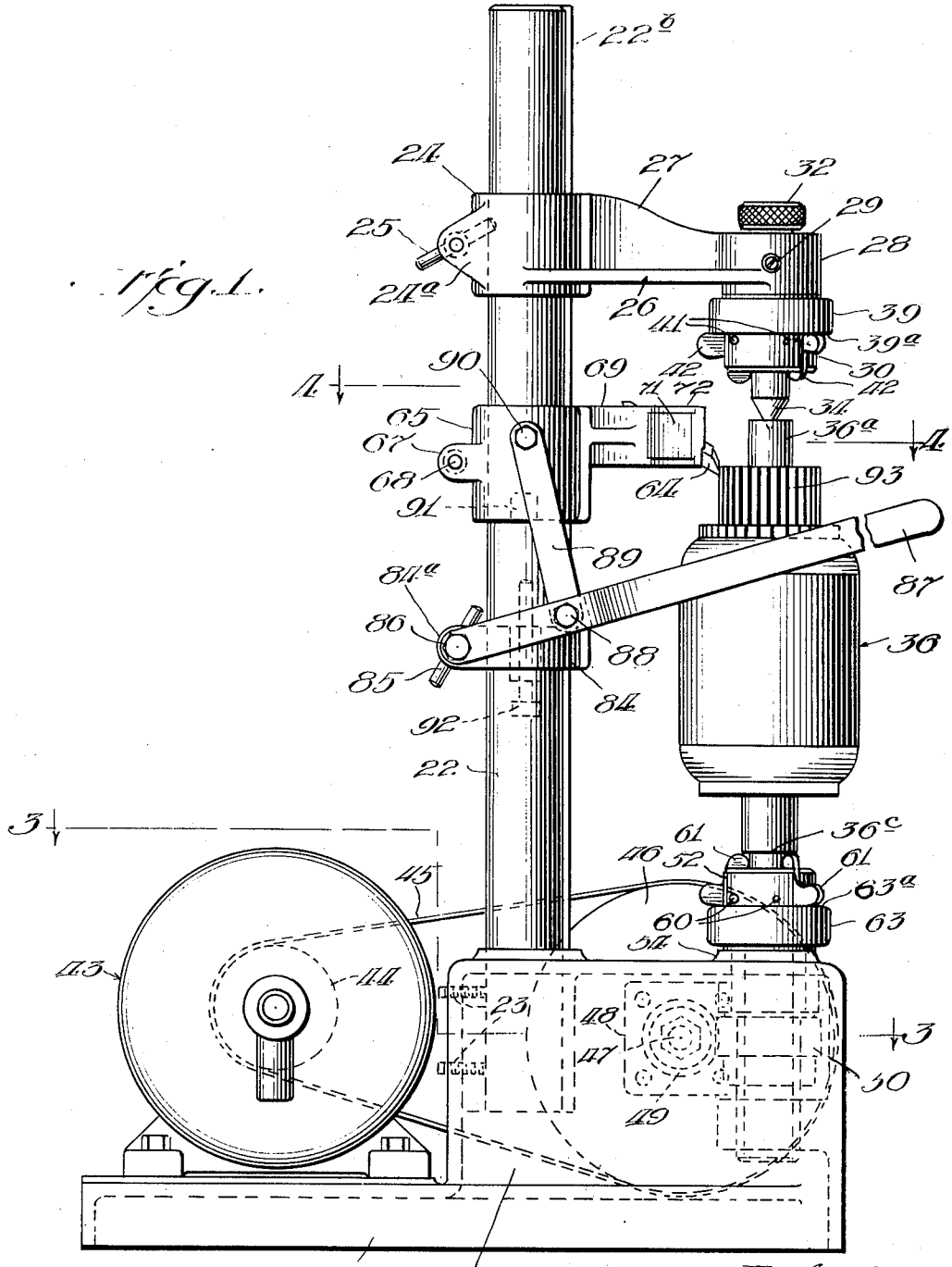
Aug. 22, 1933. H. W. ZIMMERMAN 1,923,410

TOOL FOR TURNING AND UNDERCUTTING ARMATURES

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Fig. 1.



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TOOL FOR TURNING AND UNDERCUTTING ARMATURES

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Fig. 2.

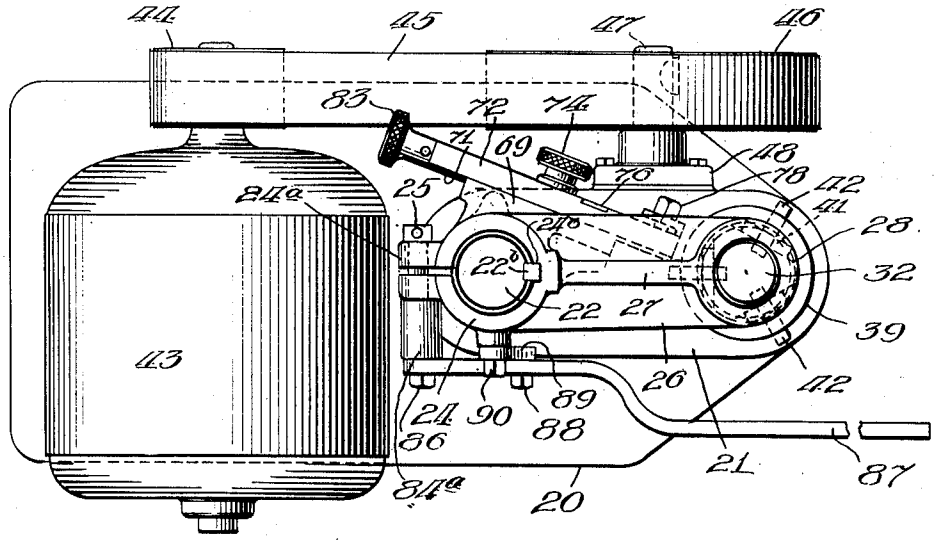
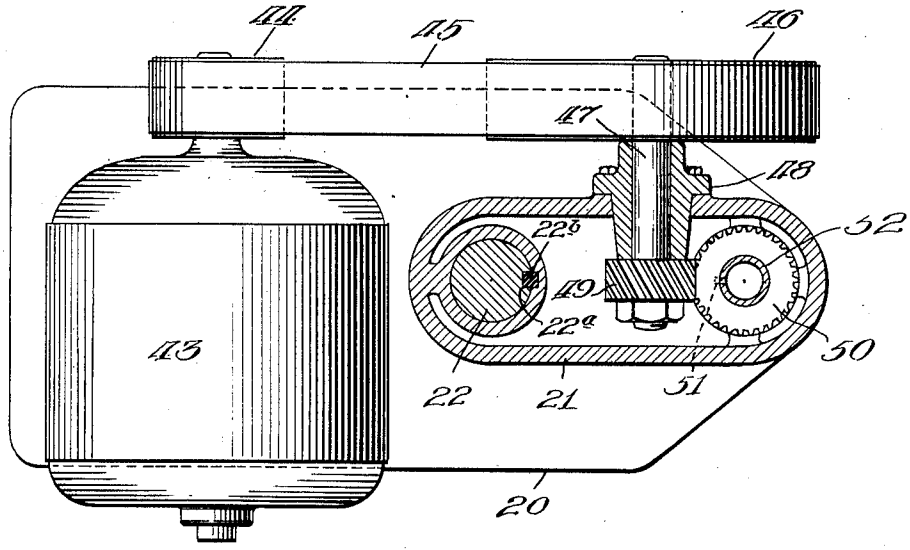


Fig. 3.



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Fig. 4.

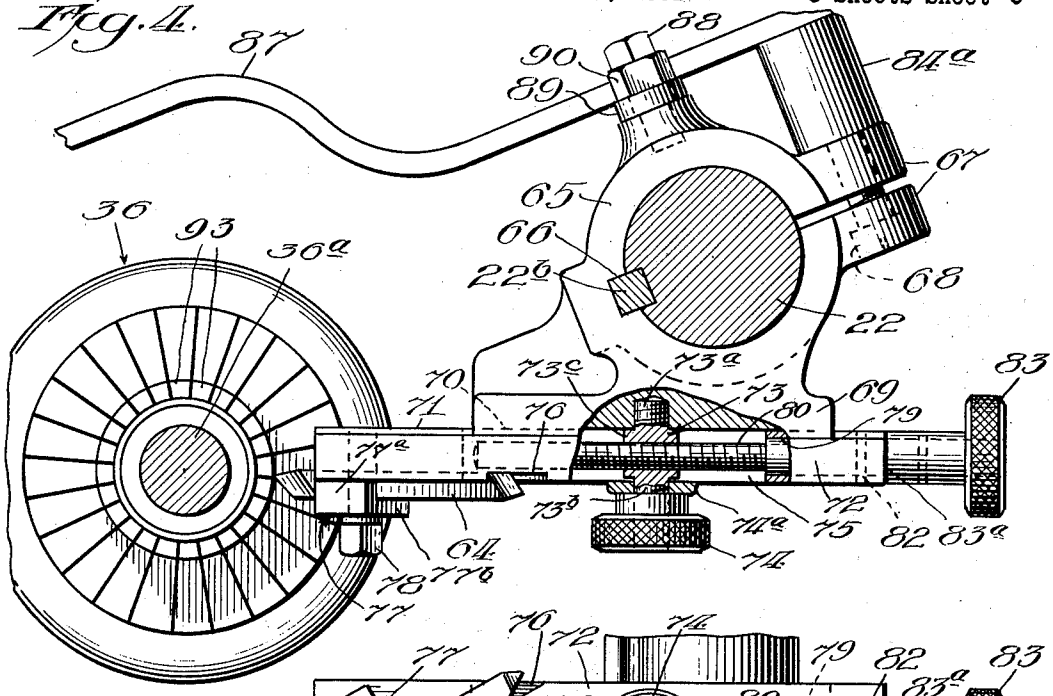


Fig. 5.

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TOOL FOR TURNING AND UNDERCUTTING ARMATURES

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Fig. 6.

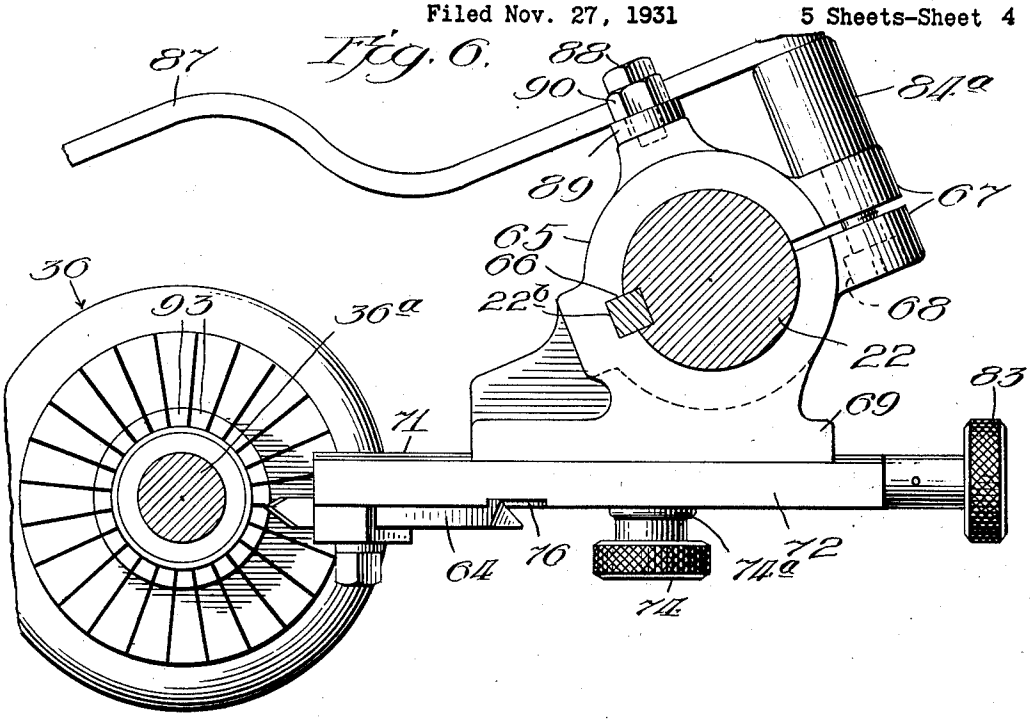


Fig. 7.

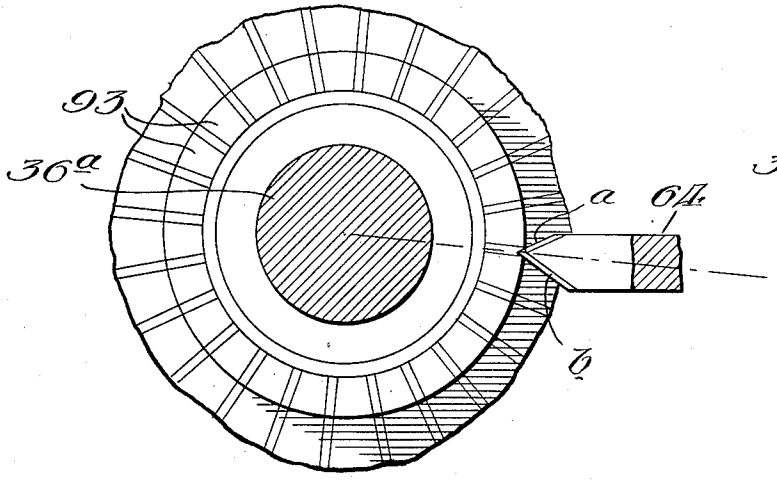
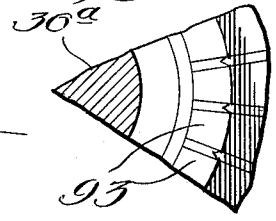


Fig. 8.



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TOOL FOR TURNING AND UNDERCUTTING ARMATURES

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Fig. 9.

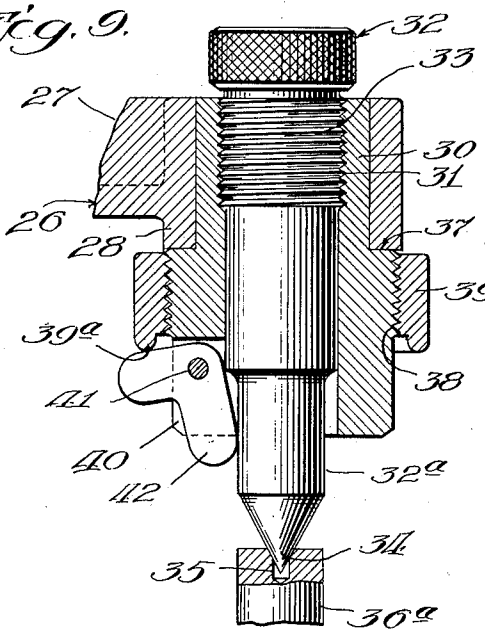


Fig. 12.

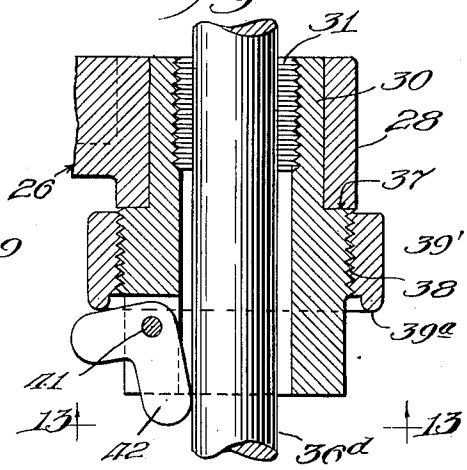


Fig. 13.

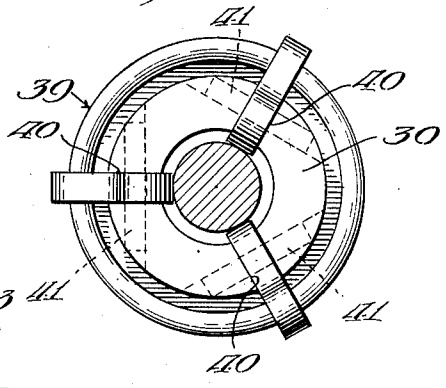


Fig. 10.

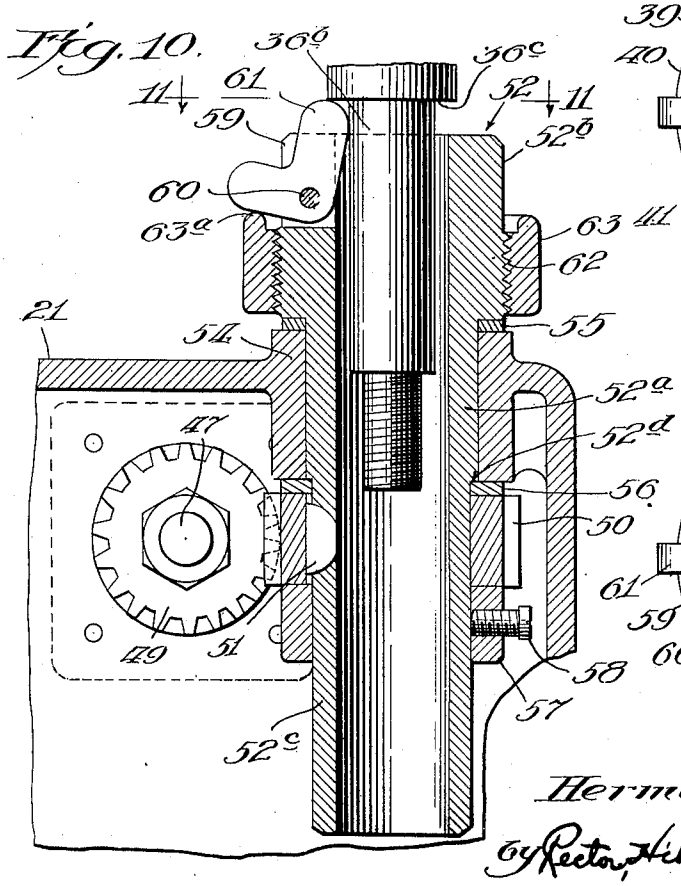
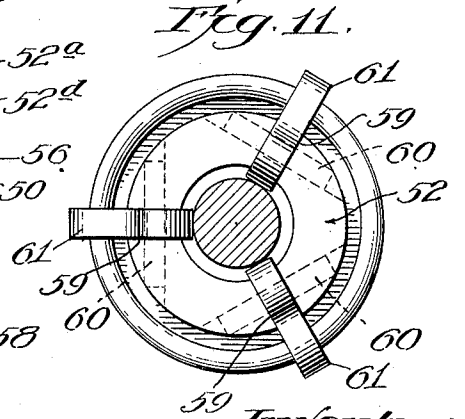


Fig. 11.



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Patented Aug. 22, 1933 1,923,410

UNITED STATES PATENT OFFICE

1,923,410

TOOL FOR TURNING AND UNDERCUTTING ARMATURES

Herman W. Zimmerman, Chicago, Ill., assignor to Automotive Maintenance Machinery Co., Chicago, Ill., a Corporation of Illinois

Application November 27, 1931
Serial No. 577,655

16 Claims. (Cl. 29—27)

My invention relates to tools for turning and undercutting armature commutators.

One of the objects of my invention is to provide an improved and inexpensive, but highly efficient, tool of the foregoing character which may be readily and easily handled by unskilled operators and which is particularly suited for garage service work.

Another object is to provide improved armature supporting means by which a large number of different types of armatures having variable-diameter and variable-length shafts may be supported by mere adjustment of the supporting means and without use of adapter devices. This is an important factor in reducing the cost of equipping for armature dressing operations.

A more specific object is to provide an improved form of chuck structure adapted to support and drive the armature.

Additional objects are to provide adjustable armature supporting means of a character adapted to automatically center the armature shaft as it is supportingly engaged with such shaft; to provide improved cutter-support means which may be rigidly supported for turning and undercutting operations but which may be readily and easily adjusted to any desired degree with precision; to provide a fast and accurate tool of the foregoing character; and to provide a lightweight and compact tool in the form of a self-contained, portable unit which may be readily and easily transported and which requires but little installation and storage space.

Other objects and advantages will become apparent as this description progresses and by reference to the drawings wherein,—

Figure 1 is an elevational view of one structure embodying my invention and showing an armature supported in position thereby for dressing operations;

Fig. 2 is a top plan view of the structure shown in Fig. 1;

Fig. 3 is a section taken substantially on line 3—3 of Fig. 1;

Fig. 4 is an enlarged sectional view taken substantially on line 4—4 of Fig. 1, the knife supporting structure being shown in partial section with the knife supported in position for turning operations;

Fig. 5 is a side elevational view of the structure shown in Fig. 4;

Fig. 6 is a view similar to Fig. 4 except that the knife is supported in position for undercutting operations;

Fig. 7 is an enlarged fragmentary view showing more clearly the relationship between the cutting edge of the knife and the commutator segments in the undercutting position of the tool;

Fig. 8 is a fragmentary end view of a commutator illustrating the form of undercutting;

Fig. 9 is an enlarged fragmentary sectional view of the uppermost armature support and centering means;

Fig. 10 is an enlarged fragmentary vertical sectional view of the lowermost supporting and centering means;

Fig. 11 is a section taken substantially on line 11—11 of Fig. 10;

Fig. 12 is a view similar to Fig. 9 except illustrating the centering stem removed and the armature shaft projected through the chuck structure; and

Fig. 13 is a section taken substantially on line 13—13 of Fig. 12.

The lathe structure which I have chosen to illustrate my invention, comprises a base 20 (Figs. 1, 2 and 3) provided with a housing 21 having a pocket in which is received the lower end of a vertical standard 22 secured in position by lock screws 23. This standard 22 is provided with a longitudinally-extending keyway 22^a in which is received key 22^b for a purpose which will become obvious hereinafter.

The upper end of the standard 22 receives a split sleeve 24 having projected ears 24^a adjustably receiving a clamp screw 25 for locking the sleeve in any desired vertically adjusted position along the standard. The sleeve 24 is provided with a suitable keyway 24^b in which is received the key 22^b for preventing relative rotation as between the sleeve and the standard. The sleeve 24 is further provided with a lateral arm 26 projected in a direction parallel with the base 20, the same being strengthened by a central upstanding rib 27. The outer end of arm 26 terminates in an integral collar or ring member 28 (Figs. 1, 2 and 9) in which is secured, by one or more set screws 29, a chuck bushing 30. The upper part of the bore of this bushing is internally threaded as at 31, and it is adapted to receive and support, in one use of my invention, a centering stem 32 threaded as at 33 to engage the chuck member threads 31. The lower end of this stem projects through and beneath the bushing 30 and is pointed as at 34 for centering-engagement with the center opening 35 in the upper end 36^a of the armature shaft (Fig. 9).

The engagement between the stem end 34 and shaft 36^a should be such as to permit relative free rotation of the armature shaft; but, unless

guarded against, the stem 33 might, in certain instances, tend to loosen or move from its set position during rotation of the armature so as to tighten or free the stem point 34 and shaft 36a which would tend to prevent proper functioning of the structure in the dressing operation. To avoid that, the lower portion of the chuck bushing 30 is enlarged providing a shoulder 37 which abuts against the bottom of the collar 28 predetermining the position of the member 30 therein. The enlarged cylindrical portion of chuck bushing 30 is externally threaded as at 38 and receives an internally threaded adjusting collar 39 which is readily accessible for manipulation by hand. The lower edge of the chuck bushing is provided with a plurality of longitudinally extended slots 40 (Figs. 9 and 13) in which are pivotally supported, as at 41, reversed L-shape fingers 42, the upper horizontal, outwardly-projecting legs of which extend beneath the lower rounded, undercut edge 39a of the adjusting collar 39. Whereupon as the collar 39 is rotated to move the same downwardly toward the fingers, the free ends of the vertical legs of these fingers are moved simultaneously inwardly against the lower reduced portion 32a of the stem 32 tightly clamping and holding the same in position. These same fingers serve a further purpose as will be described more fully hereinafter.

The base 20 also supports a motor 43 upon the drive shaft of which is mounted a pulley 44 driving, by means of a belt 45, another pulley 46 (Figs. 1, 2 and 3). Pulley 46 is fixed to a horizontally-extending shaft 47 which is journaled in housing bearing 48 and supports at its inner end a spiral gear 49. The spiral gear 49 meshes with a companion and horizontally-disposed spiral gear 50 which is keyed, as at 51, to a vertically extending hollow spindle 52.

The spindle 52 serves as a centering chuck structure which supports and bears the weight of the armature to be dressed. It is, preferably, of the form and mounted in the manner best illustrated in Fig. 10. Specifically, the hollow spindle is provided with an intermediate-diameter portion 52a which finds bearing support in the housing bear 54. The spindle, above its section 52a, is enlarged providing a head 52b which seats upon the top of the housing bearing 54, a suitable thrust washer or bearing 55 being interposed between the head 52b and housing bearing 54 for purposes well understood. A lowermost or reduced diameter section 52c of the spindle supports the gear 50, a suitable thrust bearing or washer 56 being mounted between the top of the gear 50 and the shoulder 52d formed between the spindle sections 52a and 52c. The spindle-and-gear assembly is locked in position for rotation without longitudinal displacement by a collar 57 secured to the spindle section 52c by lock screw 58 immediately beneath and in abutting engagement with the bottom of gear 50. With this arrangement, it will be obvious that upon operation of the motor, the pulley 46, gears 49, 50 and spindle 52 are rotated.

The spindle structure just described is quite sturdy and well serves to firmly and properly support the armature 36 in centered position for the dressing operations. For securing the lower end 36b of the armature shaft to the chuck spindle 52, I provide the following: The spindle head 52b is provided with a plurality (preferably three) of longitudinal and uniformly spaced slots 59 leading from the upper end thereof to a substantial depth as clearly shown in Figs. 10 and 11. In each of these slots, I pivotally support, as at 60, a reversed L-shape finger 61, the lower horizontal leg of which projects outwardly from the spindle. The spindle beneath the fingers 61 is externally threaded as at 62, for the reception of an internally-threaded adjusting nut 63, the upper reduced and rounded rim 63a of which is disposed directly beneath the horizontal portions of the fingers 61. As the nut 63 is adjusted upwardly, it engages the horizontal portions of the fingers 61 and moves the free ends of the vertical portions thereof simultaneously inward to similar extents. Wherefore, when the armature shaft end 36b is inserted in the spindle, the fingers 61 are adjusted as described to clampingly engage and hold such shaft end in exact centered position. The grip engagement afforded by the fingers 61, aided somewhat by the weight of the armature, insures proper rotation of the armature 36 when the motor 43 is in operation. In cases where the armature shaft end 36b is provided with a shoulder similar to shoulder 36c, support may be effected as shown in Figs. 1 and 10.

The spindle 52 provides, in effect, a universal chuck and accommodates shafts of various lengths and diameters. Some compensation may be made for varying shaft lengths by adjusting the upper sleeve 24 vertically along the standard 22 and also by adjusting the center stem 32. In certain forms of armatures, the armature shaft may be of such length as to project the same beyond the limits afforded by the structure just described. An example of this is shown in Figs. 12 and 13. Specifically, in that case, the center stem 32 is removed and the armature shaft section 36d, corresponding to the shaft section 36a of Fig. 9, is projected through the chuck bushing 30. To center this shaft end 36d, and to hold the same for rotation in that centered position, I adjust the collar 39' to swing the fingers 42' in the manner described in connection with the arrangement of Fig. 9. In this manner, the free ends of the fingers 42' may be brought into the proper engagement with the shaft end 36d permitting the same to rotate but, at the same time, holding it in predetermined centered position with respect to the bottom center-support spindle. This arrangement also provides for support of a shaft end which does not have a "center".

The turning and undercutting operations are both accomplished by a single cutter or knife structure 64. One end of this cutter (Figs. 4 and 5) is shaped for turning operations and the other end (Figs. 6 and 7) is shaped for undercutting operations, requiring merely reversal of the cutter in the carrying out of these different operations.

This knife or cutter is supported for reciprocation along the standard 22, and with respect to the armature 36 by a sleeve 65 having a keyway 66 receiving the key 22b and preventing relative rotation as between these parts. The fit as between the sleeve 65 and standard 22 is such that the sleeve readily slides vertically thereon and, in case of wear, and in order to keep a predetermined relationship between these parts, the sleeve is of a split character having the ears 67 adjustably connected together by a screw 68 which may be adjusted as desired to insure and maintain the proper slide relationship between these parts.

The sleeve 65 is provided at one side with a rather substantial flat, vertically-disposed face

69 having an outer, finished slide surface substantially rectangular in outline shape. The flat slide surface of the face 69 is provided with a groove 70 extending transversely toward the armature 36, which groove receives a complementally-shaped tongue 71 formed along one face of a rectangularly-shaped slide plate 72. This tongue-and-groove arrangement, obviously, provides for relative sliding movement between the sleeve face 69 and the plate 72 without angular displacement thereof. The plate 72 is held with its tongue 71 engaged in the groove 70 as follows: The sleeve face 69, in the base of the groove 70 is provided with a threaded opening for reception of the reduced threaded end 73^a of a stud 73. The outer end of this stud 73^b is also reduced and threaded for reception of a lock nut 74. The mid portion of the slide plate 72 and tongue 71 are provided with a longitudinal slot 75 through which the enlarged cylindrical central portion 73^c of the stud 73 projects permitting back and forth sliding movement of the plate 72 within the limits of the plate slot. To hold the plate 72 in any predetermined adjusted slide-position, the lock nut 74 is screwed upon a stud end 73^b until its shank portion 74^a tightly engages and clamps the plate toward and against the face 69.

The plate 72 is provided in its outer face with a rectangularly-shaped groove 76 which is diagonally directed toward the work as illustrated in Fig. 5. This groove slidably receives the rectangularly-shaped body of the cutter 64. The cutter is locked in adjusted position in this groove 76 by an L-shaped clamp member 77 secured in adjusted position by screw 78. In the use of this L-shaped clamp, one leg 77^a seats endwise against the outer face of plate 72 and the other leg 77^b rests upon the adjacent flat face of the cutter 64; whereupon as the screw 78 is tightened, the clamp is rocked so as to tightly wedge the knife in its supporting groove against accidental displacement.

During the operation of the tool, the cutting edge of the knife must be adjusted with precision relatively to the work. To accomplish this, the end of the plate opposite the knife 64 is provided with a longitudinal bore 79 which rotatably receives an adjusting stem 80 which screw-threadedly passes through a threaded opening in the stud 73. The stem 80 near its outer end is provided with an annular groove 81 in which plate-carried pins 82 are received for preventing longitudinal displacement of the stem 80 without interfering with its rotation. The outer end of the stem 80 has pinned thereto an adjusting head 83, the inner end of the shank 83^a of which seats against the adjacent end of the plate 72. By loosening the lock nut 74 slightly and rotating the head 83 to screw stem 80 through stud 73, the plate 72 and knife 64 are advanced or retracted depending upon the direction of rotation of the parts. Obviously, this form of adjustment permits of very slight and accurate adjustments of the cutter. If desired, suitable registering scale markings (not shown) may be carried by the face 69 and the plate 72, respectively, to facilitate the foregoing adjustment.

In Figs. 1, 4 and 5, I have illustrated the tool with the knife in position for commutator turning operations. In this case, after the knife has been properly adjusted, the motor 43 is set in operation and the armature rotated. During this time, the knife 64 is reciprocated in contact with the commutator. Specifically, the standard 22 has keyed thereto a split collar 84 having rearwardly projecting ears 84^a supporting a clamp screw 85 for locking the collar in a predetermined position along the standard. The collar 84 pivotally supports, as at 86, one end of a handle 87 which is, in turn, pivotally connected, as at 88, to a link 89 pivoted, as at 90, to the sleeve 65. Obviously, reciprocation of the handle 87 causes reciprocation of the sleeve 65 and the cutter 64 in contact with the work. It is desirable that the extent of reciprocation of the knife be limited to a predetermined extent to avoid injury to the armature parts not being dressed. To that end, I provide the sleeve 65 with a stop pad 91; and I also provide the collar 84 with a boss 84^b screw-threaded to support a vertically-disposed and adjustable stop screw 92, the upper end of which is adapted to be abutted by the pad 91. Consequently, by adjusting the screw 92 the extent of downward movement of the knife 64 is predetermined.

For a purpose well known, the spaces between the commutator segments 93 are filled with mica or other suitable insulating material. For best results, in the operation of the armature, the mica should be undercut and the foregoing structure is well adapted to the accomplishment of that. Specifically, the ends of the cutter 64 are reversed (Figs. 6 and 7) with respect to the position shown in Figs. 4 and 5. For best results, the undercutting between the commutator segments should be uniform as to spacement with respect to the segments; and, as shown in Figs. 6 and 7, the reversed edge of the cutter is so shaped that its point enters between the commutator segments in a manner to make a cut of V-shape with the apex of the V spaced substantially equal distances from the outer edges of the commutator segments. Such a cutting edge is accomplished by off-setting the edge in such a way that a radial line drawn through the work and passing through the cutting point extends at an angle to the longitudinal median line of the knife as clearly shown in Figs. 6 and 7. For example, the faces *a* and *b* of the undercutting edge may extend, for good results, at an angle of approximately 30° from a line passing from the center of the work radially through the cutting point of the tool.

For undercutting operations, the armature 36 is held stationary with the undercutting knife edge in alignment with the space between the commutator segments. The cutter is then reciprocated as hereinabove explained. The adjustment of the knife for the depth of the cut is determined by adjustment of the supporting plate 72, or the cutter, or both. The armature is then turned by hand so that each space between segments can be readily and quickly undercut in a similar manner without making any further adjustments.

While I have shown and described one form of my invention and several adaptations of the same, it is to be understood that other changes in details and arrangement of parts may be made without departing from the spirit and scope of my invention as defined by the claims which follow.

I claim:

1. In a tool of the class described, a base, a standard immovably supported thereon, a laterally-extending arm adjustably carried by said standard, armature guide and centering means carried by said arm, a rotatable chuck device mounted on said base on center with said armature guiding and centering means, means for rotating said chuck device, a cutter slidably sup-

ported by said standard for reciprocation relative thereto, and operating mechanism adjustably carried by said standard and operatively connected to said cutter for reciprocating the latter.

2. In a tool of the class described, a base, a vertical standard immovably supported thereon, a laterally-extending arm adjustably carried by said standard, adjustable armature guide and centering means carried by said arm, an adjustable chuck device mounted on said base and rotatable about a vertical axis on center with said armature guiding and centering means, means, including gears, for rotating said chuck device, a cutter slidably supported by said standard for vertical reciprocation, means for adjusting said cutter toward and from the armature, and operating mechanism adjustably carried by said standard and operatively connected to said cutter for reciprocating the latter.

3. In a tool of the class described, a self-contained, portable unit comprising a base, a vertical standard immovably supported thereon, a laterally-extending arm adjustably carried by said standard, armature guide and centering means carried by said arm, a chuck device mounted on said base and rotatable about a vertical axis on center with said armature guiding and centering means, means carried by said base for rotating said chuck device, a cutter slidably supported by said standard for vertical reciprocation, operating mechanism adjustably carried by said standard and operatively connected to said cutter for reciprocating the latter, and adjustable stop means for predetermining the depth of reciprocation of said cutter.

4. In a tool of the class described, a base, a standard immovably supported thereon, a laterally-extending arm adjustably carried by said standard, armature guide and centering means carried by said arm, a rotatable chuck device mounted on said base on center with said armature guiding and centering means, means for rotating said chuck device, a sleeve member slidably mounted on said standard, a laterally-extending arm adjustably carried by said sleeve member, a cutter adjustably carried by said arm, means for moving said arm back and forth to move said cutter away from and toward the armature, another sleeve adjustably mounted on said standard, a handle pivotally supported by said second sleeve, a link pivotally connected to both said handle and said first sleeve for reciprocation of said first sleeve, and adjustable stop means carried by said second sleeve and engageable with said first sleeve as the latter is reciprocated to limit the depth of reciprocation of said first sleeve.

5. In a tool of the class described, means for supporting the armature for rotation which comprises an arm having a bore at its one end with its axis extending in alignment with the axis of the work, a plurality of fingers supported for movement inwardly toward and from the center of said bore, means for simultaneously moving all of said fingers to like extent inwardly, another spaced and rotatable chuck member adapted to receive the lower end of the armature shaft and to support the weight of the armature for rotation of the latter, means carried by said member and adjustable to grippingly engage the lower armature shaft end, and a common support means for both said arm and chuck member.

6. In a tool of the class described, means for supporting the armature for rotation about a vertical axis which comprises a vertically adjustable, upper horizontal arm; a hollow, stationary chuck member supported by said arm with its bore extending in vertical direction, a plurality of annularly-arranged chuck fingers supported by said member and having their ends movable radially toward the axis of said member, means for moving all said fingers simultaneously and to similar extents in a direction to grippingly engage and hold the armature; and similar rotatable chuck structure at a lower and vertically aligned position for centering and supporting the weight of the armature for rotation.

7. In a tool of the class described, means for supporting the work for rotation which comprises an adjustable arm; a hollow, stationary chuck member supported by said arm with its bore extending in alignment with the axis of the work, a plurality of angularly-arranged chuck fingers supported by said member and having their ends movable radially toward the axis of said member, means for moving said fingers simultaneously and to similar extents, a centering, rotational-guide stem adjustably mounted in said member with its lower end on center with said member and adapted to engage one end of the work on center, said fingers being adapted to firmly engage said stem to prevent rotational displacement of the latter; and aligned and spaced chuck means for supporting the other end of the work for rotation.

8. In a tool of the class described, means for supporting an armature for rotation which comprises a stationary chuck structure engageable with one end of the armature shaft, and which includes means providing a bore for reception of said shaft end, a plurality of fingers radially adjustable with respect to the axis of said bore and shaft end, a member for simultaneously adjusting all said fingers to similar extents to rotatably support and center said shaft end; and rotatable chuck structure engageable with the other end of the armature shaft, and having a plurality of members for gripping said other shaft end for rotation of the armature.

9. In a tool of the class described, chuck means for supporting, centering and rotating the armature which comprises a hollow rotatable spindle adapted to receive one end of the armature shaft, gear means for rotating said spindle, a plurality of identical shaft-engaging fingers pivotally supported by said spindle for radial swing movement toward the spindle axis, and a single adjustable means for simultaneously swinging said fingers radially and for holding them in any predetermined radial position.

10. In a tool of the class described, chuck means for supporting, centering and rotating the armature which comprises a hollow rotatable spindle adapted to receive one end of the armature shaft, gear means for rotating said spindle, a plurality of annularly-arranged, equally-spaced and longitudinally-extending slots in said spindle, a reversed L-shaped finger, pivotally mounted in each said slot with one leg thereof extending outwardly and its other leg swingable inwardly through said slot toward the axis of the spindle, and a single means adjustably carried by said spindle and engageable with said outwardly-extending finger legs for swinging all said inwardly-swingable finger legs simultaneously inward to similar extents.

11. In a tool of the class described, cutter structure therefor which comprises a sleeve member adapted for sliding support and having a face

disposed in a plane substantially parallel with its axis, a plate mounted for slide movement over said face in a direction transverse to the axis of said sleeve, means for moving said plate back and forth upon said face to any desired extent, and a cutter member carried by the end of said plate nearest to the armature.

12. In a tool of the class described, cutter structure therefor which comprises a support member having a slide face thereon, a plate member mounted on said face for slide movement relative thereto by a tongue-and-groove connection, means for clamping said plate against said face in any adjusted position thereof, means for sliding said plate over said face, and a cutter device supported by said plate.

13. In a tool of the class described, cutter structure therefore which comprises a support member having a plane face, a plate mounted for slide movement over said face, said plate having a slot between its ends, a stud member carried by said support member and projecting through said plate slot, a clamp element adjustable upon said stud member to engage said plate and clamp the latter against said face, and adjustable means for moving said plate back and forth to desired extent upon loosening of said clamp element.

14. In a tool of the class described, cutter structure therefor which comprises a support member having a plane face, a plate mounted for slide movement over said face, said plate having a slot between its ends, a stud member carried by said support member and projecting through said plate slot, a clamp element adjustable upon said stud member to engage said plate and clamp the latter against said face, and means rotatably carried by said plate and screw-threadedly engageable with said stud member for sliding said plate back and forth upon loosening said clamp element.

15. In a tool of the class described, cutter structure therefor which comprises a support member having a plane face, a plate mounted for slide movement over said face, said plate having a slot, a stud member carried by said support member and projecting through said plate, a clamp element screw-threadedly engaging the free end of said stud member and adjustable to press said plate against said face, a screw stem rotatably supported by said plate without longitudinal displacement and screw-threadedly engageable with said stud member for sliding said plate back and forth dependent upon direction of rotation of said screw stem.

16. In a tool of the class described, cutter structure therefor which comprises a support member having a slide face, a plate mounted for slide movement along and upon said face, means for sliding said plate back and forth toward the work, said plate having on one side a diagonally-disposed groove leading to its end nearest the work, a cutter having a body in said groove, and a clamp element carried by said plate and adjustable into engagement with said cutter to clamp the latter in predetermined position in said groove.

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