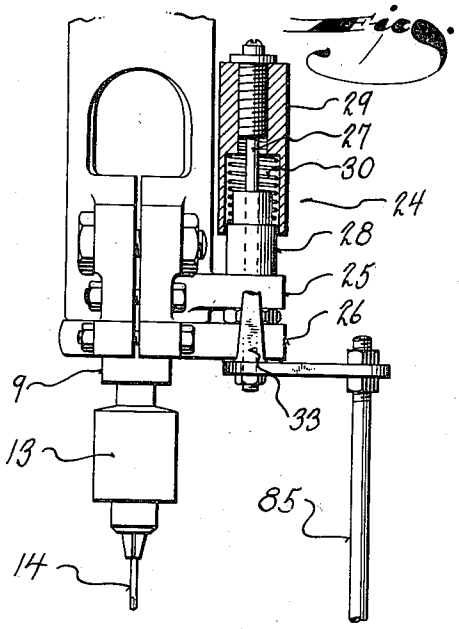
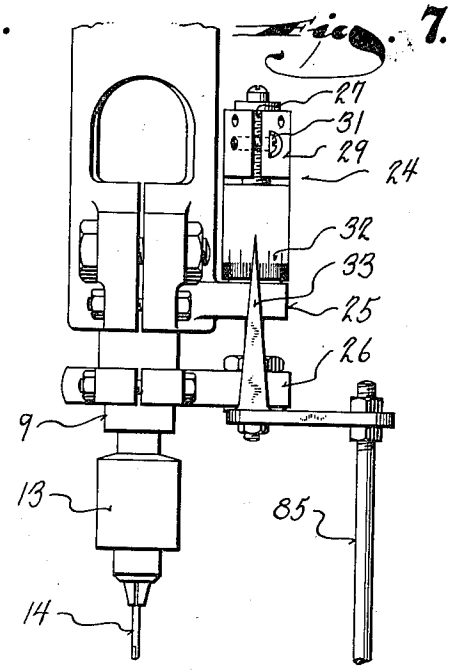


Fig. 7.



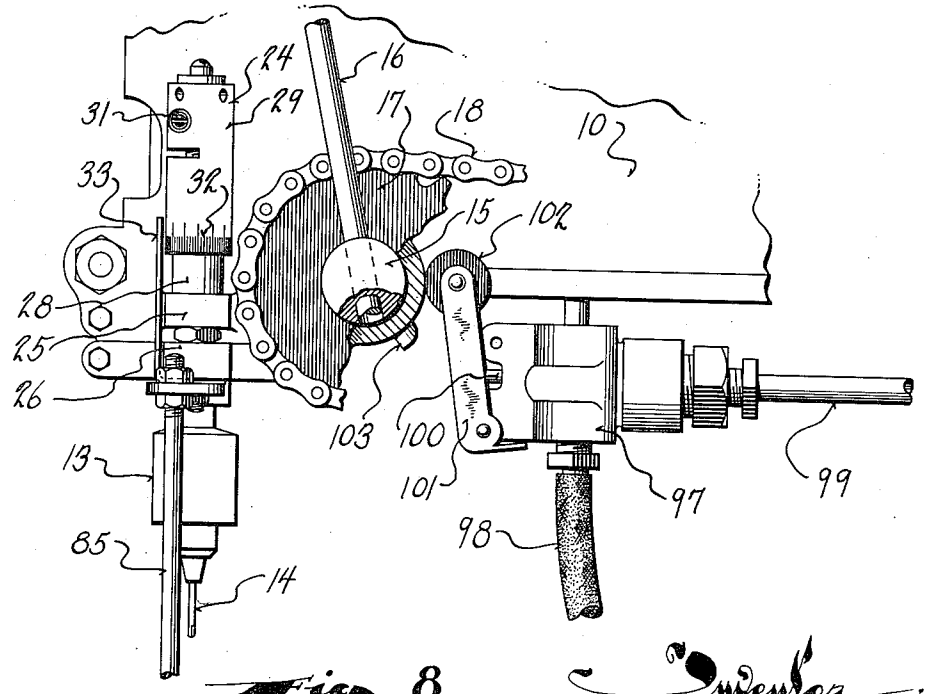


Fig. 8.

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Patented July 7, 1936 2,046,624

UNITED STATES PATENT OFFICE

2,046,624

MACHINE FOR USE IN MANUFACTURE OF CYLINDER LOCKS

Raymond W. Griffith, Milwaukee, Wis., assignor to Briggs & Stratton Corporation, Milwaukee, Wis., a corporation of Delaware

Application June 7, 1935, Serial No. 25,451

20 Claims. (Cl. 90—14)

This invention relates to machinery for manufacturing cylinder locks and refers more particularly to a machine for notching the tumblers in that type of lock shown in Patent No. 1,965,336, issued to John W. FitzGerald on July 3rd, 1934.

In this type of cylinder lock, the cylinder is not secured against rotation by the projection of tumblers therefrom, but through the medium of a locking bar projectible radially from the side of the cylinder by the tumblers. To so project the locking bar, each tumbler has a V-shaped notch cut in one side edge portion which coacts with the inner V-shaped edge of the locking bar to cam the locking bar outwardly as the tumbler is moved endwise by its respective spring.

In the manufacture of these locks, the tumblers at the time of assembly with the cylinder are all blank. That is, the V-shaped notches have not been cut therein. Inasmuch as different tumblers are moved different distances by the key and assume different positions within the cylinder upon complete insertion of the key, it follows that the V-shaped notches to be properly aligned when the key is in its fully inserted position must be cut at different locations with regard to the length of the tumblers. If the notches are cut with the key in place, proper location of the notches in the tumblers will be automatically assured.

To provide a machine for cutting the notches in the tumblers at this stage in the manufacture of the locks quickly and accurately is the primary object of this invention.

A further object of this invention is to provide a machine for the purpose set forth which is partially automatic so as to increase its speed of operation.

More specifically it is an object of this invention to provide a machine of the character described which is so constructed that merely the depression of a foot treadle simultaneously clamps the cylinder in proper position and lowers the cutting tool into operative position.

Another object of this invention is to provide novel means for feeding the cylinder past the cutting tool which means is automatically rendered operable concomitantly with the lowering of the cutting tool and is returned automatically upon retraction of the cutting tool to an inoperative position.

Another object of this invention is to provide novel means for removing the chips formed during the cutting of the notches in the tumblers as they are formed.

Another object of this invention is to provide simple means for adjusting the depth of the cut.

A further object of this invention is to provide a machine for the purpose set forth which is so constructed as to be substantially fool-proof so as to insure accuracy with a minimum of manual attention.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side view of a machine embodying this invention;

Figure 2 is a perspective view of the work holding fixture showing its relationship to the cutting tool;

Figure 3 is a detail section view taken through Figure 2 on the plane of the line 3—3;

Figure 4 is a section view taken through Figure 2 on the plane of the line 4—4;

Figure 5 is a detail section view taken through Figure 4 on the plane of the line 5—5;

Figure 6 is a detail view in front elevation with parts broken away and in section showing particularly the manner of adjusting the depth of the cut;

Figure 7 is a view similar to Figure 6 but entirely in front elevation and with the cutter lowered;

Figure 8 is a detail view in side elevation with parts broken away and in section to show particularly the manner of controlling the air blast;

Figure 9 is a detail section view showing a lock cylinder in cross section and the manner in which the chips are blown from the cylinder; and

Figure 10 is a perspective view showing a lock cylinder of the type for which this machine is designed.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates the base of the machine on which an upright supporting standard 6 is mounted. Secured to the medial portion of the standard is a work supporting table 7 and mounted on the upper end of the standard is a power

driven cutter head indicated generally by the numeral 8.

The cutter head 8 is constructed like an ordinary drill press and has a rotary arbor 9 journalled in the outer end of a supporting arm 10 and driven by a belt 11 from a motor 12 also carried by the arm 10. At its lower end, the arbor 9 has a drill chuck 13 in which a cutting tool 14 is secured. The arbor 9 carrying the chuck and the cutter tool is vertically movable toward and from the work supporting table 7, and to raise and lower the arbor, a shaft 15 having a driving connection (not shown) with the arbor is journalled in the arm 10.

On the outer extremity of the shaft 15 a handle 16 is mounted by which the shaft 15 may be turned to raise and lower the tool arm. Also fixed to the shaft 15 is a sprocket 17 over which a sprocket chain 18 is trained. One end of the sprocket chain is anchored to the arm 10 through a tension spring 19 and its other end portion is trained over an idler sprocket 20 and connected to the upper end of a link 21 whose lower end is attached to a foot treadle 22.

A tension spring 23 is preferably interposed in the connection between the sprocket chain and link 21 to provide for overtravel on the part of the treadle during operation of the machine. Through the treadle 22 and sprocket chain, the shaft 15 is rotatable to effect descent of the tool arbor to move the tool toward the work supported on the table 7, and inasmuch as the movement of the chain to effect this descent of the tool arbor necessarily stretches the spring 19, it will be readily apparent that the spring 19 returns the tool arbor and the treadle to their raised positions.

The descent of the tool arbor during the depression of the treadle 22 is adjustably limited by a depth gauge indicated generally by the numeral 24. This depth gauge comprises an arm 25 fixed to and extending laterally from the arm 10, and a second arm 26 fixed to the tool arbor and aligned with the arm 25. A rod 27 projects up from the arm 26 and extends slidably through the arm 25 and a collar 28 resting on the arm 25. Being fixed to the arm 26, the rod moves with the tool arbor 9. Its upper end is threaded and has an adjusting collar 29 threaded thereon. The lower end of the collar 29 is counterbored to telescope over the collar 28 and to enclose an expansive spring 30 confined between the collar 29 and a shoulder on the collar 28.

As best shown in Figure 6, upon descent of the tool arbor and consequently the collar 29, the spring 30 is depressed until the bottom of the counterbore in the collar 29 strikes the top of the collar 28 thus limiting the descent of the tool arbor. Hence, by adjusting the position of the collar 29 on the rod 27, the downward limit of movement of the tool arbor and tool may be set.

To prevent accidental shifting of the collar 29 on the rod 27, the upper end of the collar is split as shown in Figure 7 and a clamping screw 31 is provided to draw the ends of the split portion together and securely lock the collar on the rod. A scale 32 on the lower end of the collar 29 cooperating with an indicator finger 33 fixed to the arm 26 facilitates adjustment of the collar 29. This scale is preferably graduated to represent thousandths of an inch corresponding to equal distances in the range of adjustment of the tool arbor.

The work, which in this instance, is a lock cylinder 35 of the type hereinbefore described and shown in Figure 10, is held in position to be acted upon by the cutting tool through the medium of a jig or fixture indicated generally by the numeral 36. This fixture comprises a base 37 bolted onto the table 7 and a carriage 38 slidable on the base.

The carriage 38 has an upstanding boss or block 39 carried thereby and preferably formed as an integral part thereof. This block 39 is bored transversely as at 40 to receive a lock cylinder 35. The bore 40 has its axis disposed horizontally and in parallel alignment with the direction of sliding movement of the carriage on the base, and breaking into the top of the bore 40 is a longitudinal slot 41 through which the cutting tool 14 enters the bore for engagement with the work held therein.

The slot 41 is of such width as to permit the cutting tool to pass freely therethrough and to guard against destruction of the sides of the slot, the top of the block preferably has hardened metal guard plates 42 removably fixed thereto to define the sides of the slot.

As best seen in Figure 9, the lock cylinder 35 has tumblers 43 movable in a plane normal to the plane of a slot 44 opening to the side of the cylinder and in which the locking bar operates when the cylinder is completely assembled. As is customary, the tumblers are yieldingly urged in one direction by springs 45 and are movable against the action of the springs by a key 46 to align the V-shaped notches 47 in all of the tumblers.

As noted hereinbefore, the purpose of the machine of this invention is to accurately and quickly cut these V-shaped notches 47. To this end, the key 46 is first inserted into the cylinder to properly locate all of the tumblers and then with the key fully inserted, the lock cylinder is secured in the bore 40. To insure the proper rotational disposition of the cylinder in the bore 40, a fixed pin 48 projects into the bore at a point to engage in a notch 49 in the inner end of the cylinder. With the pin 48 engaging in the notch 49, the slot 44 aligns with the slot 41 to allow the cutter unrestricted access to the tumblers for the cutting operation.

The lock cylinder is held against displacement in the bore by a clamp 50 slidable in a recess 51 in the block 39. The outer end of the clamp 50 is curved to correspond to the wall of the bore. A spring 52 yieldingly holds the clamp 50 in a retracted non-clamping position and to move the same forwardly into clamping position, a clamping screw 53 is threaded in the block with its inner end abutting the block 50. Turning the screw 53 to thread the same into the block forces the clamp 50 against a cylinder disposed in the bore. The manner in which the screw 53 is turned to effect this clamping action will be hereinafter more fully described.

From Figure 4, it will be noted that the underside of the carriage has a recess 54 into which a lug or projection 55 on the base extends. At one side of the lug or projection 55, the carriage mounts a spring pressed plunger 56 which bears against the lug or projection 55. The plunger 56 is slidable in a bore 57 axially parallel to the direction of sliding motion of the carriage. The end of the plunger which abuts the projection or lug 55 is enlarged in diameter, and confined between the shoulder formed by said enlarged end and a plate 58 closing the end of the bore 57 is an expansive spring 59.

The spring 59 yieldingly maintains the carriage at one limit of its sliding motion across the base. This limit of movement is defined by the engagement of a stop pin 60 carried by the carriage and arranged to abut the opposite side of the lug or projection 55, and to cushion the abutment of the stop pin 60 with the lug 55, the pin 60 is maintained in operative position by a heavy spring 61.

The opposite limit of sliding movement of the carriage across the base which motion is effected against the action of the spring 59 is defined by the engagement of the small diameter end 62 of the plunger 56 with the closure plate 58.

With the carriage in its normal position shown in Figure 4 and a lock cylinder inserted into the bore 40 from the front side of the block 39, as indicated in Figure 4, the cutting tool is in position to begin the cutting of the outermost of the series of tumblers in the cylinder so that upon moving the carriage to the right (with respect to Figure 4) all of the tumblers in the cylinder will be carried past the cutting tool. To move the carriage in this direction and carry the tumblers past the cutting tool, a feed screw 65 is provided.

The feed screw 65 is freely journalled in a sleeve 66 mounted in aligned bores in two bosses 67 and 68 projecting up from and forming an integral part of the base. The sleeve 66 does not extend through the boss 68, but merely has its end anchored therein as shown in Figure 3. However, the feed screw 65 extends entirely through the boss 68 which is bored sufficiently large to permit unrestricted endwise movement of the screw.

As best shown in Figure 2, the feed screw 65 is arranged at ninety degrees to the line of motion of the carriage and to transmit the force of the feed screw to the carriage an arcuate lever 70 is provided. The lever 70 is pivoted to the base as at 71 so that one end thereof is engaged by a cap 69 freely rotatably mounted on the end of the feed screw, and its other end is engaged with the closure plate 58 of the carriage.

The boss 68 has a well 72 in which a half nut 73 is slidably mounted. This half nut 73 has an oval shaped hole 74 extending transversely therethrough through which the feed screw passes and the bottom of this oval shaped hole has threads 75 to coact with the feed screw 65 and cause the feed screw to move endwise upon clockwise rotation thereof when the half nut 73 is held up against the feed screw.

The half nut 73 is yieldingly urged against the feed screw by a spring 76 confined between the bottom of the well 72 and the bottom of a socket 77 in the half nut. Consequently, as long as the half nut is not held down against the action of the spring 76, it is engaged with the feed screw thus rendering the same operative to transmit sliding movement to the carriage. However, the half nut is normally held down against the action of its spring 76 to disengage its thread 75 from the feed screw in a manner to be hereinafter described.

The outer end portion of the feed screw 65 is reduced in diameter and is journalled in a bushing 78 threaded in the outer end of the sleeve 66. The outer end of the sleeve 66 is split and the boss 67 is likewise split and has a clamping screw 79 by which the split boss and sleeve may be drawn together to clamp the bushing 78 in any position of adjustment.

On its outer face, the bushing 78 has a stop lug 80 which is engageable by a pin 81 projecting from the inner face of a ball crank 82 fixed to the feed screw and through which rotation may be imparted to the feed screw. Upon engagement of the pin 81 with the lug 80 the clockwise rotation of the feed screw and consequently the endwise motion of the carriage is limited. Hence, by adjusting the position of the bushing in the sleeve 66, the limit of sliding movement of the carriage is readily adjusted. Determining the limit of sliding movement of the carriage in this manner prevents the application of undue strain upon the parts as it arrests the operating force at its point of application.

As noted hereinbefore, the half nut is normally disengaged from the feed screw so that the feed screw is normally inoperable to effect sliding movement of the carriage. Also, the clamp 50 is yieldingly held out of clamping position except when the clamping screw 53 is threaded into its bore. Freeing the half nut for engagement with the feed screw to render the feed screw operative and threading the clamping screw 53 into its bore to clamp the cylinder is effected automatically and simultaneously by the depression of the foot treadle 22 to lower the tool arbor and consequently the tool into operative association with the work.

To this end, a tie rod 85 has its upper end securely fixed to the tool arbor 9, as shown in Figures 6 and 7. The lower end of this tie rod 85 has an enlarged head 86 through which a lifting force may be transmitted from the tie rod to a lever 87 medially pivoted on the base as at 88. To effect connection between the tie rod 85 and the lever 87, the long arm 89 of the lever has a bifurcated portion 90 in which the lower end of the rod 85 is disposed with its head 86 bearing against the lower edges 91 of the bifurcated portion 90 which, as shown in Figure 4, are preferably rounded.

It will be remembered that the tool arbor through the medium of the tension spring 19 is normally held in its raised position so that the tie rod 85 will likewise be held up to maintain the lever 87 in its position shown in Figure 4. In this position, the short arm 92 of the lever 87 holds the half nut 73 down against the action of its spring 76 to render the feed screw inoperative, while the longer arm 89 of the lever 87 holds a finger 93 which is fixed to the clamping screw 53 in a raised position against the action of a tension spring 94. The spring 94, when free, pulls the finger 93 down to turn the pressure screw 53 so as to thread the same into its bore and force the clamp 50 against the lock cylinder with a pressure determined by the strength of the spring 94.

Obviously, though, whenever the rod 85 is raised, the finger 93 will be lifted to impart retrograde rotation to the pressure screw 53 to release the clamp 50 and also press the half nut down out of engagement with the feed screw 65.

Immediately upon disengagement of the half nut from the feed screw, the spring 59 returns the carriage and the feed screw to their initial positions.

The chips incidental to the cutting of the tumblers are blown out of the cylinder by air pressure in the manner now about to be described.

As best shown in Figure 9, the block 39 has a port 96 leading to the bore 40 at a point to communicate with the tumbler chamber of a cylinder in place in the bore so that air blown through the port 96 passes into the tumbler chamber and up through the slot 44 in the cylinder to carry the chips out through the slot 41, as clearly shown by the arrows in Figure 9.

Air under pressure is led to the port 96 from a valve 97 through a hose connection 98. The valve 97 is connected by a pipe line 99 with a source of air pressure and has a normally closed plunger valve (not shown) adapted to be opened by depression of its stem 100. To depress the valve stem 100 and thus open the valve a pivoted arm 101 carrying a cam roller 102 at its free end is provided and the valve 97 is so mounted from the arm 10 that the cam roller 102 is engageable by a lug 103 carried by the hub of the sprocket 17, the lug 103 being so placed as to engage the roller 102 to open the valve upon rotation of the sprocket through the number of degrees necessary to effect the functioning of the machine.

Hence, whenever the treadle 22 is depressed the valve 97 is open and air under pressure is available to blow the chips incidental to the cutting action out through the slot 41.

Operation

Assuming that the machine has been properly set up for lock cylinders of a certain size, that is, the base has been properly located on the table 7 and the depth of the cutter movement has been properly adjusted, a cylinder with its key inserted all the way is placed in the bore 40 of the holding fixture. During the insertion of the cylinder into the bore, which is preferably done with the left hand, the key should be horizontal and the locking bar slot upwards. Rotating the cylinder when inserting it facilitates the engagement of the cylinder notch with the locating pin 43 to properly locate the cylinder in the bore.

With the key held securely in the cylinder, the foot treadle is then pressed down and held there. This clamps the cylinder in place by allowing the spring 94 to pull the finger 93 down and impart a turning moment to the pressure screw 53. It also permits engagement of the half nut with the feed screw as hereinbefore described, and lowers the cutting tool to its proper depth.

With the pedal held down, the feed screw is then gradually turned clockwise until it comes to a full stop effected by the engagement of the pin 81 with the lug 80. All of the tumblers are then properly milled and inasmuch as the air valve 97 is open as long as the treadle is held down, the chips resulting from the milling of the tumblers are blown out through the top of the slot 41 as they are formed.

When the feed screw has been turned to its limit of movement, the ball crank and the foot treadle are released allowing the spring 59 to return the feed screw and carriage to their initial positions and the spring 19 to retract the tool arbor, which, as noted hereinbefore, releases the cylinder for removal.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which this invention appertains, that this invention provides a novel and practical machine for quickly and accurately milling the V-shaped notches in the tumblers of side bar locks.

What I claim as my invention is:

1. In a machine of the character described, a table to support work to be acted upon, a power driven cutter movable toward and from the table, a movable carriage on the table, means for clamping the work to be acted upon in position on the carriage, normally inoperative means for moving the carriage to shift the work with respect to the cutter, and means for simultaneously moving the cutter toward the table, for actuating the clamping means to secure the work on the carriage and for rendering said carriage moving means operative.

2. In a machine of the character described, a cutter tool rotating on a fixed axis, a carriage adapted to hold work to be acted upon, means mounting the carriage for sliding movement to carry the work past the cutter, spring means yieldingly urging the carriage in one direction, and manually operable means for moving the carriage in the opposite direction comprising a feed screw and a half nut movable to and from engagement with the feed screw, and means for controlling the engagement of the half nut with the feed screw.

3. In a machine of the character described, the combination with a rotating cutter movable vertically to and from an operative position, a carriage adapted to grip work to be acted upon by the cutter, means slidably mounting the carriage for movement to carry the work past the cutter, spring means yieldingly urging the carriage in one direction, manually operable means for moving the carriage in the opposite direction comprising a feed screw and a half nut movable to and from engagement with the feed screw, and means for simultaneously lowering the cutter into operative position and effecting operative engagement between the half nut and feed screw.

4. In a machine of the character described, the combination with a power driven rotating cutter movable vertically to and from operative position, a work carrying carriage movable to carry work mounted thereon past the cutter, spring means yieldingly urging the carriage in one direction, manually operable means for moving the carriage in the opposite direction, means for rendering said manually operable means ineffective, and means for simultaneously lowering the cutter tool to operative position and disabling said last named means so that the manually operable means is rendered effective.

5. In a machine of the character described, the combination with a rotating cutter movable vertically to and from operative position, a work carrying carriage movable to carry work to be acted upon past the cutter, a spring yieldingly urging the carriage in one direction, a hand operated feed screw for moving the carriage in the opposite direction, a half nut engageable with the feed screw to render the feed screw operative to effect movement of the carriage, means for holding the half nut out of engagement with the feed screw, and foot treadle actuated means for simultaneously lowering the cutter into operative position and rendering said holding means ineffective so as to release the half nut for engagement with the feed screw.

6. A work holding fixture for machines of the character described, comprising a base, a carriage slidable on the base and having means to grip the work to be acted upon, a spring yieldingly urging the carriage in one direction, and manually operable means for moving the carriage in the opposite direction comprising a rotatable feed screw, bearings carried by the base in which the feed screw is freely journalled, a half nut carried by the base movable to and from engagement with said feed screw, said half nut being held by the base against movement endwise with respect to the feed screw so that upon turning of the feed screw endwise movement is imparted to the feed screw when the half nut is engaged therewith, means for transmitting endwise move-

ment of the feed screw to the carriage, and means for controlling the engagement of the half nut with the feed screw.

7. A work holding fixture for machines of the character described comprising a base, a carriage slidable on the base and adapted to grip the work, means for moving the carriage in one direction including a rotatable feed screw, and means for limiting the movement of the feed screw comprising a bushing in which the feed screw is journalled, a stop lug carried by the bushing, and a stop pin carried by the feed screw and disposed eccentrically with respect thereto and in line with the stop abutment to engage the same upon a predetermined motion of the feed screw.

8. In a work holding fixture of the character described, including a base, a carriage slidable on the base and a feed screw for sliding the carriage in one direction, adjustable means for limiting the movement of the feed screw comprising a boss on the base, a bushing adjustable in the boss and having the feed screw journalled therein, an abutment on the bushing, and a pin carried by the feed screw and disposed eccentrically with respect thereto to engage said stop abutment upon predetermined movement of the feed screw, the degree of movement which said limiting means permits being adjustable by adjusting the position of the bushing in the boss.

9. A work holding fixture for machines of the character described comprising a base, a carriage slidable across the base and having a bore to receive the work, a clamp movable into the bore to secure the work therein, a pressure screw adapted to press the clamp into the bore upon rotation of the screw in one direction, yieldable means tending at all times to turn the screw in said direction, and manually controlled means acting against said yieldable means for turning the screw in the opposite direction and for holding the screw in its retracted position.

10. In a fixture for machines of the character described, a member having a bore to receive work to be acted upon, a clamp movable into the bore to secure the work therein, a pressure screw threaded in said member and operable upon rotation in one direction to press the clamp into the bore and against the work disposed therein, spring means yieldingly urging the screw in said direction of rotation, and manually controlled means acting in opposition to said spring means for turning the screw in the opposite direction and for holding the screw in its retracted position.

11. In a fixture for machines of the character described, a member having a bore to receive work to be acted upon, a clamp movable into the bore to secure the work therein, a pressure screw threaded in said member and operable upon rotation in one direction to press the clamp into the bore and against the work disposed therein, spring means yieldingly urging the screw in said direction of rotation, a finger fixed to the screw, and a manually controlled rocking lever acting on said finger to turn the screw in a retrograde direction against the action of said spring means.

12. In a machine of the character described, the combination with a rotating cutter adapted to be lowered into operative position, a member bored to receive the work to be acted upon, a clamp for securely locking the work in said bore, a pressure screw threaded in said member and adapted to push the clamp toward the work upon being turned in one direction, spring means for applying a yielding turning moment to the screw in said direction, common means for yieldingly maintaining the cutter tool in elevated position and for acting on the pressure screw against said spring means to normally hold the pressure screw in a retracted position, and manually operable means for simultaneously lowering the cutter into operative relationship to the work and for releasing the pressure screw for actuation by its spring means.

13. In a machine of the character described, the combination with a cutter carried by a power driven tool arbor adapted to be moved vertically to lower the tool to an operative cutting position, a member bored to receive the work to be acted upon, a clamp movable into the bore to secure the work therein, a pressure screw operable upon being turned in one direction to force the clamp into the bore, a spring yieldingly applying a turning moment to the pressure screw in said direction, means to yieldingly hold the tool arbor in a raised position, a connection between the tool arbor and the pressure screw through which retrograde rotation is applied to the pressure screw by the action of said yielding means acting on the tool arbor, and manually operable means for lowering the tool arbor against the action of said yielding means and for moving said connection to release the pressure screw for action by its spring means.

14. A work holding fixture for machines of the character described comprising a base, a carriage slidable across the base and having a part bored to receive the work to be acted upon, a clamp movable into the bore to clamp work therein, a pressure screw threaded in said part and adapted upon being turned to push the clamp into the bore, a spring yieldingly applying a turning moment to the pressure screw in said direction, a lever fixed to the pressure screw through which turning force may be applied to the pressure screw, a feed screw for moving the carriage, a half nut carried by the base and engageable with the feed screw, yieldable means for urging the half nut into engagement with the feed screw, a medially pivoted lever engageable with the half nut to hold the same disengaged from the feed screw and engageable with the finger to hold the pressure screw in a retrograde position of rotation, and means for controlling the position of said lever.

15. In a machine of the character described, a work holding fixture including a clamp, a pressure screw adapted upon forward rotation to render said clamp effective, a spring to apply a yielding turning moment to the screw in said forward direction, a second spring for imparting a retrograde turning moment to the screw, said second spring being stronger than the first so that the pressure screw is normally retracted, and manually operable means to overcome the second named spring and allow the first spring to act on the screw.

16. In a machine of the character described, a work holding fixture comprising a member having a bore to receive the work, a clamp slidable into the bore to clamp the work in the bore, a pressure screw threaded in said member and operable upon forward rotation to force the clamp into the bore, a radially extending finger fixed to the pressure screw, a spring acting on said finger to apply a yielding turning moment to the screw in said forward direction, a second stronger spring, means for applying the force

of said stronger spring to the finger in opposition to the first spring including a pivoted lever having its free end contacting the finger, and manually operable means for overcoming the second spring to allow the first named spring to act.

17. In a machine of the character described, a work holding fixture comprising a base, a carriage having means to grip the work, means for slidably mounting the carriage for linear movement across the base along a fixed axis, a spring yieldably urging the carriage in one direction, a feed screw, means mounting the feed screw on the base with its axis disposed at an angle to the axis of sliding movement of the carriage, and a pivoted lever for transmitting endwise motion of the feed screw to the carriage.

18. In a machine for cutting notches into the tumblers of a lock cylinder, the cylinder having a longitudinal slot through which a cutting tool has access to the tumblers and also having an opening in its side leading to the chamber in which the tumblers are mounted, a holding block bored to receive the cylinder, said block having an opening to admit a cutting tool to the bore and having a port opening into the bore, means for locating the cylinder in the bore with its slot in alignment with said opening through which the cutting tool has access to the bore and its opening leading to the tumbler chamber in line with the port, and means for conducting air under pressure to said port so that air blowing into the interior of the tumbler chamber carries chips formed by the cutting action out through the slot in the cylinder and the tool opening in the block.

19. In a machine for notching the tumblers of a lock cylinder, a power driven cutting tool movable to and from an operative position, a holding member bored to receive and hold a lock cylinder, said member having a slot opening to the bore through which the cutting tool has access to a cylinder in the bore and having a port opening to the side of the bore, means for holding a lock cylinder in the bore with the open end of its tumbler receiving chamber in line with said port and a slot formed in its side and leading to the tumbler chamber in line with the slot in said holding member to allow the cutting tool unrestricted access to the tumblers, means for conducting air under pressure to said port to blow chips out through the slots in the cylinder and holding member as they are formed, a valve to control the flow of air to the port, means for lowering the cutting tool into operative relationship with the cylinder, and means operable upon lowering of the cutting tool for opening said valve.

20. In a machine for notching the tumblers of a lock cylinder in which the tumblers operate in a tumbler chamber which is open at one end and which joins with an opening in the side of the cylinder, said machine including a cutter and a holding fixture having a bore to receive and hold the lock cylinder in position to have the cutter enter the opening in the side of the cylinder and act on its tumblers, said fixture having an air discharge port communicating with its bore at a point to discharge into the open end of the tumbler chamber so that air blown therefrom passes into the tumbler chamber and out through said side opening against the end of the cutter to blow chips as they are formed through said side opening in the cylinder, and means for conducting air under pressure to said discharge port.

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