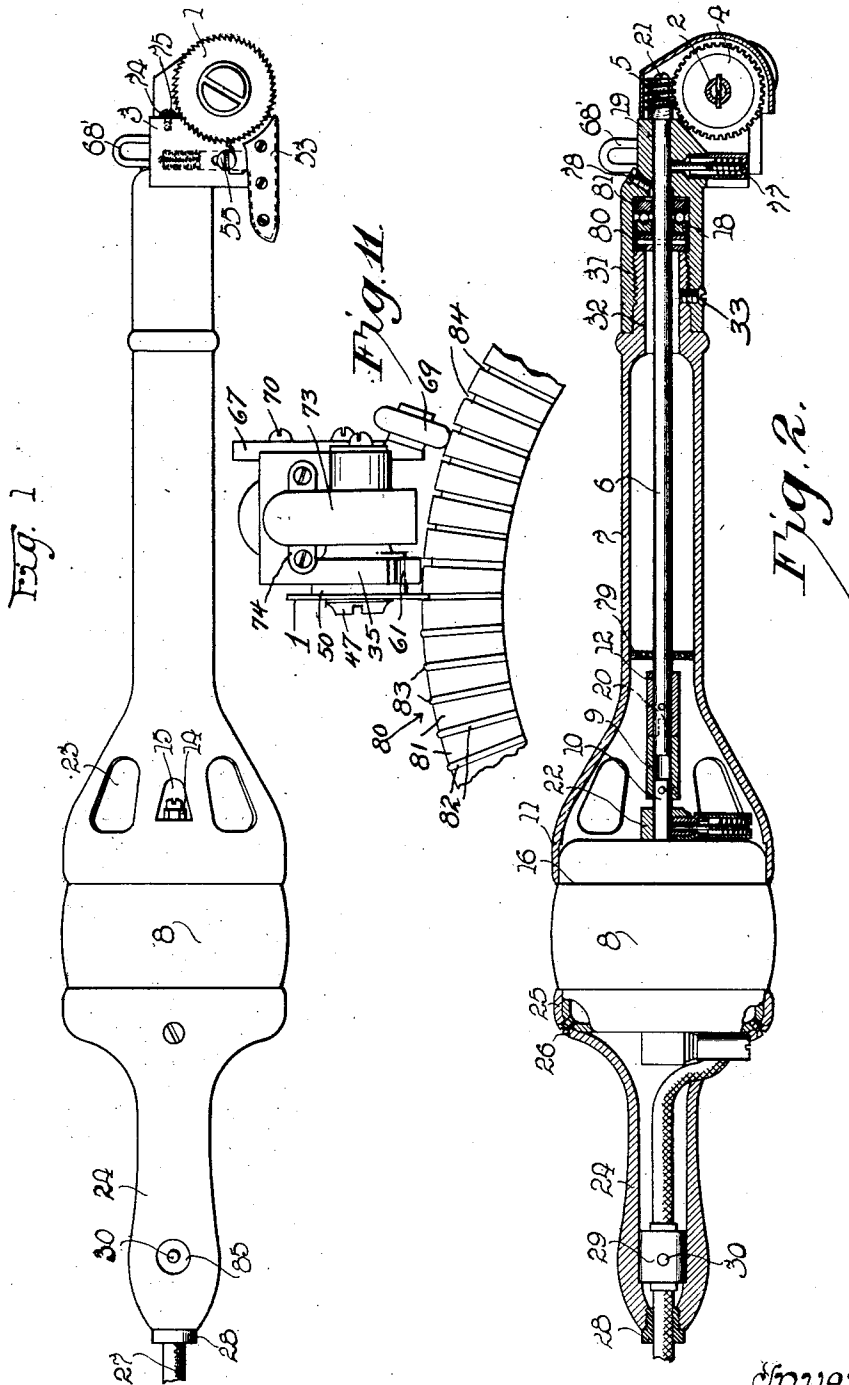


F. E. AURAND.
COMMUTATOR SLOTTING MACHINE.
APPLICATION FILED JULY 10, 1918.

1,303,011.

Patented May 6, 1919.
2 SHEETS—SHEET 1.



Inventor
Frank E. Aurand
By Brown Henson & Besten,
Attorneys

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2 SHEETS, SHEET 2.

Fig. 7

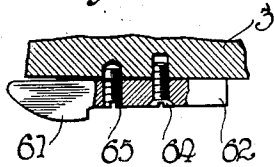


Fig. 6

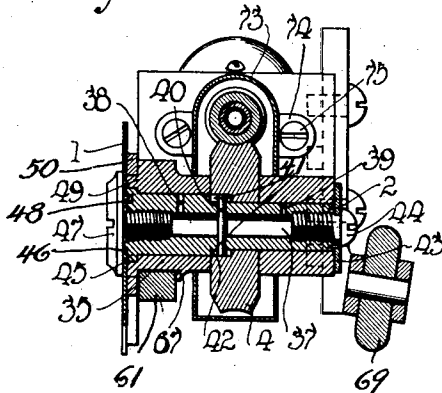


Fig. 9

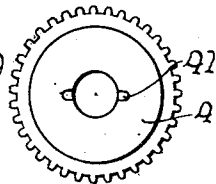


Fig. 5

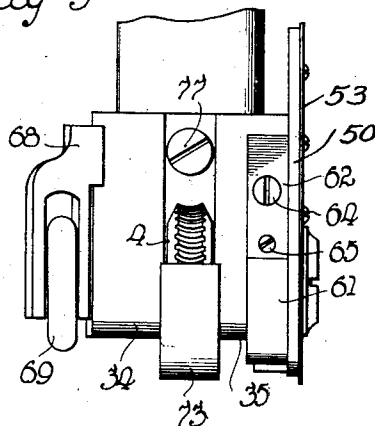


Fig. 3

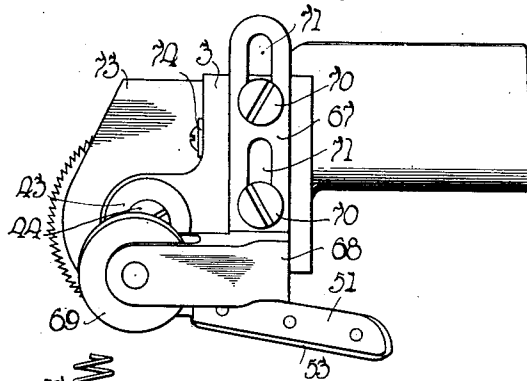


Fig. 8

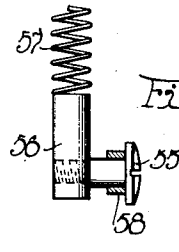


Fig. 4

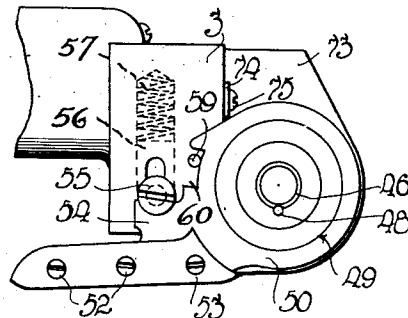
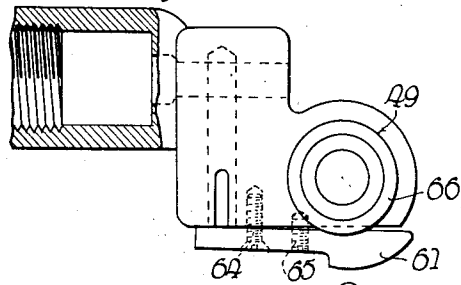


Fig. 10



Inventor
Frank E. Aurand
By Brown, Kauson, & Boutwell
Attorneys

UNITED STATES PATENT OFFICE.

FRANK E. AURAND, OF OAK PARK, ILLINOIS, ASSIGNOR OF ONE-HALF TO GUY W. LUNN,
OF RIVERSIDE, ILLINOIS.

COMMUTATOR-SLOTTING MACHINE.

1,303,011.

Specification of Letters Patent

Patented May 6, 1919.

Application filed July 10, 1918 Serial No. 244,228

To all whom it may concern:

Be it known that I, FRANK E. AURAND, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Commutator-Slotting Machines, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to commutator slotting machines.

The insulating material between the copper bars of commutators generally consists of mica. When the commutator is assembled the mica is put under pressure and forms a dense hard mass which resists wear to a greater degree than does the metal of the commutator bars. It is customary to undercut the mica slightly where the commutator is first put out.

Unless this is done the rubbing of the brushes will wear the copper below the level of the mica and then chattering and excessive wear of the brushes, and bad running results because of the mica projecting above the copper of the commutators.

My invention aims to provide a suitable slotting machine for cutting away to the desired degree the insulation between bars.

The present invention is an improvement upon the device of my prior Patent Number 1,260,125 granted March 19th 1918.

While the prior device has proven to be highly satisfactory in service, I have found that as to certain details of construction the present device is markedly superior.

It is one of the objects of the present invention to provide an improved guide.

In the prior device the guide, which runs in the slot between commutator bars and which holds the slotting saw in line with the mica which normally fills the slot, is pivoted on the head member to the rear of the saw. As a consequence, raising or lowering of the handle beyond a certain critical position tended to cause only the toe or the heel of the guide to operate in guiding the saw. I have provided in the present device, a guide which is pivoted concentrically with the saw so that the edge of the guide always stands tangent to the saw and therefore changing of the position of the handle does not alter the effectiveness of the guide.

The mounting of the guide concentrically with the saw is of great advantage but I do not wish to be limited to a rigidly exact relation.

I have further provided the guide with a detachable wearing shoe which may be replaced for slots of different widths. The guide has been further improved by the employment of a coiled spring working in a socket in the head for holding the guide in the slot.

A further object of my invention is the provision of an improved live spindle for the saw and improved means for lubricating the bearings of the live spindle and means for lubricating the worm shafts.

A further object is the provision of an adjustable depth controlling shoe for varying the depth of the cut of the saw.

Another improvement resides in the combined casing and handle and the provision of a switch in position where it can conveniently be controlled by the operator.

Further improvements will be apparent from the following detailed description and the accompanying drawings which form a part of the present specification.

In the accompanying figures:

Figure 1 is a right hand side elevation of the slotting machine of my invention;

Fig. 2 is a longitudinal axial section of the same;

Fig. 3 is a left side view of the head of the machine on a slightly enlarged scale;

Fig. 4 is a right hand side view of the head with the cutting saw removed;

Fig. 5 is a bottom plan view of the head showing the shield for the worm and worm wheel in place;

Fig. 6 is a transverse cross-sectional view through the head and the live spindle;

Fig. 7 is a fragmentary elevational view showing the depth controlling shoe;

Fig. 8 is a fragmentary elevation of the spring plunger;

Fig. 9 is a side elevation of the worm wheel;

Fig. 10 is a right side view of the head and depth shoe, and

Fig. 11 is a front elevational view of the slotting machine of my invention showing the same arranged for use on a commutator.

As shown in the accompanying drawings, the device of my invention comprises a slotting saw 1, which is in the form of a

thin circular disk. The saw is mounted on a live spindle 2 which is journaled transversely in the head member 3 and is driven directly by a worm wheel 4 which in turn is operated by a worm 5. The worm 5 is mounted on the outer end of the driving shaft 6, this shaft being contained within the longitudinal handle and frame member 7.

10 The shaft 6 is driven by a small electric motor 8 of any convenient electrical characteristics. The motor and the shaft are connected by a suitable coupling 9-12.

15 The combined handle and frame member 7 connects the head 3 with the motor 8, the rear part of said handle frame member being enlarged as shown at 11 to form a bell or housing closely embracing the forward end of the motor 8. This housing or bell portion 11 is secured to the motor frame by suitable studs which thread into the end of the motor frame. These studs pass through ears or lugs extending inwardly from the opening 15. The clamping nuts 14 thread over the studs and hold the bell firmly in place on the end of the motor frame so that the edge of the bell engages the shoulder 16. The bell 11 is provided with ornamental openings 23. The driving shaft 6 is coupled to the motor shaft 10 by a pair of toothed coupling members 9 and 12 which are readily separable. The end of the shaft 6 projects into the portion 9 of the coupling, thus holding the two shafts together in axial alinement. The driving connection is secured by the offset tongues and notches 20 in the coupling members 9 and 12 respectively.

40 A collar 80 is pinned to the shaft 6 and the roller thrust bearing 18 lies between the collar and the shoulder 81 in the extension 31 of the head 3. The thrust of the worm is in an outward direction; an anti-friction bearing on the other side of the collar is not necessary.

45 The worm 5 is threaded or otherwise mounted upon the outer reduced end of the shaft 6 and is held in place by means of the screw 21. The shaft 6 has a bearing 50 19 at the front end in the head 3 as indicated at 19. The rear end of the shaft is supported from the bearing 22 of the motor frame. Axial motion of the shaft 6 is prevented in the forward direction by the thrust bearing 18 and in the other direction by the collar 80 which engages the end of the frame and handle member 7.

55 A rear handle and frame member 24 is provided with a bell member 25 which is secured upon the rear end of the motor frame by means of the counter-sunk headed screws 26 which fasten to the motor frame. The cable which carries the conductors for the motor enters the rear end of the handle member 24 through an insulated bushing 28

and passes through the switch 29 to the motor 8. This switch 29 is of the push pin variety having a pin 30 which is shoved from one side to the other to open and close the circuit. This pin is surrounded by a finger depression 85.

75 The head member 3 is provided with a tubular extension 31 which is internally threaded to receive the threaded extension 32 of the elongated frame member 7. The two parts are pinned together by means of the screw 33.

80 The head member 3 is provided with transverse bearings for the saw spindle 2, these bearings being formed in the projecting members 34 and 35 (see Figs. 5 and 6) which have a slot between them for receiving the worm wheel 4. The slot in the front of the head member 3 which forms the extensions 34 and 35 is just wide enough to receive the worm gear 4 and to hold the same in alinement with the worm. The live spindle 2 has a hollow bore 37, which is adapted to be filled with grease. Openings 85 38 and 39 from the bore 37 to the outside of the spindle, provide means for lubricating the bearings in the extensions 35 and 34 respectively.

95 The live spindle is provided with a transverse pin 40 which serves as a key to connect the worm wheel 4 with the spindle 2. The worm wheel 4 is provided with slots or keyways 41 on each side of the central bore to receive the ends of the pin 40 for keying the worm wheel and the spindle together. A shoulder 42 is formed by turning down the idle end of the spindle 2 and this shoulder abuts against the side face of the worm wheel 4 to position these parts definitely with respect to each other. The pin 40 is of a length no greater than the larger portion of the spindle 2 so that the spindle may be introduced into the bearings axially from the left as shown in Fig. 6. The idle end of the spindle 2 is provided with a collar or washer 43 which is pinned to the spindle and is held in place by means of the screw 44 which threads into the open end of the bore 37.

115 The end of the spindle which carries the saw 1 is provided with a collar 45 which seats in a corresponding annular recess in the bearing of the extension 35 and which thereby tends to prevent axial displacement of the spindle 2 to the right as shown in Fig. 6. The end of the spindle 2 is provided with a collar 46 shown more clearly in Fig. 4, this collar being of an outer diameter substantially equal to the central opening in the saw 1 so that the saw may be easily centered and clamped in place by the flat headed clamping screw 47. I provide a pin 48 adjacent the collar or projection 46, which pin is adapted to fit into a corresponding notch in the saw to serve

as a key for preventing slippage of the saw with respect to the spindle.

The adjacent portion of the head is provided with a cylindrical bearing surface 49 upon which is mounted the guide member 50. The guide 50 comprises a flat plate adapted to fit on the cylindrical bearing 49 and to lie between the saw 1 and the right hand side surface of the head member 3. This guide member is provided with a rearwardly extending guide shoe supporting portion 51, shown more clearly in Fig. 3. To this portion is fastened by means of the screws 52 the guide shoe 53, which guide shoe consists of a thin plate of hardened steel of a thickness such as to fill substantially the slots between commutator bars. If desired, plates of different thickness may be employed for different sized slots between bars.

The forward edge of the guide shoe 53 lies immediately behind the cutter with only sufficient clearance for the teeth of the cutter. This construction is important as it permits the guide to take hold as soon as the cutter or saw enters the slot.

The main body of the guide member 50 has a shoulder 54 which engages the pin 55. The pin 55 is attached to the plunger 56 which plunger is controlled by a spring 57. The spring 57 lies in a suitable socket in the head member 3 and tends to force the plunger 56 with its attached pin 55, downward and this pressure is transmitted to the guide member 50. Thus for varying positions of the handle the guide shoe 53 will tend to be held in the slot of the commutator. A small anti-friction roller 58 on the pin 55 provides for easier operation of these parts. The motion of the guide member 50 is limited by a pin 59 which lies in a slot or notch 60 formed on the adjacent edge of the guide member 50. The outward motion of the spring plunger 56 is limited by the rear end of the depth controlling shoe 61 which shoe lies over the recess in which the spring and the plunger are located.

It will be apparent from the above description that the mounting of the guide member 50 concentrically with the axis of the saw 1 insures a constant and unvarying relative position between the saw and the guiding shoe 53. The lower edge of the guiding shoe 53 is placed substantially tangent with the edge of the saw and consequently any variation in the radial position of the guide member 50 will have no effect upon the relative position of these two parts.

The depth controlling shoe 61 comprises a separable member attached to the bottom of the head member 3 closely adjacent the saw 1 and the guide member 50. The bottom of the shoe 61 is suitably curved immediately below the saw 1 so that the same may ride easily along the commutator bars regardless

of the position of the handle. The rear end of the shoe 61 has an extension 62 which is clamped to the bottom of the head 3 by means of the screw 64. A fulcrum pin 65, which projects into a shallow recess in the bottom of the head member 3 serves to control the setting of this adjustable shoe to give the desired depth of cut. To adjust the depth controlling shoe the clamping screw 64 is loosened and the fulcrum pin 65 is then adjusted and the clamping screw 64 again tightened up.

The depth controlling shoe 61 is seated and held laterally in the slot which is formed between the lower portion 66 of the cylindrical bearing 49 and a projecting shoulder 67 formed on the bottom portion of the extension 35.

The left hand side of the head member 3 is provided with a square groove to guide the vertical portion 68' of the bracket 68 which bracket supports the guiding roller 69. The guiding roller is adapted to engage the surface of the commutator for holding the saw 1 in radial position with respect to the commutator so that the slots between bars may be accurately cleaned without damage to the metal of the bars. The vertical portion 68' is slotted as shown at 71 to receive the clamping screws 70 which hold the bracket in any desired position.

I have found that the fine mica dust and particles are injurious to the wearing surfaces and have therefore provided a suitable cover or guard 73 which may be formed of sheet metal and which is adapted to be secured to the front of the head member 3 by means of the ears 74 and screws 75. This guard or casing further protects the worm and gear from injury and prevents anything accidentally getting into the same.

I have provided means for lubricating the bearing 19 in the grease cup 77 which lies between the extensions 34 and 35 back of the worm wheel 4 and which has a wick which extends up in contact with the bearing portion of the shaft 6. An oil hole is tapped diagonally from the top of the head 3 for the thrust bearing 18. This oil hole is normally closed by the screw 78.

I have provided a felt washer or barrier 79 within the frame 7 to prevent, as far as possible, any dust or dirt getting into the smaller end of the frame 7 and entering the bearings 18 and 19.

I do not intend to be limited to the precise details of construction shown and described, as it is apparent that modifications within the scope of the appended claims are possible without departing from the spirit of the invention.

The operation of the device described is as follows: Slotting of the commutator 80, shown in Fig. 11 is necessitated by the wearing down of the copper bars 81 faster than

the mica or other suitable insulating material 82 therebetween, so that the mica tends to project beyond the copper as shown at 83, thereby forming ridges which prevent
 5 good contact between the brush and the commutator. With my device it is unnecessary to provide any special mechanism or to take out the armature in order to cut away to the desired degree as shown at 84, the insu-
 10 lation 82 between the bars 81, as all that is required is a clear space to work. On larger machines it is not even necessary to remove the brushes. The push button switch 29 in the rear handle 24 is operated to supply
 15 current to the motor 8. The motor 8 drives the shaft 6 and this shaft, through the worm 5 and the worm wheel 4, turns the spindle in a counter clockwise direction as indicated in Fig. 1. The saw 1 is then pressed against
 20 the edge of the mica and guided by hand for a very short distance until the guiding shoe 53 takes hold and thereafter the entire device is automatically guided to cause the saw to run in the slot.

25 As clearly shown in Fig. 11, the axis of the roller 69 lies substantially parallel with a tangent to the circumference of the commutator 80, consequently the roller 69 itself stands substantially radially with respect to
 30 the commutator, and the roller can be adjusted as to relative height, so that when the saw cuts down into the mica the required depth, the roller will contact with the commutator, and at the same time the depth
 35 guide 61 will also rest upon the periphery of the commutator and these two will effectually guide the slotting machine on the commutator and control the depth of the cut of the saw. This is an important point,
 40 as it relieves the operator of the strain of steadying the device against lateral tilting or other condition of unbalance and results in more accurate and even trimming of the mica.

45 The roller 69 carries considerable of the weight of the device and as it is arranged to roll on the surface of the commutator as the device advances in the cutting operation, it facilitates the cutting and it offers no hindrance to the guiding and depth control-
 50 ling function of the depth guide 61. The result of the operation of the device is to cut away the mica insulation strips 82 to a point below the outer surface of the commutator
 55 bars 81 and thus provide the slots 84, Fig. 11, the depth of which slots is controlled as hereinbefore described.

The bracket 68 may be adjusted to accommodate commutators of different diameters. The roller 69 is provided with a rounded face or tread in order to roll readily upon
 60 different size commutators.

The hollow spindle 2 has its bore 34 packed with hard grease and this can conveniently be accomplished whenever the

screw 47 is released to change a saw. The entire handle driving shaft and motor is adapted to lie in a plane parallel to the plane of the saw and may readily be moved up and down in that plane without in any
 70 manner disturbing the relation of the saw and the guiding shoe with the slot in which the saw is working.

I claim:

1. In a device of the class described, a
 75 circular slotting saw, a spindle for the saw and a guide lying in the plane of the saw and pivotally mounted concentrically with the spindle of the saw.

2. In combination, a saw spindle adapted
 80 to carry a saw, a guide adapted to lie in the same plane as the saw, said guide being pivoted concentrically with the saw spindle, a controlling handle in the front end of which said saw spindle is journaled and
 85 spring means between said handle and said guide.

3. In combination, a head member, a handle secured to said head, a saw spindle
 90 mounted transversely in the head with respect to the handle, a guide member pivotally mounted on the head concentrically with the saw spindle, a guiding shoe secured to said guiding member, said shoe being adapted to lie in substantially the same
 95 plane as the saw, a recess in said head member, a spring lying in said recess and a pin adapted for transmitting pressure from said spring to said guide member.

4. In combination, a head member having
 100 a transverse saw spindle journaled therein, a saw mounted on said journal, a guide member mounted on the head and adapted to swing concentrically with the saw spindle, a guiding shoe on said guide member, said
 105 guiding shoe having a lower edge adapted to lie at all times substantially tangent to the saw.

5. In combination, a head member, a transverse spindle journaled in said head
 110 member, a saw mounted on the spindle, said head having a cylindrical bearing, a guiding member mounted on the cylindrical bearing, said guide member having a guiding shoe held in substantially the same
 115 plane as the saw, a recess in the head, a spring plunger in said recess and a pin adapted for transmitting pressure from said spring to said guide member.

6. In combination, a head having a trans-
 120 verse bearing therethrough, a saw spindle in said bearing, said spindle having a circular saw mounted on one end thereof, said head having a cylindrical bearing between the saw and the adjacent portion of the head, a
 125 guide member having a portion journaled on said cylindrical bearing and having a portion extending rearwardly from the saw, a guiding shoe mounted on said rearwardly extending portion, said shoe being adapted
 130

to lie in substantially the same plane as the saw, said head having a recess therein, a spring plunger in the recess, a pin connected with the plunger and bearing on the rearwardly extending portion and a depth controlling shoe closing the outer end of said recess.

7. In combination, a supporting member having a pair of bearings in axial alignment, a spindle supported in said bearings, said spindle having a hollow bore, transverse lubricating passages from the hollow bore to said bearings, a worm wheel keyed to said spindle between said bearings, a rotary cutting member and a screw plug threading into said bore and holding said cutting member on the end of said spindle.

8. In a device of the class described, a hollow spindle having two bearing portions, said spindle having passageways between the bore of the spindle and the outside of said bearing portions, a pin passing through said spindle intermediate said bearing portions for providing attaching means for a driving wheel, said spindle having a shoulder at one end thereof, a rotary cutter adapted to fit against said shoulder, a screw plug for closing said end of the bore and for clamping the cutter against said shoulder, a collar for the other end of the spindle and a screw plug threaded into the adjacent end of the bore for holding said collar on the end of the spindle.

9. In combination, a frame member, a transverse spindle journaled in said frame member adjacent each end of the spindle, a driving gear keyed to the spindle intermediate said bearing portion, an adjustable bracket bearing a roller on one side of the gear supported on said frame member, a rotary cutter secured to the spindle on the other side of said driving gear and a depth controlling shoe having a screw threaded adjusting member for clamping the shoe to the frame member between the rotary cutter and the driving gear.

10. In combination, a frame member, a spindle having bearings in said frame member, said frame member being divided to form an opening between said bearings, a driving wheel secured to the spindle between said bearings, said frame member having a concentric boss at one side thereof, a rotary cutter secured to the end of the spindle adjacent said boss, a guide member embracing said boss and being concentrically pivoted with the spindle, a groove between the boss and the driving wheel, a depth controlling shoe lying in said groove and guided against lateral displacement and screw threaded means for controlling the position of the depth controlling shoe and for clamping said shoe to the frame member in said groove.

11. In a device of the class described, a

depth controlling shoe, a frame member, said frame member having a pair of recesses, one of said recesses being screw threaded, a screw pin passing through the depth controlling shoe into said threaded recess, a fulcrum pin secured to said shoe and passing into the other recess in said frame member.

12. In a device of the class described, a head member, a transverse spindle journaled in said head member, a driving wheel for the spindle, a rotary cutter secured to the spindle, a cylindrical boss on the head member, concentric with the spindle, said boss lying adjacent the rotary cutter, a guide member having an eye fitting over said circular boss, said guide member having a rearwardly extending portion and a guide shoe secured to said rearwardly extending portion, said guide shoe lying substantially in the plane of said rotary cutter.

13. In combination, a head member having a transverse bearing, a cutter spindle mounted in said transverse bearing, said cutter spindle having a lubricating opening through the side wall thereof, a rotary cutter mounted on the outer end of said spindle, and a screw plug for closing the outer end of the bore and for clamping the rotary cutter on the end of the spindle.

14. In combination, a motor having a circular frame, a hollow frame and handle member having a bell fitting over one side of the frame of the motor, means for clamping said bell to the motor frame, a shaft secured axially in line with the motor shaft, a head member mounted on the outer end of the frame and handle member, a rotary cutter mounted in said head, said cutter being driven by said shaft, a rear handle member having a bell embracing the opposite side of the frame of the motor, conductors for the motor passing through said handle member.

15. In combination, a motor having a circular frame, a hollow frame and handle member having a bell fitting over one side of the frame of the motor, means for clamping said bell to the motor frame, a shaft secured axially in line with the motor shaft, a head member mounted on the outer end of the frame and handle member, a rotary cutter mounted in said head, said cutter being driven by said shaft, a rear handle member having a bell embracing the opposite side of the frame of the motor, conductors for the motor passing through said handle member, and a switch mounted in said handle member at the rear end thereof, said switch having a transverse operating member adapted to project from the sides of the handle member.

16. In a device of the kind described, a motor, a hollow handle member and a frame member between which the motor is mount-

ed, a shaft mounted within the frame member in axial alinement with the motor shaft, a head member mounted on the outer end of the frame member, a rotary cutter mounted in said head, said cutter being adapted to be driven by said shaft, and conductors for the motor passing through said handle.

17. In a device of the kind described, a motor, a hollow frame member having an enlarged end for embracing the motor, a shaft secured axially in line with the motor shaft and extending through said frame, a head member mounted on the outer end of the frame, a rotary cutter mounted in the head and adapted to be driven by said shaft, a rear handle member also having an enlarged end for embracing the motor and conductors for the motor passing through said rear handle member.

18. In a device of the kind described, a circular slotting saw, a spindle for the saw, a guide lying in the plane of the saw and mounted to swing around the saw concentrically therewith, said guide having an edge substantially tangent to the periphery of the saw, and adapted to contact with the bottom of the slot cut by the saw.

19. In a device of the kind described, a longitudinally extending handle member, a transversely mounted rotatable saw spindle at one end of the handle, a circular slotting saw on the spindle, a guide carried by the handle in the plane of the saw and having an edge substantially tangent to the periphery of the saw, said guide adapted to follow in the slot made by the saw and movable to permit the handle to extend at different inclinations.

20. In a device of the kind described, a longitudinally extending handle member, a transversely mounted rotatable saw spindle at one end of the handle, a circular slotting saw on the spindle, a guide carried by the handle and in the plane of the saw, and having an edge extending substantially tangent to the periphery of the saw and mounted to swing around the saw in the plane thereof, and spring means interposed between the guide and the handle member for maintaining the guide yieldingly pressed into the saw slot at all inclinations of the handle.

In witness whereof, I hereunto subscribe my name this 6th day of July, A. D. 1918.
FRANK E. AURAND.