

D. E. ROSS.
MACHINE FOR CUTTING INTERNAL FLUTES.
APPLICATION FILED NOV. 26, 1907.

961,537.

Patented June 14, 1910.

3 SHEETS—SHEET 1.

FIG. 2

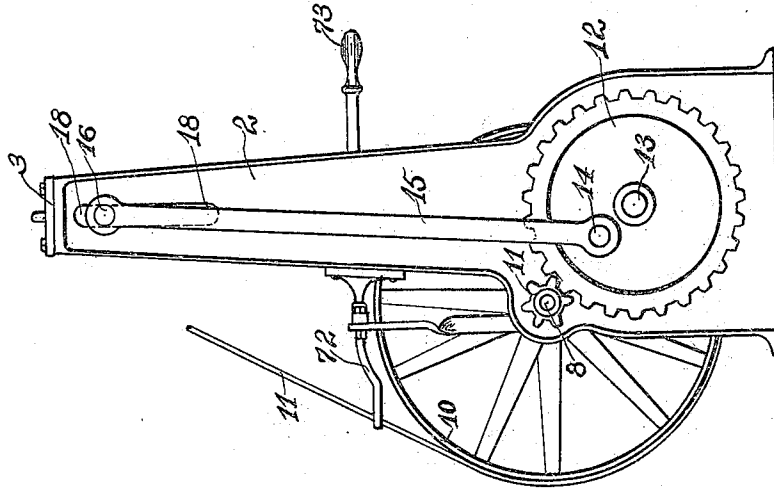
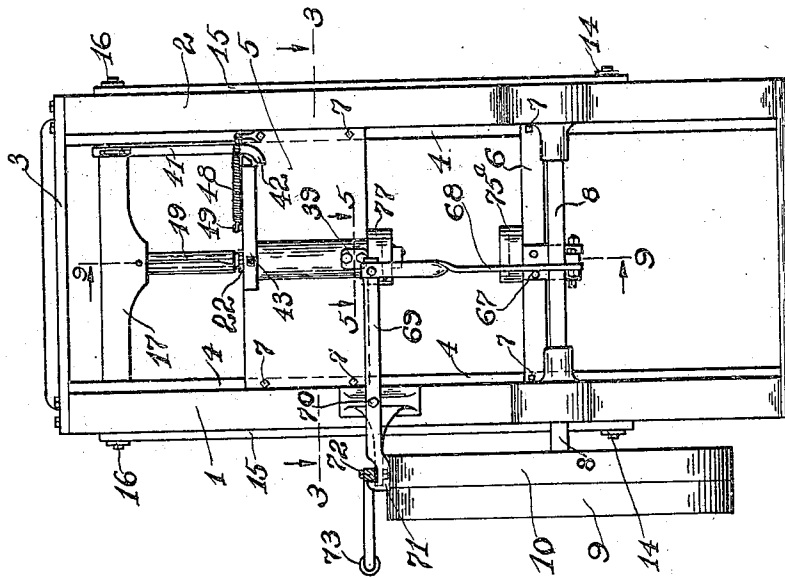


FIG. 1



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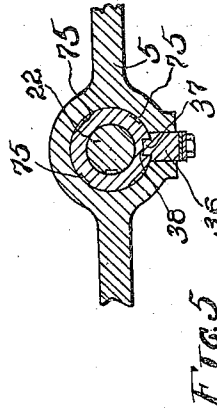
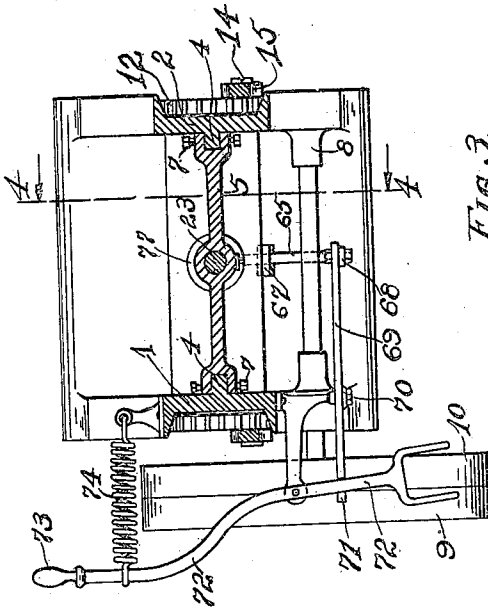
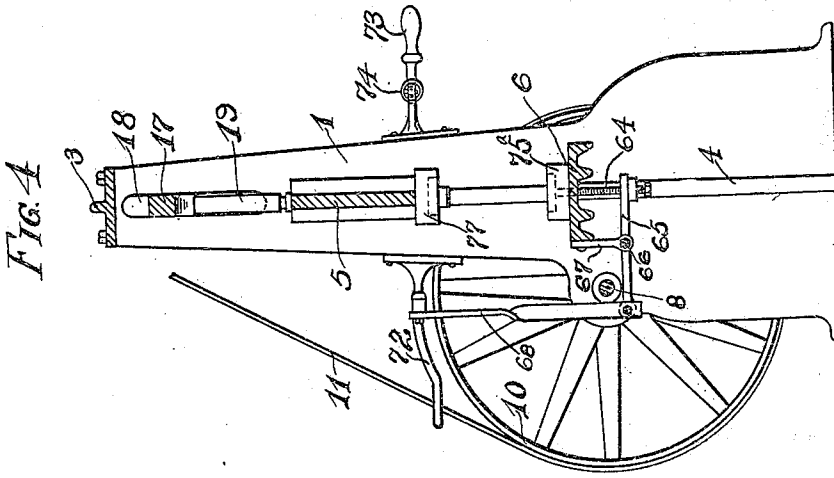
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3 SHEETS—SHEET 2.



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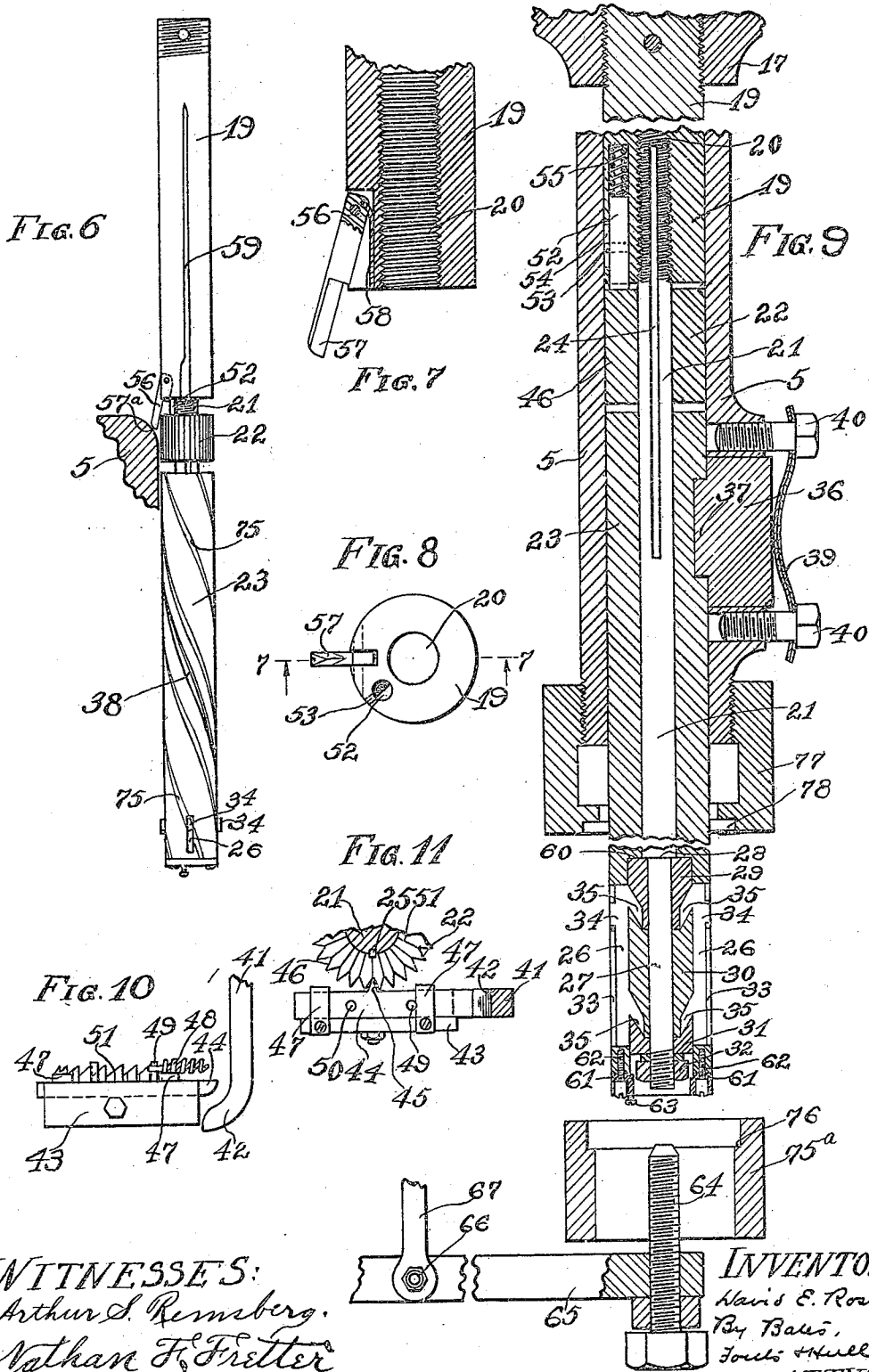
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR CUTTING INTERNAL FLUTES.

961,537.

Specification of Letters Patent. Patented June 14, 1910.

Application filed November 26, 1907. Serial No. 403,895.

To all whom it may concern:

Be it known that I, DAVID E. ROSS, residing at Brookston, in the county of White and State of Indiana, have invented a certain new and useful Improvement in Machines for Cutting Internal Flutes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

10 This invention relates to machines for cutting spiral internal flutes; and, while it is adapted for more general application, it is designed more particularly for cutting the spiral flutes in the housing of my steering gear mechanism for automobiles and the like that is shown in my application No. 316,594 filed May 14th, 1906. In the said steering mechanism, a threaded member is adapted to move longitudinally within an outer housing with which it has threaded engagement, so that when the said member is moved longitudinally it will be given a rotary movement within the housing. The steering knuckle of the vehicle is connected with the said longitudinally movable member, and as the latter is turned the steering wheel of the vehicle is turned. Reference is thus made to the said steering gear in order that it may be clear that lost motion be securely provided against, to accomplish which it is necessary that the flutes in the outer housing be square or of uniform width throughout their entire depth, thus making it necessary to give the cutter-bits by which the flutes are produced, an absolutely parallel movement as they are fed into the flutes.

My present invention, therefore, consists of a cutter-bar carrying a plurality of cutter-bits, said cutter-bar being given a longitudinal and a rotary motion, and mechanism for feeding outwardly the cutter-bits in such a manner as to keep them always parallel.

45 A further object of the invention is to combine with the feeding mechanism for the cutter bits an automatic device for stopping the machine when the flutes have been cut to the proper depth.

Other objects of my invention will be specifically set forth in the following specification which is descriptive of the drawings accompanying this application, in which drawings—

Figure 1 shows a rear elevation of my ma-

chine, the belt shifting lever being shown in section. Fig. 2 is a side elevation of the machine. Fig. 3 is a transverse section taken substantially on line 3—3 of Fig. 1. Fig. 4 is a vertical section taken substantially on line 4—4 of Fig. 3, and showing the belt shifting mechanism. Fig. 5 is a horizontal section taken on line 5—5 of Fig. 1. Fig. 6 is a rear elevation of the cutter-bar and the mechanism immediately connected therewith for operating the bar and for feeding the cutter-bits. Fig. 7 is a central sectional view through the lower part of the shank carrying the cutter-bar, said view being taken on line 7—7 of Fig. 8. Fig. 8 is a bottom plan view of the main shank shown in Figs. 6 and 7. Fig. 9 is an enlarged sectional view taken vertically through Fig. 1 on the line 9—9, certain parts being broken away and omitted for purpose of clearness of illustration. Figs. 10 and 11 are detailed views showing parts of the feeding mechanism for the cutter-bits.

Taking up a detailed description of the invention by reference to the drawings, in which the same reference characters designate the same parts throughout the several views, 1 and 2 represent the side housings of the machine, which are secured together at their upper ends by a cross plate 3. On their inner faces these housings are provided with vertically extending guide ribs 4, to which ribs there are stationarily secured transverse cross-heads 5 and 6, said cross-heads being adjustable vertically along the ribs in order that they may be placed in any desirable location, in which location they may be secured in any suitable manner, as by set screws 7.

Journalled in the housings is a transverse drive-shaft 8, on one end of which is journalled a loose-pulley 9, and keyed to which adjacent said loose-pulley is a drive-pulley 10, said pulleys being driven by a belt 11. Secured to the shaft 8, adjacent to each of the housings 1 and 2, are pinions 11. These pinions mesh with gear wheels 12, which are journalled on either side of the machine on the studs 13, projecting from the housings. But one set of said pinions and gear wheels appears on the drawings. Each of these gear wheels is provided with a crank-pin 14, and connected with said crank-pins

and extending upwardly therefrom are connecting-rods 15, said rods being likewise connected at their upper ends with pins 16 on the ends of a movable cross-head 17, said cross-head being guided in its vertical movement in slots 18 formed in the upper ends of the housings. From this description it will be understood that, as the drive-pulley 10 is rotated, the pinions 11 and the gears 12 will be turned, the latter at a comparatively slow speed, and the rotation of the gear wheels will cause the vertical reciprocation of the cross-head 17.

Screwed and pinned, or otherwise securely attached to the cross-head 17 at its center, is a downwardly extending, cylindrical shank 19, said shank being provided at its lower end with a centrally located threaded socket 20, as shown in Figs. 7, 8 and 9. Into this socket I screw the upper end of the feed-rod 21, said feed-rod extending downwardly and centrally through the feed-wheel 22 and the cutter-bar 23, said cutter-bar extending through the center of the stationary cross-head 5, in which it is guided. The feed-screw is provided at its upper end with a slot or keyway 24, and the feed-wheel 22 carries a key 25 by means of which it is connected to the feed-screw so as to turn therewith, but be capable of longitudinal movement thereon. By turning the feed-wheel 22, therefore, the screw 21 is screwed into or out of the socket 20 in the shank 19, which operation results in feeding the cutter-bits 26 inwardly or outwardly with respect to the cutter-head. Near its lower end the feed-screw 21 is turned down to a smaller diameter at 27, forming a shoulder at 28. Carried upon the smaller portion, 27, of the feed-screw, are cones 29, 30 and 31, said cones being held in proper position on the feed-screw by a nut 32, which is screwed to the lower end of the feed-screw. By setting up on this nut, the cones are securely clamped together and forced against the shoulder 28 on the feed-screw.

The cutter-bits are elongated and are set in recesses 33 in the cutter-bar so as to stand vertically in the bar. The cutting edge of the bit is located on a diamond shaped projection 34 on the bit; and, in the beginning of the operation, the bits are held within the cutter-bar so that these projections are substantially withdrawn into the recesses. The cones 29, 30 and 31 are so formed as to leave angular circumferential recesses between their conical faces, and, into these recesses, angular arms 35 on the rear of the cutter-bits project, said arms substantially fitting across said recesses so as to prevent any lost motion between the bits and cones. Furthermore, the cutter-bits are of such length and size as to fit securely within the recesses 33

so there can be no lost motion between the cutter-bits and the cutter-bar 23. The angular arms 35 are parallel with each other, and, being located near the respective ends of the cutter-bits, the latter will be moved in and out, maintaining their parallelism with the axis of the cutter-bar.

It will be understood from this description that, it being impossible to move the cutter-bits longitudinally with respect to the cutter-bar, vertical reciprocation of the feed-screw 21 and the cones thereon with respect to the cutter-bar, will result in camming outwardly and inwardly the cutter-bits in the recesses 33 of the cutter-bar. It will also be understood that the distance which the projections 34 extend beyond the surface of the cutter-bar will depend upon the movement provided for between the cones and the cutter-bar.

As the cutter-bar is reciprocated, it is given a rotary motion in order that the projections 34 of the cutter-bits may cut spiral flutes in the housing upon which they operate. This rotary motion is imparted to the cutter-bar by a spring-pressed block 36, which is mounted in the stationary cross-head 5 and has an inwardly projecting tongue 37 that extends into a deep spiral flute 38 on the cutter-bar. This projection 37 extends spirally across the inner face of the block so as to conform to the spiral shape of the groove 38 within which it works. The block 36 is held yieldingly in position by means of springs 39, which are preferably of the flat plate type, bearing upon the block at their central portions and having tensioning bolts 40 passing through their ends and screwing into the housing of the stationary cross-head 5.

The feed-wheel 22 is rotated to turn the screw 21, and thus feed it into and out of the shank 19, by means of a cam-bar 41 (see Fig. 1), which bar is adjustably secured to the movable cross-head 17, and has a curved cam portion 42 on its lower end. Secured to the stationary cross-head 5 at its upper edge is a plate 43, behind which there is guided by said plate a feed-bar 44, said bar having a single tooth 45 that is adapted to engage with ratchet teeth 46 on the outer curved surface of the feed-wheel 22. The feed-bar 44 is held in position by the plate 43 and by stop plates 47 which are secured to the plate 43 and project over the feed-bar. The feed-bar is reciprocated in one direction by the engagement therewith of the curved extension 42 of the cam-bar 41 when it is substantially at the extreme upper end of its movement, and it is reciprocated in the opposite direction by a spring 48, that is attached to a pin 49 on the feed-bar, said spring being also connected to the

stationary cross-bar. The engagement of the pin 49 with the plate 47 limits the movement of the feed-bar in a backward direction, while the engagement of a similar pin 50 with the other plate 47 limits the movement of the feed-bar in the other or feeding direction, the length of stroke given the said feed-bar being just sufficient to turn the feed-wheel the distance of one tooth. To prevent backward rotation of the feed-wheel, its upper surface is toothed or notched at 51, and with these teeth or notches engages a spring-pressed plunger-pawl 52, which is inserted into a socket drilled into the lower end of the shank 19. The lower end of the plunger-pawl is flattened, as shown in Fig. 8, so as to effectually engage the teeth on the feed-wheel, and the plunger-pawl is limited in its travel by a pin 53, which projects through and engages with the ends of a slotted opening 54 in the side of the shank 19 near its lower end. The plunger-pawl is forced outwardly into engagement with the teeth on the feed-wheel by means of a spring 55, which is placed in the bottom of the socket behind the plunger-pawl.

After the feed-wheel has been turned by the feed-bar 44, and the cutter-bar has started on its operating stroke, it is necessary to prevent the rotation of the feed-wheel 22 with respect to the shank 19; and for this purpose I pivot in a slot in the lower end of the shank 19 a detent pawl 56, said pawl having a V-shaped blade 57 projecting below the end of the shank and over the side of the feed-wheel in position to engage with the teeth 46 on said wheel. In Fig. 6 I have shown a fragment of the housing of the stationary cross-head 5, from which it will appear that the upper part of the bore through the housing, in which the cutter-bar operates, is rounded or cammed at 57^a. The detent pawl 56 is moved into engagement with the teeth on the feed-wheel by the said cammed portion 57^a, and is held in such engagement by the housing during the entire movement of the cutter-bar, except when it is substantially in its upper position, at which time the pawl 56 has passed so far out of the bore in the housing as to be thrown out of engagement with the feed-wheel by a spring 58. This spring is secured to the upper end of the pawl 56 beyond its pivot point, and lies in the bottom of the slot made in the shank 19 for said pawl.

With the construction above set forth, it will be understood that, during the upward stroke of the cutter-bar 23, the pawl 56 will be held in engagement with the teeth of the feed-wheel until the cutter-bar reaches substantially the upper end of its travel, when

the pawl 56 will be thrown out of engagement with the feed-wheel so that the latter may be turned. During said upward stroke of the cutter-bar, the feed-bar 44 has been in the position shown in Fig. 11, with the pin 49 resting against the stop-plate 47, being held in that position by the spring 48. As the feed-wheel 22 is lifted, the tooth 45 on the feed-bar will enter the space between two adjacent teeth 46, and, immediately thereafter, the pawl 56 will release said wheel so that it may be turned by the end 42 of the cam-bar, which engages the rounded end of the feed-bar 44 and forces the latter to the left, as seen in Fig. 1, thereby turning the feed-wheel the distance of one tooth, and screwing out the feed-screw from its shank a proportional distance. As the feed-wheel 22 is thus turned, the spring-pressed plunger 52 rides over a tooth 51, and drops in behind the next adjacent tooth so as to prevent the return movement of the feed-wheel and the feed-bar 44. As the feed-wheel is forced downwardly again with the cutter-bar, the pawl 56 is cammed into engagement with the teeth 46 on the feed-wheel, which thereby locks the feed-wheel against rotation with respect to the shank 19. This downward movement of the feed-wheel carries the latter away from the tooth 45 on the feed-bar, which then snaps back to its normal position, with its pin 49 against the stop-plate 47, ready for the next feeding operation. The shank 19 is of substantially the same diameter as the wheel 22 and the cutter-bar, and for that reason a groove 59 is cut in the shank to accommodate the tooth 45 on the feed-bar as the shank travels downwardly. As appears from Fig. 6, the lower end of said groove 59 is widened, for the reason that at the beginning of the downward movement of the shank the tooth 49 is in its feeding position, and the length of such widened portion is sufficient to permit the tooth to return to normal position before it reaches the narrow part of the groove.

As the feed-screw 21 is screwed out of the shank 19, and the latter is moved downwardly, the cones 29, 30 and 31 will be forced downwardly in the cutter-bar, thereby forcing outwardly the cutter-bits 26. During the cutting stroke, the cutter-bar, the feed-wheel and the shank 19 abut closely together, so that the strain due to the cutting action is sustained by the parts above named. During said cutting stroke, if the feed-screw has been fed out of the shank, the cones 29, 30 and 31 will move downwardly in the cutter-bar, so that the upper cone 29 will be out of contact with the internal shoulder 60 of the cutter-bar. During the return stroke of the cutter-bar, the

shank and feed-screw are first lifted, and the cutter-bar remains stationary until the cone 29 contacts with the shoulder 60, after which the cutter-bar is lifted with the shank. There is thus established between the shoulder 60 and the upper cone as the feed-screw is turned, a gradually increasing lost motion, the extent of which governs the extent of outward motion of the cutter-bits.

To prevent the cutter-bits from being fed out too far, and to hold the parts in proper position, I attach to the lower end of the cutter-bar a ring 61, said ring being secured by means of screws 62, which enter the lower end of the cutter-bar. This ring has an opening at its center which is slightly less than the diameter of the cone 31, so that when said cone is fed downwardly in contact with the ring, the cutter bits 26 will not be fed outwardly any farther. The extent to which the cutter-bits may be fed outwardly may be regulated by a screw 63 in the ring 61, the upper end of said screw extending into the path of movement of cone 31. By adjusting this screw inwardly and outwardly, the cone 31 will contact earlier or later therewith, and thus the depth of the flutes to be cut will be regulated.

When the desired depth of the flute is obtained, the machine may be automatically stopped by having the lower end of the feed-screw 21 engage with an adjustable screw 64 on a trip-lever 65 which is pivoted at 66 to a bracket 67 that is carried by the lower cross-head 6. The outer end of the lever 65 is connected to a vertically extending link 68 that is pivoted to the inner end of a catch lever 69. This catch lever is pivoted at 70 to the housing 1, and it has its outer end provided with a hook 71 which engages with a belt-shifting lever 72. The belt-shifting lever has its rear end forked to engage with the opposite sides of the belt 11, and has its other end extending forwardly at 73 into a position such as will be convenient for the operator to grasp with his hand when he desires to start the machine. From this it will be understood that, when the operator starts the machine, he pushes outwardly on the end 73 of the shifting-lever until the belt 11 is carried from the loose-pulley 9 to the driving-pulley 10, when the lever 72 will be caught by the catch lever 69 and held with the belt in driving position. When the flutes are cut to the desired depth, the catch lever 69 will be automatically rocked to release the belt shifting lever 72, whereupon a spring 74, which is connected to the said lever and to the frame of the machine, automatically throws the belt off of the drive-pulley and on to the loose-pulley 9.

The cutter-bar 23 is of substantially the

same diameter as the hole through the housing in which the flutes are to be cut. It will be understood, therefore, that, as the flutes are cut in the housing, a bur will necessarily be formed which will bind against the cutter-bar, thereby producing friction and wear. For this reason, shallow spiral flutes 75 are cut on the cylindrical surface of the cutter-head in positions corresponding with the cutting faces on the projections 34, so that the bur formed by cutting the flutes will follow in the said shallow flutes and thereby avoid such wear and friction.

The housing into which the flutes are to be cut is of the form of a hollow tube; and, for supporting said housing in its proper position, I connect with the lower stationary cross-head 6, a collar 75^a, having an internal shoulder 76 against which the lower end of the said housing is to rest. Also, screw threaded upon the lower end of the stationary cross-head 5, is a somewhat similar collar 77 having an internal shoulder 78 which rests upon the upper end of the said housing. By placing the housing in position between these two collars, and by screwing downwardly on the collar 77, said housing may be securely clamped into position and held during the cutting operation.

While I have necessarily shown and described one embodiment of my invention, I appreciate the fact that the principle of the invention may be embodied in machines differing in details from those shown and described, and I therefore desire it to be understood that the following claims are not limited to such details any further than is rendered necessary by the terms expressly employed therein.

Having thus described my invention, I claim:

1. In a machine for cutting internal grooves, a main frame, a reciprocating cross-head mounted in said frame, a feed-screw, a feed-wheel connected with said feed-screw, a cutter-bar connected with the cross-head and reciprocating therewith, a cutter-bit carried by the cutter-bar, connections between the cutter-bit and the feed-screw, such that, when the feed-screw is turned, the cutter-bit will be forced outwardly, means for turning the feed-wheel and the feed-screw at a definite time in the stroke of the cutter-bar and means for locking the feed-wheel and the feed-screw against rotation except at the time when the same is to be turned.

2. In a machine for cutting spiral, internal flutes, a main frame, a reciprocating cross-head mounted in said frame, a feed-screw connected with the said cross-head, a feed-wheel feathered to said feed-screw, a cutter-bar connected with the cross-head and reciprocating therewith, a cutter-bit car-

ried by the cutter-bar, connections between the cutter-bit and the feed-screw, such that when the feed-screw is turned in the cutter-bar, the cutter-bit will be forced outwardly, means for turning the feed-wheel and the feed-screw at a definite time in the stroke of the cutter-bar, means supported from the cross-head for locking the feed-wheel and the feed-screw against rotation except at the time when the same is to be turned, and mechanism for turning the cutter bar during its reciprocations.

3. In a machine for cutting internal flutes, a main frame, a cross-head mounted to reciprocate in said main frame, a shank depending from the central part of said cross-head, said shank having a threaded socket in its lower end, a feed-screw threaded in said socket, said screw having a feather-way formed therein, a feed-wheel feathered to said feed-screw, a cutter-bar supported by and surrounding the said feed-screw, a cutter-bit mounted in said cutter-bar, connections between the cutter-bit and the feed-screw whereby, when the feed-screw is screwed out of the shank, the cutter-bit is fed outwardly from the cutter-bar, means for guiding the cutter-bar in its reciprocation, means carried by said guiding means for turning the feed-wheel and means carried by the shank and engaging with the guiding means for locking the feed-wheel and the feed-screw against rotation during the cutting operation.

4. In a machine for cutting internal grooves, a main frame, a cross-head mounted to reciprocate in said frame, a shank depending from the central portion of said cross-head, said shank having a threaded socket in its lower end, a feed-screw threaded into said socket, said feed-screw having a feather-way therein, a feed-wheel feathered on the feed-screw below the shank, a cutter-bar carried by the feed-screw, said cutter-bar having an opening therethrough for the feed-screw, a cutter-bit mounted in the lower end of said cutter-bar, connections between the cutter-bit, and the feed-screw, such that, when the feed-screw is turned, the cutter-bit will be fed outwardly from the cutter-bar, a stationary guide for the cutter-bar, a feed-bar mounted upon the stationary guide and having a tooth for engaging the feed-wheel, means carried by the cross-head for moving the feed-bar to turn the feed-wheel and means carried by the shank for locking the feed-wheel against rotation during the descent of the cutter-bar.

5. In a machine for cutting spiral internal grooves, a main frame, a cross-head mounted to reciprocate in said frame, a shank depending from the central portion of said cross-head, said shank having a thread-

ed socket in its lower end, a feed-screw threaded into said socket, said feed-screw having a feather-way therein, a feed-wheel feathered on the feed-screw below the shank, a cutter-bar carried by the feed-screw, said cutter-bar having an opening therethrough for the feed-screw, a cutter-bit mounted in the lower end of said cutter-bar, connections between the cutter-bit and the feed-screw, such that, when the feed-screw is turned, the cutter-bit will be fed outwardly from the cutter-bar, a stationary guide for the cutter-bar, a feed-bar mounted upon the stationary guide and having a tooth for engaging the feed-wheel, means carried by the cross-head for moving the feed-bar to turn the feed-wheel, means carried by the shank for locking the feed-wheel against rotation during the descent of the cutter-bar, and means for rotating the cutter-bar during the cutting operation.

6. In a machine for cutting internal grooves, a main frame, a reciprocating cross-head mounted in said frame, mechanism for reciprocating said cross-head, a feed-screw supported from said cross-head, means for turning said feed-screw, a cutter-bar supported from the cross-head, a cutter-bit carried by the cutter-bar, connections between the cutter-bit and the feed-screw, such that when the latter is turned, the cutter-bit will be fed outwardly from the cutter-bar, a trip-lever adapted to be engaged by the feed-screw after the same has been turned to a predetermined extent and connections between the trip-lever and the mechanism for reciprocating the cross-head, such that, when said trip-lever is operated, said mechanism will be automatically stopped.

7. In a machine for cutting internal grooves, a main frame, a shaft journaled in said frame, a loose and a fast pulley carried by said shaft, a cross-head mounted in the main frame, connections between said shaft and said cross-head for reciprocating the latter as the shaft is rotated, a belt for driving the pulleys, a cutter-bar supported from said cross-head, a feed-screw connected with the cutter-bar, a cutter-bit carried by the cutter-bar, connections between the cutter-bit and the feed-screw such that, when the latter is turned the cutter-bit will be fed outwardly from the cutter-bar, and means for automatically shifting the belt from the fast to the loose-pulley when the cutter-bit has been fed outwardly to a predetermined distance.

8. In a machine for cutting internal flutes, the combination of a main frame, a cross-head mounted to reciprocate in said frame, means for reciprocating said cross-head, a shank depending centrally from said cross-head, said shank having a central threaded

socket in its lower end, a feed-screw threaded into said socket, said feed-screw having a feather-way therein, a feed-wheel feathered to said feed-screw, a tubular cutter-head below said feed-wheel and through which the said feed-screw extends, cone members carried by the lower end of said feed-screw within the cutter-bar, said cutting-bar having a plurality of radial slots opposite said cones, a cutter-bit mounted in each of said radial slots, angular parallel arms projecting from the rear of each of said cutter-bits and between the conical faces of said cone members, means for turning the feed-wheel as the cutter-bar reciprocates, whereby the feed-wheel is screwed out of the shank and the cones are caused to feed the cutter-bits, carrying the same outwardly and maintaining them parallel with their former positions, and means for locking the feed-wheel and feed-screw against rotation during the cutting stroke of the cutter-bar.

9. In a machine for cutting spiral, internal flutes, the combination of a main frame, a cross-head mounted to reciprocate in said frame, means for reciprocating said cross-head, a shank depending centrally from said cross-head, said shank having a central threaded socket in its lower end, a feed-screw threaded into said socket, said feed-screw having a feather-way therein, a feed-wheel feathered to said feed-screw, a tubular cutter-head below said feed-wheel and through which the said feed-screw extends, cone members carried by the lower end of said feed-screw within the cutter-bar, said cutter-bar having a plurality of radial slots opposite said cones, a cutter-bit mounted in each of said radial slots, angular parallel arms projecting from the rear of each of said cutter-bits and between the conical faces of said cone members, means for turning the feed-wheel as the cutter-bar reciprocates, whereby the feed-wheel is screwed out of the shank and the cones are caused to feed the cutter-bits, carrying the same outwardly and maintaining them parallel, with their former positions, means for locking the feed-wheel and feed-screw against rotation during the cutting stroke of the cutter-bar, and means for turning the cutter-bar as it reciprocates.

10. In a machine for cutting internal grooves, a main frame, a cross-head mounted to reciprocate in said frame, means for reciprocating the cross-head, a shank depending centrally from said cross-head, said shank having a central threaded socket in its lower end, a feed-screw threaded into said socket and having a feather-way therein, a feed-wheel feathered to said feed-screw, a cutter-bar, a cutter-bit carried by the cutter-bar, connections between the cutter-bit and the feed-screw, such that, when the latter is

turned, the cutter-bit will be fed outwardly from the cutter-bar, a guide housing for the cutter-bar, a feed-bar mounted to reciprocate on said guide housing, said feed-bar having a tooth that is adapted to engage with teeth on the circumferential surface of the feed-wheel, a plunger pawl carried by the shank and adapted to engage teeth on the upper surface of the feed-wheel to prevent reverse rotation of the latter, means carried by the cross-head and adapted to engage the feed-bar to turn the feed-wheel and a detent pawl secured to the shank and engaging with the guide housing, whereby the pawl is moved into locking engagement with the teeth on the circumferential surface of the feed-wheel for locking the latter during the cutting stroke of the cutter-bar.

11. In a machine for cutting spiral, internal grooves, a main frame, a cross-head mounted to reciprocate in said frame, means for reciprocating the cross-head, a shank depending centrally from said cross-head, said shank having a central threaded socket in its lower end, a feed-screw threaded into said socket and having a feather-way, a feed-wheel feathered to said feed-screw, a cutter-bar, a plurality of cutter-bits carried by the cutter-bar, connections between the cutter-bits and the feed-screw, such that, when the latter is turned, the cutter-bits will be fed outwardly from the cutter-bar, a guide housing for the cutter-bar, a feed-bar mounted to reciprocate on said guide housing, said feed-bar having a tooth that is adapted to engage with teeth on the circumferential surface of the feed-wheel, a plunger-pawl carried by the shank and adapted to engage teeth on the upper surface of the feed-wheel to prevent reverse rotation of the latter, means carried by the cross-head and adapted to engage the feed-bar to turn the feed-wheel, a detent pawl secured to the shank and engaging with the guide housing, whereby the pawl is moved into locking engagement with the teeth on the circumferential surface of the feed-wheel for locking the latter during the cutting stroke of the cutter-bar, and means for rotating the cutter-bar as it reciprocates.

12. In a machine for cutting spiral flutes, a main frame, a cutter-bar mounted to reciprocate in said frame, said cutter-bar having a spiral external flute, a cutter-bit carried by said cutter-bar, means for feeding said cutter-bit outwardly from the cutter-bar, a guide housing for the cutter-bar, a pressed block mounted in the guide housing, said block having a tongue extending into the spiral flute on the cutter-bar and a spring for holding said block in position.

13. In a machine for cutting spiral, internal flutes, a main frame, a cutter-bar mount-

ed to reciprocate in said frame, said cutter-
bar having a spiral external flute, a plurality
of cutter-bits carried by said cutter-bar,
means for feeding said cutter-bits outwardly
5 from the cutter-bar, said means maintaining
the cutter-bits parallel to their former posi-
tions in the cutter-bar, a guide housing for
the cutter-bar, a pressed block mounted in the
guide housing, said block having a tongue

extending into the spiral flute on the cutter- 10
bar and a spring for holding said block in
position.

In testimony whereof, I hereunto affix my
signature in the presence of two witnesses.

DAVID E. ROSS.

Witnesses:

Wm. Ross,

D. L. Ross.