April 28, 1931. R. S. McKEAGE 1,803,068

ROTARY CUTTER DEVICE

Filed July 12, 1926 4 Sheets-Sheet 1

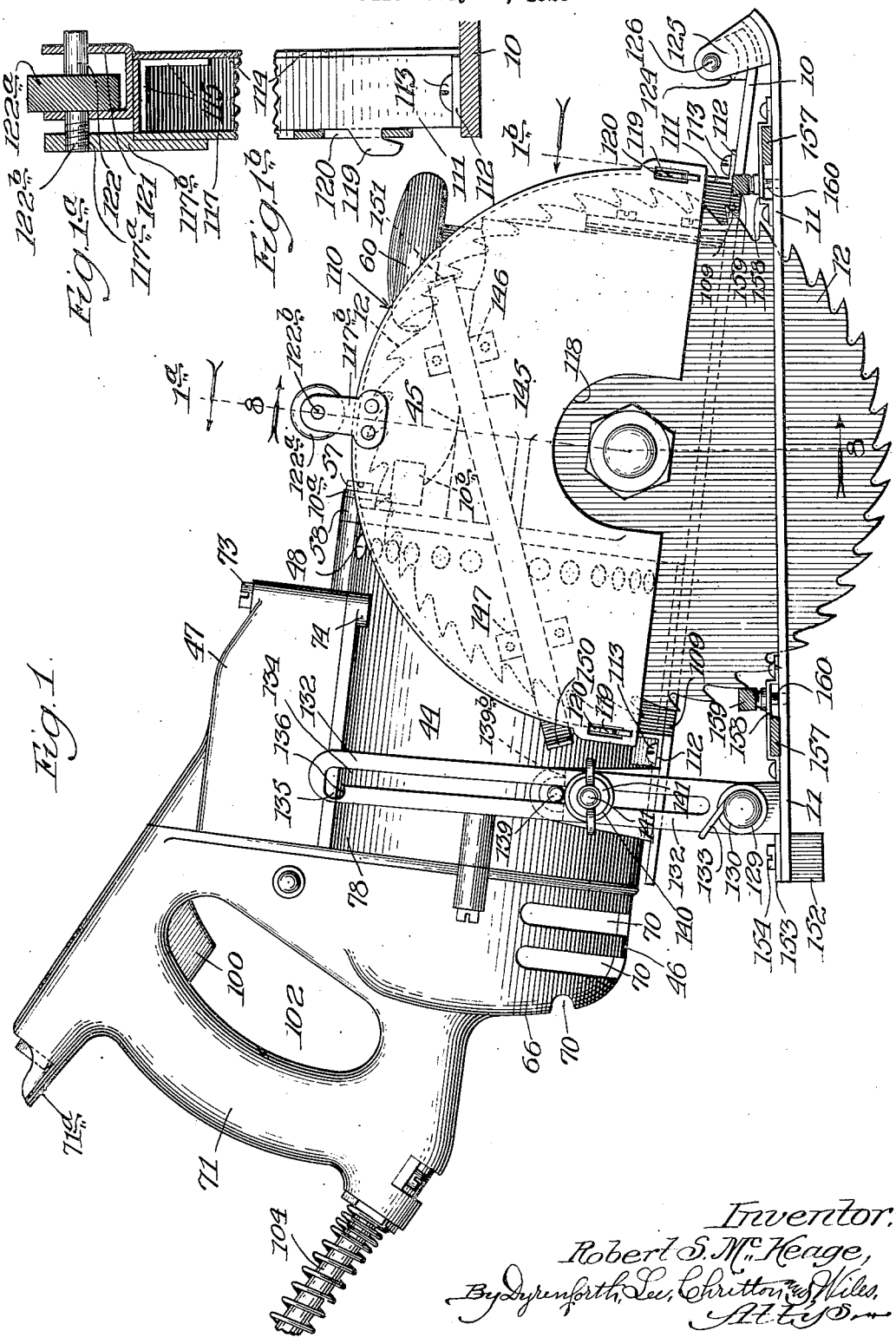

Fig. 1.

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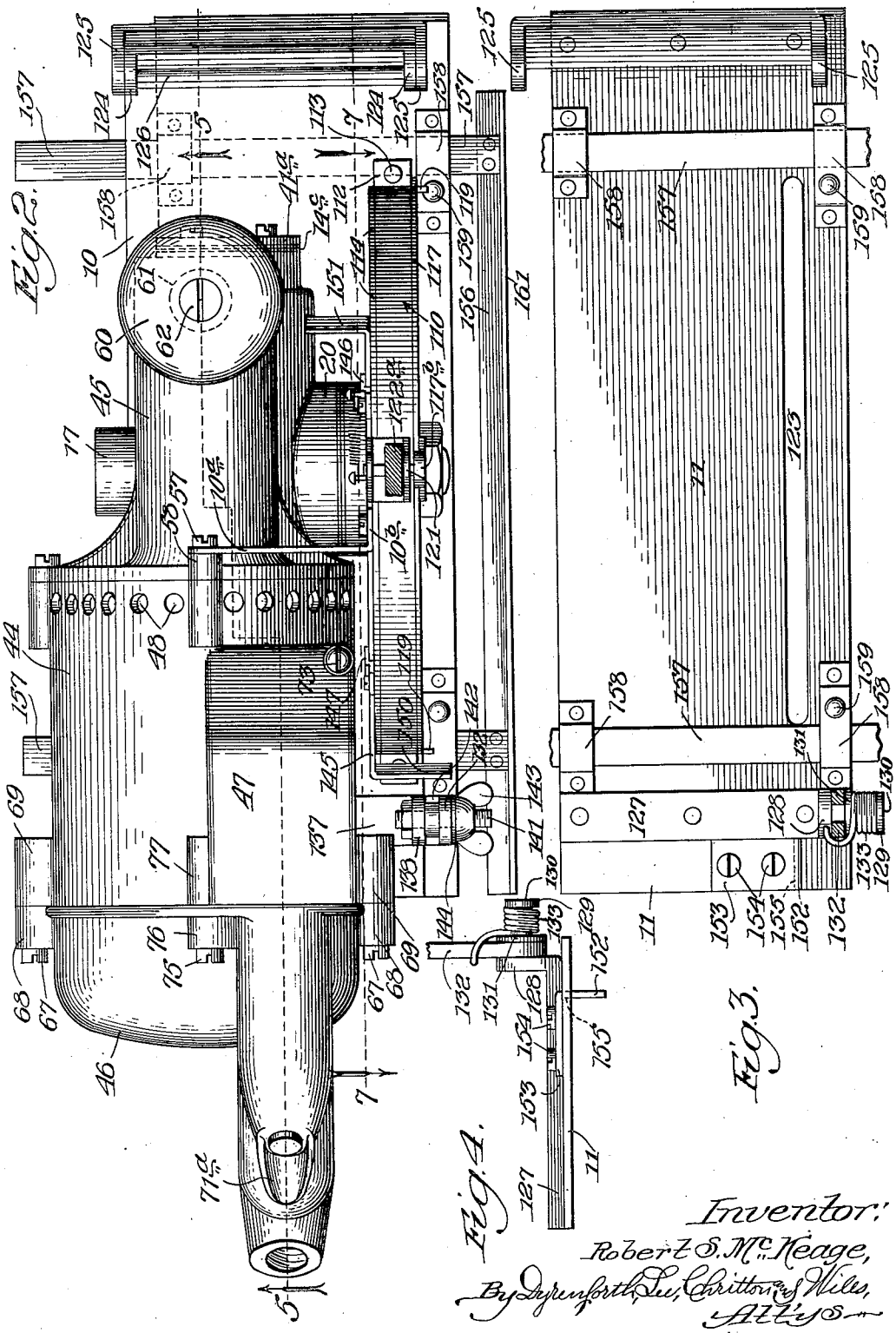

Fig. 2.

Fig. 3.

Fig. 4.

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ROTARY CUTTER DEVICE.

Filed July 12, 1926 4 Sheets-Sheet 3

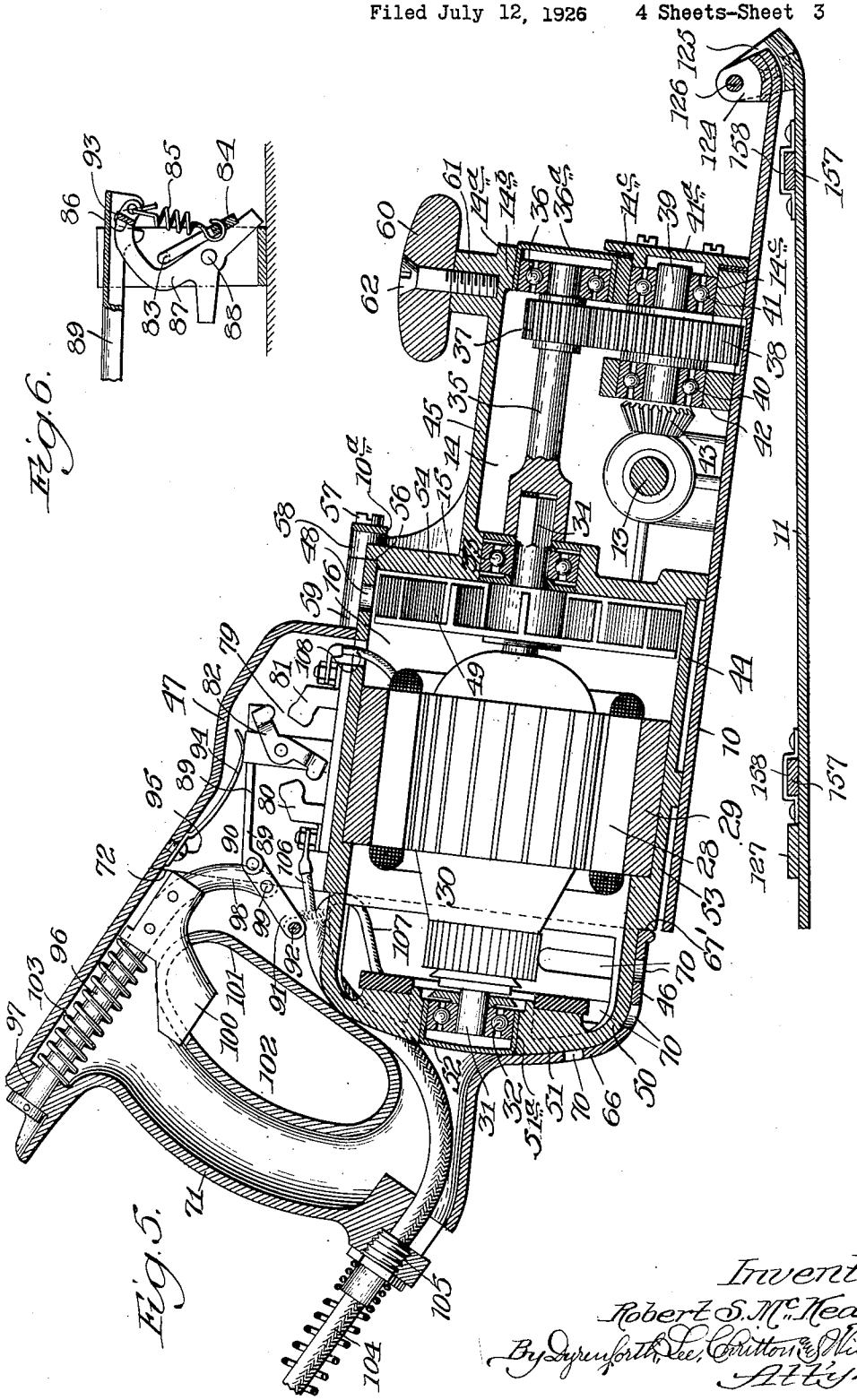

Fig. 6.

Fig. 5.

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ROTARY CUTTER DEVICE

Filed July 12, 1926 4 Sheets-Sheet 4

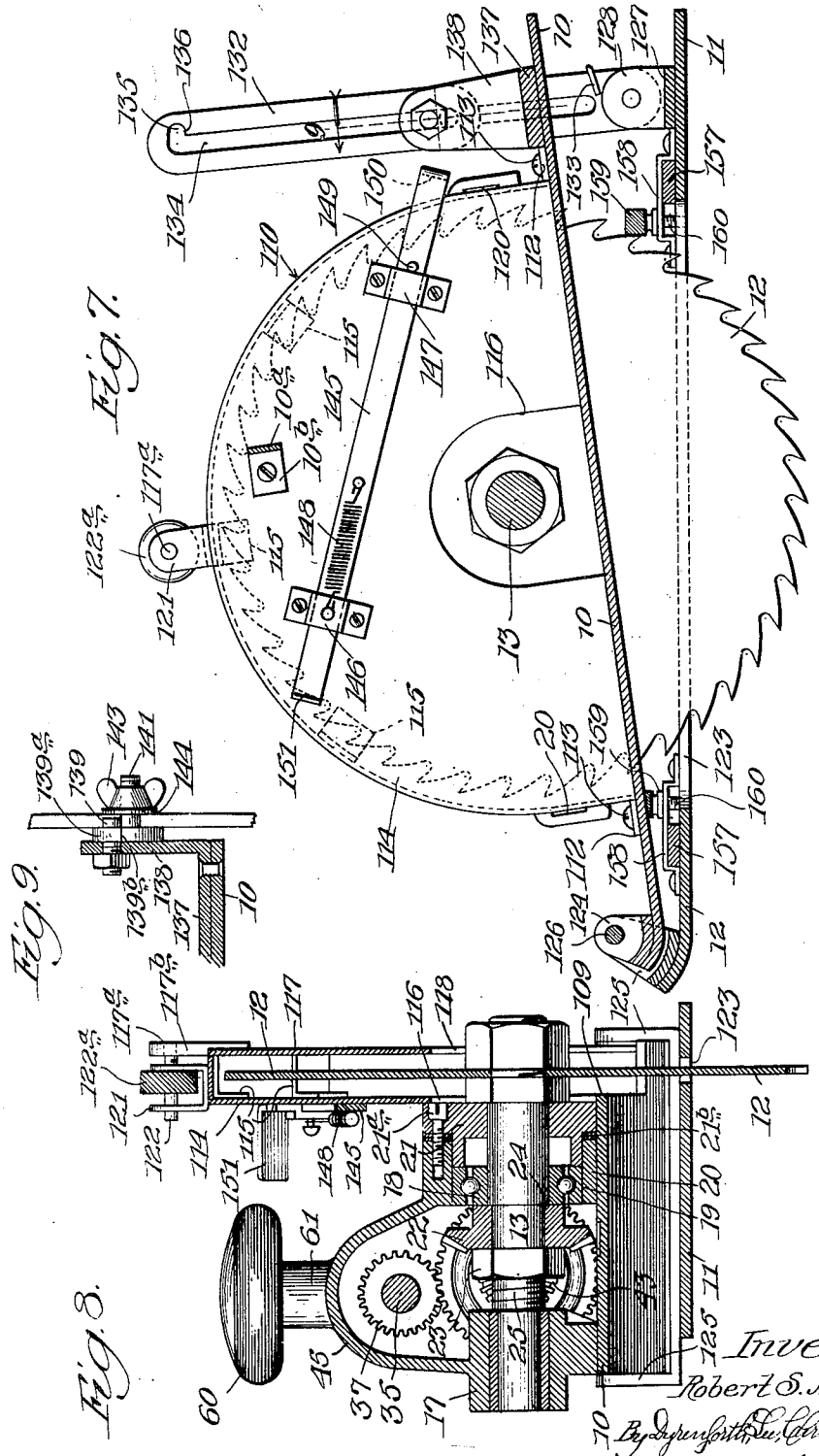

Fig. 7.

Fig. 9.

Fig. 8.

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UNITED STATES PATENT OFFICE

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ROTARY CUTTER DEVICE

Application filed July 12, 1926. Serial No. 121,861.

My improvements relate to rotary cutter devices, more particularly rotary saws, provided as portable hand tools and involving motors, as for example and more especially, electric motors, for driving the cutter elements.

My object, generally stated, is to provide improvements in devices of this general type to the end that the device may be rendered more compact; be more readily manipulated; and protection be afforded to the operator from injury by the cutter especially upon the disengagement of the device from the work.

More specifically stated, certain of my objects are to provide for the shortening of devices of the character above referred to; to provide a guard device which shall in the disengagement of the device from the work following the cutting operation, automatically become so positioned that it will prevent the contacting of the cutter element with the operator and thus protect him from injury; to provide improved gage means for limiting the depth of cut, and preferably to provide such gage means for direct cooperation with the guard controlling means; to provide for the engagement of the device with the upper surface of the work, at a sufficiently large area thereof and so located relative to the mass of the tool, as to ensure the operation of the cutting element in a plane at a right angle to the work to which the device is applied; to provide improvements in the guard device for the upper portion of the cutting element to the end that the cutter-element may be rendered more readily accessible; to provide in a device of the general character above referred to and equipped with an electric motor controlled by a switch on the device, for readily and conveniently engaging, and disengaging, at will, from the switch proper, the manually operable switch-controlling lever; and other objects as will be manifest from the following description.

Referring to the accompanying drawings:—

Figure 1 is a view in side elevation of a rotary cutter device constructed in accordance with my invention, the device being shown in the position it assumes when conditioned for operating on the work, one of the gaging means of the device being shown in section. Figure 1ª is an enlarged detail sectional view of a portion of the saw-guard, the section being taken at the line 1ª on Fig. 1 and viewed in the direction of the arrow. Figure 1ᵇ is an enlarged sectional detail taken at the line 1ᵇ on Fig. 1 and viewed in the direction of the arrow. Figure 2 is a plan view of the structure shown in Fig. 1, this view being taken in a plane normal to the body portion of the device. Figure 3 is a plan view of the slipper-plate at which the device engages, and slides along, the work to be operated on, the pivoted link rising therefrom being shown in section, with portions of one of the gaging devices broken away. Figure 4 is a view in end elevation of the structure shown in Fig. 3 and representing the structure as viewed from the left-hand side of Fig. 3, with said gaging device omitted. Figure 5 is a section taken at the irregular line 5—5 on Fig. 2 and viewed in the direction of the arrow, but with the parts positioned as shown in Fig. 1. Figure 6 is a detail, somewhat in the nature of a diagram, of the switch for the motor of the device and the controlling means therefor. Figure 7 is a broken section taken at the line 7—7 on Fig. 2 and viewed in the direction of the arrows. Figure 8 is a section taken at the line 8—8 on Fig. 1 and viewed in the direction of the arrows with the said gaging device omitted; and Figure 9, a broken sectional view taken at the line 9 on Fig. 7 and viewed in the direction of the arrow.

According to the particular illustrated embodiment of my invention, the device comprises a base-plate 10 upon which the cutting element and the motor for operating the latter are mounted, this plate extending forwardly beyond these parts and hingedly connected at its forward extremity with a plate 11 at which the device, in performing the cutting operation, rests on, and slides along, the work to be operated on, as for example a board to be cut.

The cutter element, shown as a circular saw in the construction illustrated, is represented at 12 and is rigidly secured to the outer end of a shaft 13 which extends trans-

versely through the forward compartment 14 of a casing 15, the rear compartment of which is represented at 16. The shaft 13 is journalled at one end in a bearing 17 provided in a wall of the casing 15 and at its opposite end, adjacent to the saw 12, in a ball-bearing 18 mounted in an opening 19 in the opposite side wall of the casing, the casing at this point being provided with an annular ring-like boss 20. The ball-bearing 18 is slidably adjustable in the opening 19 in a direction lengthwise of the shaft 13 and is backed by an adjustable gland 21 which also is slidable lengthwise in the ring-boss 20 and is held in adjustable position with shims 21^b interposed between the boss and gland, by screws 21^a passing through this gland and screwing into the ring-boss. The shaft 13 is provided with a bevel gear 22 rigidly secured thereto by a nut 23 screwed upon the shaft 13 and clamping it against an annular shoulder 24 on this shaft. The inner ball-race of the bearing 18 flatwise abuts the adjacent face of the gear 22 and the inner end of the gland 21 engages the outer face of the outer-race of this bearing 18 thus resisting movement of the shaft 13 to the right in Fig. 8 under the thrust exerted thereon through the gear 22, the bearing 18 serving as a combined radial and thrust bearing, and the adjustable gland 21 permitting of accurate adjustment of the gear 22 relative to its driving intermeshing gear, hereinafter referred to.

The motor represented at 28 for driving the saw 12 and which may be of any suitable type, is shown as an electric motor located within the compartment 16, its field being represented at 29 and its rotatable armature at 30, the armature being journalled at its shaft 31 in the end walls of the compartment 16, by means of ball-bearings represented at 32 and 33. The forward end of the armature shaft 31, which is squared as represented at 34, extends into the compartment 14 and telescopes, as shown, with a jack-shaft 35 which is journalled, at its forward end, in ball-bearings 36 housed in a cup-shaped dust-cap 36^a located in an opening 14^b in the forward end wall 14^a of the compartment 14. The shaft 35 is provided with a pinion 37 meshing with a gear 38 rigidly connected with a shaft 39 journalled, at opposite sides of the gear 38, in ball-bearings 40 and 41 supported, respectively, in a bearing-boss 42 on the casing and in an opening 14^c in the forward wall 14^a of the compartment 14. The inner end of the shaft 39 is provided with a bevel pinion 43 meshing with the bevel gear 22 on the shaft 13, and proper adjustment of the pinion 43 relative to the gear 22 is effected by the gland-structure 41^a functioning as in the case of the gland 21.

The casing 15 is preferably formed of hollow main sections 44, 45, 46 and 47. The section 44, in which the motor above referred to is located, is of general cylindrical form with its forward end open and containing a peripheral series of apertures 48 radially aligned with an air-circulating fan 49 mounted on the armature shaft 31 and located in the compartment 16 and operating to cause air to be drawn into the compartment 16 through air-openings, hereinafter referred to, in the casing-section 46 and be discharged through the apertures 48 to assist in maintaining the motor in cool condition. The rear end of the casing-section 44 is formed with a yoke-portion 50, in an opening 51^a in the cross-piece 51 in which a cup-shaped dust-plug 52 confining the bearing 32, is located. The cross-piece 51 serves as a support for the brushes of the motor and their binding posts, details of which are omitted from the drawings.

The casing-section 45 is closed at its opposite ends, except for the openings in which the bearings 33, 36, and 41 are located, the end walls thus provided being represented at 54 and 55. The end wall 54 is peripherally grooved, as represented at 56, to adapt this wall-forming portion to be telescoped with the forward end of the casing-section 44, as represented, these sections being secured together by screws 57 passing through bosses 58 on the member 54 and into bosses 59 on the casing-section 44. The casing-section 45 is provided, adjacent its forward extremity, with a hand-knob shown as formed of a knob-portion 60 secured, to an upwardly-extending boss 61 formed as a part of the casing section 45, by a screw 62 extending through this knob and screwing into the boss.

The casing section 46 comprises a portion 66 of general cup-shape which fits over the yoke 50 and against an annular flange 67′ formed on the casing-section 44 at the base of the yoke, the section 46 being rigidly secured in position on the section 44, by screws 67 passing through bosses 68 on the portion 66 and screwing into bosses 69 on the section 44, the air-inlet openings hereinbefore referred to, and represented at 70, being provided in the section 46 as shown, the casing-section 46 being formed with a hollow hand-grip portion 71 which extends to one side of the longitudinal axis of the device and is open, as represented at 72, at its forward upper extremity.

The casing-section 47 which forms a housing for the switch, hereinafter referred to, and by which the operation of the motor is controlled, is formed of a hollow member open along its underside and at one end and secured in superposed position on the casing-section 44, as by a screw 73 screwing into a boss 74 on the section 44 and by a screw 75 passing through a boss 76 on the casing-sec-

tion 46 and screwing into a boss 77 on the casing-section 47. The forward open end of the hand-grip portion 71, in the assembly of these various sections, fits the rear open end of the casing-section 47 to form a continuation thereof, as represented; the upper portion of the casing-section 44 being formed with a portion, represented at 78, and presenting a flat upper surface to form a bottom closure for the switch-housing 47.

The switch for controlling the motor 28 and which may be of any desirable construction, is represented generally at 79. The switch shown is of a type comprising the spaced pairs of contacts 88 and 81 and a rocking contact 82 adapted when swung in clockwise direction in Fig. 6 to engage the contacts 80 and 81 thereby bridging the gap and closing the circuit at this point. The rocking contact 82 is connected with a yoke-shaped member 83 interposed therebetween and connected at its cross-piece 84 with the lower end of a coil spring 85 the upper end of which is connected with the cross-bar portion 86 of a rocking member 87 journalled on stationary trunnions 88. The movable contacts 82 are moved into and out of engagement with the cooperating stationary contacts by a snap action produced by the spring 85 in the rocking of the member 87, in its movement in both directions, to carry the point of connection between it and the spring 85 beyond a line passing through this last-referred-to point of connection, the axis about which the yoke 83 swings and the point of connection between the spring 85 and the yoke, the yoke 83 in its swinging movements referred to, engaging terminal stops (not shown) which limit the rocking of this yoke in both directions.

The device also comprises means, operated by the operator, for controlling the switch just described, these means comprising a link 89 pivotally connected at its rear end, as indicated at 90, to a link 91 pivoted to the casing-section 66, as represented at 92, the forward end of the link 89 containing a downwardly opening recess 93 at which this link is adapted to straddle the cross-piece 86 and in which position this link is held by a flat spring 94 connected at its rear end, as represented at 95, to the top of the casing-section 47 and bearing, under spring tension at its forward end downwardly against the link 89, the switch being operated into and out of circuit closing position, by shifting the link 89 in opposite directions. The switch-controlling mechanism also comprises a rod 96 which slides in an opening 97 in the rear end of the grip 71, which latter carries a guard-rib 71a, the forward end of the rod 96 being downwardly curved, as represented at 98, and pivotally connected at 99 with the link 91 between the pivots 90 and 92. The bar 96 carries a trigger element 100 rigidly connected therewith and movable, with the rod 96, in a slot 101 in the grip 71, the trigger 100 extending into the finger-opening 102 in the hand-grip portion 71, in position to be actuated by the forefinger of the hand grasping the grip 71. A coil-spring 103 surrounding the rod 96 and interposed between the trigger 100 and a wall of the hand-grip 71, serves to normally hold the switch-operating mechanism and the switch, in the positions shown in Figs. 5 and 6, in which the circuit of the motor is broken, and to automatically return this bar to circuit-open position following the closing of the switch by pressing rearwardly on the trigger 100, and the releasing of the operator's grip thereon, the spring 94 ensuring the engagement of the link 89 with the switch mechanism at all times.

The current-conducting wires, for supplying current to the motor, and which are located in the sheath 104, lead into the interior of the hand-grip 71 through an opening 105 therein, one of these wires represented at 106 and 107, connecting with the stationary contact 80 and the other thereof leading to one of the binding posts of the motor. The other stationary contact 81 connects by a wire 108 with the other binding post of the motor.

The base plate 10, which is slotted, as represented at 109, to permit the saw 12 to project downwardly therethrough as shown, is provided with a guard 110 for covering that portion of the saw which extends above this plate, to protect the operator from contact with the saw. This guard is in the form of a substantially semi-circular hollow casing which straddles the upper portion of the saw in spaced relation thereto and is formed of a curved peripheral-wall-forming strip 111 having its ends outwardly turned, as reperesented at 112, at which it is secured to the base-plate 10 by screws 113. The guard also comprises a substantially semi-circular plate 114 permanently connected with the wall portion 111, as by means of angle-bars 115 located in the interior of the guard and secured to the strip 111 and the plate-portion 114 as by spot-welding them thereto, the plate 114 containing a slot 116 at which it straddles the shaft 13. The outer-side-wall-forming portion of the guard is in the form of a substantially semi-circular plate 117 containing a slot 118 at which it straddles the shaft 13, the plate 117 being releasably held against the outer edge of the wall-portion 111, by releasably interlocking the plate 117 at its lower end with the curved strip 111 and providing a fastening device on the strip 111 which releasably engages the upper end of the plate 117. The interlock referred to is provided by forming undercut-lugs 119 on the outer edge of the strip 111 and slots 120 in the plate 117 which receive the lugs 119

with the lower edges of the slots extending into the undercut portions, when the plate 117 is applied to position on the stationary part of the guard. The fastening device referred to comprises a yoke 121 rigidly secured to the upper part of the strip 111 and in which a spindle 122 is journalled, the spindle having a knurled disk 122^a rigid thereon and located between the arms of the yoke 121 but of a thickness less than the width of the space between the arms of the yoke, whereby the spindle may have limited lengthwise movement in the yoke 121. The outer end of the spindle 122 is screw threaded at 122^b to screw into a threaded opening 117^a in a lug 117^b on the plate 117 when this plate is applied to position as stated, and securely hold this plate in place. It will be understood from the foregoing that the plate 117 may be readily removed from the stationary part of the guard of which it forms a part and thereby render the saw 12 readily accessible for removal from the shaft 13 without disturbing the fastening devices for the stationary part of the guard. The guard is preferably steadied in position on the base 10 by a brace-bar 10^a which is connected at its outer angular end-portion 10^b with the plate 114 and at its opposite end with the casing-section 45, as by one of the screws 47 extending therethrough.

The device also comprises means for gaging the depth to which the saw enters the work, and means for preventing the contacting of the lower portion of the saw with the operator following the disengagement of the device from the work; these means comprising the following described mechanisms: The plate 11 which contains a slot 123 in registration with the saw 12 and through which the latter extends when the device is conditioned for cutting, is hingedly connected at its forward end with the forward end of the base-plate 10 by the nested yoke-members 124 and 125 provided on the base plate 10 and the plate 11, respectively, and connected together by a hinge-pin 126. The plate 11 is provided at its rear end with a bar 127 extending transversely thereof and rigidly secured thereto and having an upwardly-turned portion 128 at one end equipped with a screw 129 having a head 130 at its outer end and a flange 131 between its ends, this pin extending through, and forming a pivot for, the lower end of a link 132, which is yieldingly pressed in clockwise direction (Fig. 1) by a spring 133 encircling the pin 129 between the head 130 and flange 131 and connected at its outer end with this pin and at its inner, free, end, lapped across the edge of the link 132, tending to swing the latter to the right in Fig. 1. The link 132 contains a slot 134 extending lengthwise thereof with a lateral recess 135 at its upper end affording a shoulder 136 for a purpose hereinafter described. The base-plate 10 is provided with a bar 137 extending crosswise thereof and having an upturned end 138 carrying a pin 139 extending into the slot 134 and adapted to enter the recess 135 and engage with the shoulder 136 under the conditions, and for the purpose, hereinafter described, the pin 139 having a mutilated collar-portion 139^a presenting a flat surface 139^b. The link 132 is provided with a gaging device, represented generally at 140, for cooperation with the pin 139 to regulate the depth of cut, this device comprising a screw 141 extending through the slot 134 and screw 141 extending through the slot 134 and provided at one end with a block 142 presenting a flat upper surface and at its opposite end with a clamping thumb-nut 143 for vertical adjustment on the link 132, a washer 144 being confined on the screw 141 between the nut 143 and the link 132. As the block 142 is located directly below the collar 139^a it serves as a stop for the latter to limit the downward swinging of the base-plate 10 and the parts carried thereby, at the hinge 126 thereby regulating the depth of cut, it being understood that by adjusting the device 140 up or down on the link 132 the position of the base-plate 10 relative to plate 11, may be varied as desired.

It may be here stated that in the use of the device, as for example to saw a board, the device is applied to the work to rest at its plate 11 thereon and then moved across the work, the weight of the plate 10 and the parts carried thereby, augmented or not, as desired, by downward pressure applied by the operator while grasping the handle 60 with one hand and the handle-grip 71 with the other. So long as the plate 11 is supported, as by engaging the work as stated, the weight of the plate 10 and the parts carried thereby is supported by the plate 11. As soon, however, as the plate 11 becomes unsupported, as for example in the disengagement of the device from the work being cut, the plate 11 is free to swing downwardly at its hinge-connection 126 with the plate 10, the link 132 in this movement lowering until the recess 135 is opposite the pin 139 whereupon the spring 133 swings the link 132 in clockwise direction in Fig. 1 to cause this recess to receive the pin and thereby lock the plate 11 in the downwardly-swung position stated in which it extends beyond the lowermost edge of the saw 12 thereby preventing the rotating saw from striking the leg of the operator in case the operator permits the device to lower to such position. The parts just referred to remain in the spread condition stated, until the shoulder 136 on the lever 132 is disengaged from the pin 139, by swinging the lever 132 in counterclockwise direction in Fig. 1. The means shown for this purpose comprise a bar 145 slidable

in guides 146 and 147 secured to the plate 114 and yieldingly pressed, by a spring 148, in a direction to hold a pin 149 on this bar against the guide 147. The rear end of the bar 145 is provided with a lip 150 which extends crosswise of the link 132 and with which it engages, to release the shoulder 136 from the pin 139, when the bar 145 is shifted rearwardly, as for example by the operator pressing rearwardly against a lip 151 extending laterally from this bar at the forward end thereof.

The device also comprises means for guiding the device in a straight-line path during the cutting operation, these means comprising a depending guide-lip 152 carried by the rear end of the plate 11 in line with the saw 12, whereby this lip, in the bodily movement of the device, slides in the kerf produced by the saw 12 and ensures a straight-line cut. The lip 152 is shown as provided on the end of a plate 153 flatwise secured to the upper surface of the plate 11, as by screws 154, the plate 11 being slotted at 155 to receive the lip 152.

Means for gaging the distance of the cut from a predetermined line, as for example from an end edge of the work, or a cleat, or the like, secured to a face of the work, are provided, these means comprising an angle-bar 156 connected with the outer ends of parallel cross-arms 157 which overlie the plate 11 and slide in strap guides 158 secured to this plate, these arms being held in adjusted position by nuts 159 which screw upon the upper threaded ends of studs 160 fixed in the plate 11 and down against the upper flexible portions of certain of the straps 158. If desired the gage device formed of the plate 156 and arms 157 may be positioned to extend at either of the opposed side edges of the plate 11 with its vertical flange 161 extending either upwardly or downwardly.

The feature of providing the switch-actuating lever 89 as described and which is held in engagement with the switch by the spring 94, is of advantage as it may be readily swung clear of the switch to render the latter accessible as for example for repairing, upon disengaging the housing section 47 from the section 44.

The feature of providing a wide bearing area at which the device slides over the work, with the motor and other operating parts mounted thereon in centralized position is also of advantage in that it facilitates the manipulation of the device and ensures the desired straight-line movement thereof, and the operation of the cutter at a predetermined angle to the plane of the work.

While I have illustrated and described a particular construction embodying my invention I do not wish to be understood as intending to limit it thereto, as the same may be variously modified and altered without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

A rotary-cutter device comprising a cutter shaft, a cutter on said shaft, a drive shaft extending across said cutter shaft, the two shafts lying in spaced parallel planes, a motor for driving said drive shaft connected with the latter to one side of said cutter shaft, a reduction gearing for driving said cutter shaft from said drive shaft engaging with said drive shaft at the other side of said cutter shaft and comprising an intermediate shaft and gearing connecting said intermediate shaft to said first and second-named shafts.

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