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Filed Dec. 13, 1947

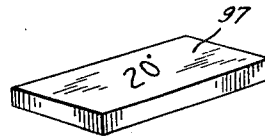
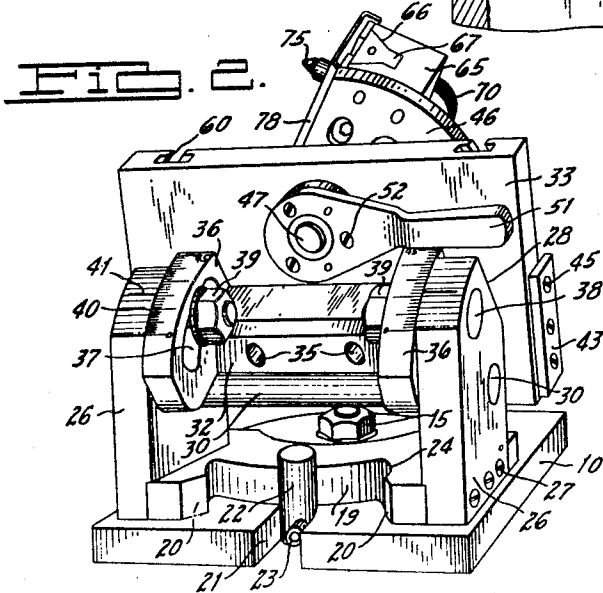


Fig. 12.

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Jan. 11, 1949.

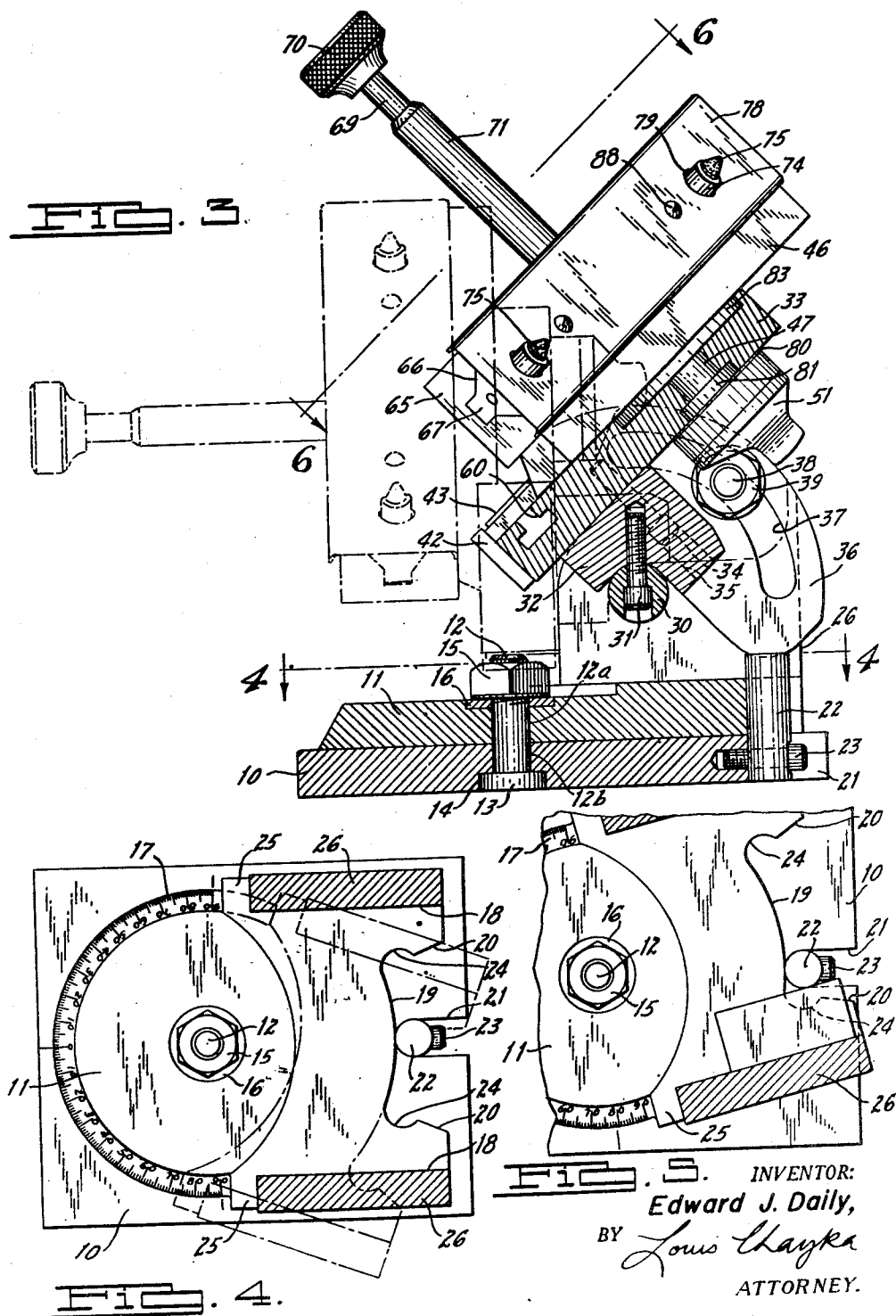
E. J. DAILY

2,458,768

GRINDING WHEEL DRESSING DEVICE

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Jan. 11, 1949.

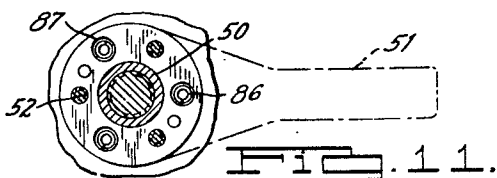
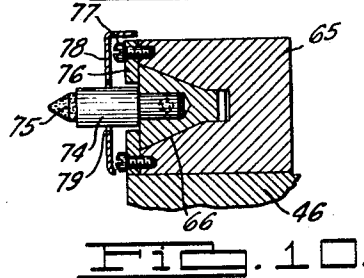
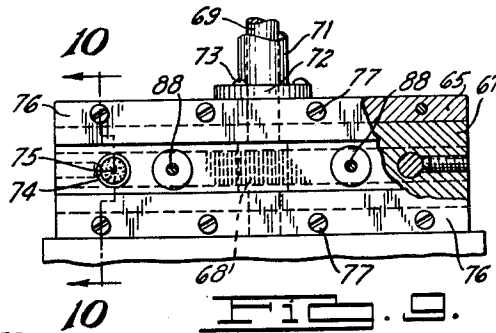
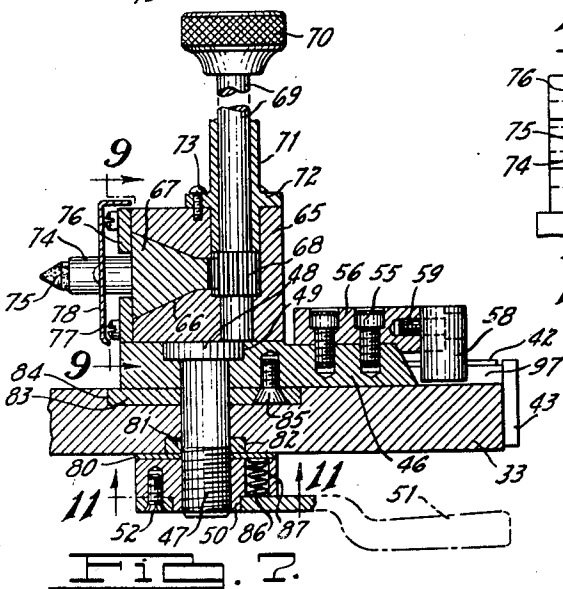
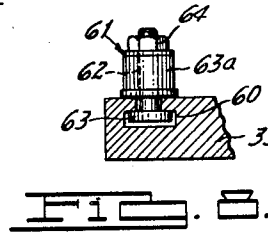
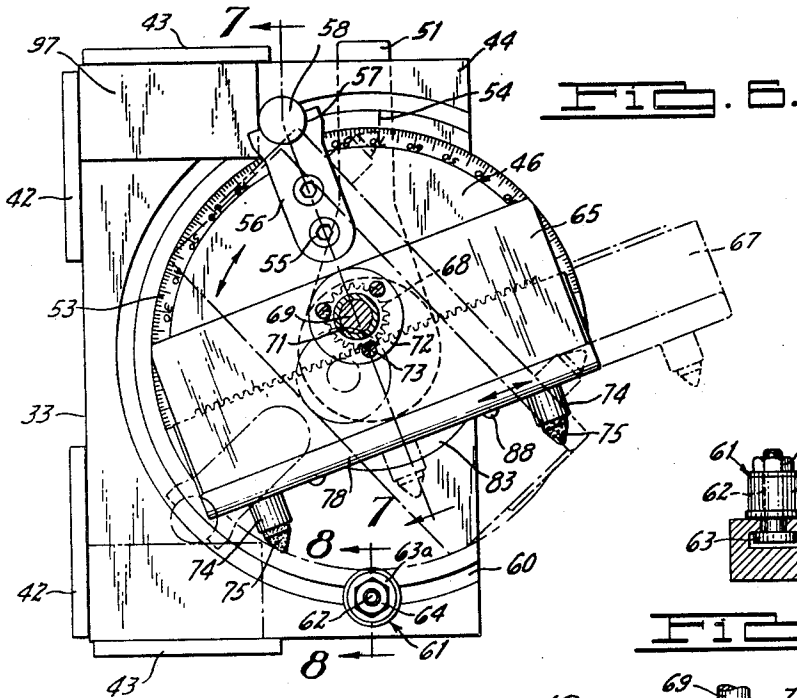
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GRINDING WHEEL DRESSING DEVICE

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4 Sheets-Sheet 3



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GRINDING WHEEL DRESSING DEVICE

Filed Dec. 13, 1947

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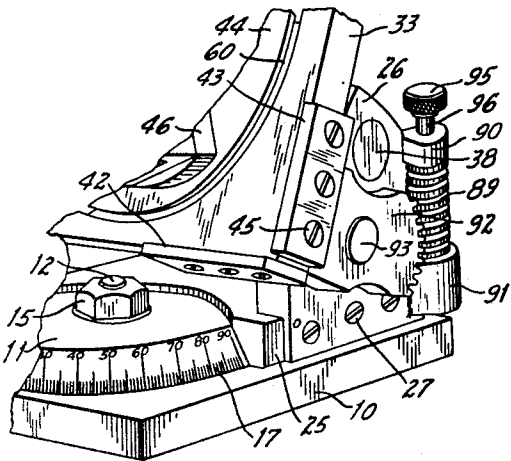


Fig. 13.

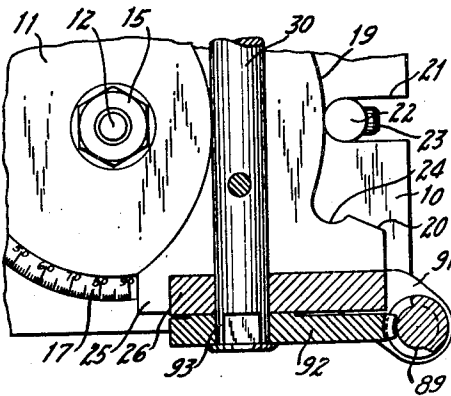


Fig. 15.

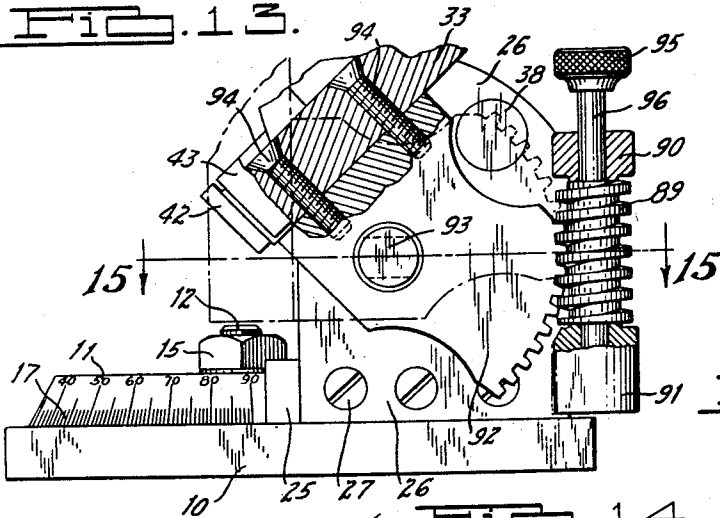


Fig. 14.

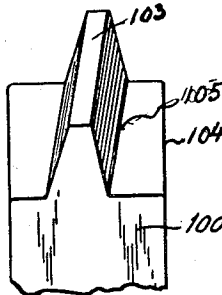
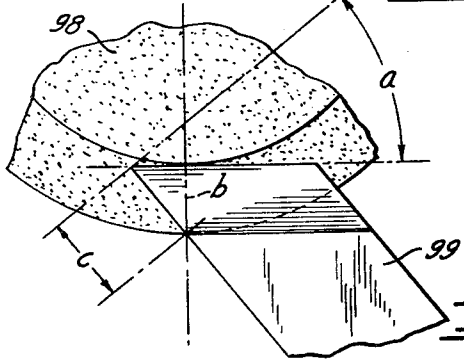


Fig. 16.



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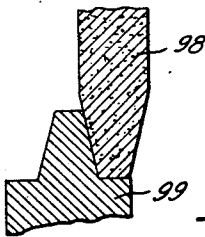


Fig. 19.

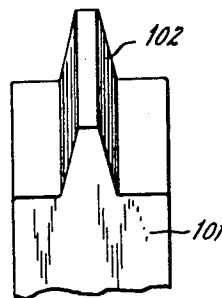


Fig. 17.

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GRINDING WHEEL DRESSING DEVICE

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Application December 13, 1947, Serial No. 791,619

5 Claims. (Cl. 125—11)

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My improvement pertains to devices used in industry for dressing abrasive wheels employed in grinding tools to a specific shape. The grinding is effected by means of diamond points. In practice, a diamond point suitably mounted is brought against the peripheral portion of a grinding wheel, while the same is in rotation, and the point is progressively moved either at an angle with respect to the plane of the rotation of the wheel, or turned in an arc of a convex or concave circular curve.

While, as above intimated, my device may be used in dressing the abrasive wheels for a radii, the principal object of my invention is to provide a device for dressing angles on abrasive wheels employed for the purpose of grinding form tools used in cutting threads, for forming the back relief on hobs used for hobbing gears, and for other analogous uses. Another purpose of my improvement is to provide a device which may be set up quickly to any desired angle as indicated by calibrations on the respective elements or by replaceable gauge blocks. As a result of this improvement, the device may be set up quickly for repeated use to duplicate the angles of operation simply by use of the same block or the same calibrations.

Other advantages and uses of my device will be described and will become apparent from the specification of my device which I shall now describe with reference to the accompanying drawings. In said drawings:

Figure 1 is a perspective view of my device as set for use upon a grinding wheel table;

Figure 2 is a perspective view of my device as seen from the rear thereof;

Figure 3 is a vertical, sectional view taken on line 3—3 of Figure 1;

Figure 4 is a sectional view taken on line 4—4 of Figure 3;

Figure 5 is a fragmentary view of a detail of construction shown in Figure 4, but with members in a different operative position;

Figure 6 is a top elevational view of my device with parts shown in sectional view as on line 6—6 of Figure 3;

Figure 7 is a sectional view on line 7—7 of Figure 6;

Figure 8 is a sectional view of a detail of construction taken on line 8—8 of Figure 6;

Figure 9 is a sectional view taken on line 9—9 of Figure 7;

Figure 10 is a sectional view of a detail of construction taken on line 10—10 of Figure 9;

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Figure 11 is a sectional view taken on line 11—11 of Figure 7;

Figure 12 is a perspective view of a gauge block used in combination with my dresser;

Figure 13 shows a perspective view of a fragment of my device as modified by inclusion of a worm drive for adjustment of an element thereof;

Figure 14 is a side elevational view, partly in section, of the worm drive arrangement shown in Figure 13;

Figure 15 is a sectional view taken on line 15—15 of Figure 14;

Figures 16 and 17 show samples of the operative ends of tools ground by means of a wheel dressed with my device;

Figure 18 shows the end of a tool in the process of being ground by an abrasive wheel;

Figure 19 shows the manner of grinding a side face of a tool.

Similar numerals refer to similar parts throughout the several views.

The device includes a base 10 to be placed for use on table T of a grinder with which it is to be used. It may be secured in place by any suitable means which, however, are not shown in the drawings. Mounted upon base 10 for rotation thereon, is an index plate 11 which is secured to the surface of the base by means of a bolt 12. The bolt 12 passes through an aperture 12a in said plate and through an aperture 12b in the base as best shown in Figure 3, and is provided with a head 13 fitting into a recess 14 in the under surface of the base 10. At the upper end of the bolt, a nut 15 seated on top of a washer 16 serves to hold the bolt in place.

The index plate is shaped at one end to form a semicircular disc having a rim portion slanting downwardly and calibrated in degrees as shown at 17. The remainder of said plate, integrally connected to the disc portion, is substantially rectangular in shape, being defined by sides 18 disposed parallel to each other, while the end of the plate, opposite to that of the disc-shaped portion, is provided with a recess in the direction of said bolt 12. The recess is defined by an arc 19 described from the center of the disc to a radius exceeding that of said disc, and by outwardly flaring sides 20, the conjunction of the arc and the respective sides being semicircular in shape as shown at 24.

Mounted within a slot 21 at what is the rear end of base 10—that is, the end remote from the index plate—is a stop pin 22 secured in place by means of an Allen-type screw 23 passing

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through the body of the stop pin into said base 10 as best shown in Figure 3. The stop pin 22 rises above the surface of the base 10 to a level above the top of the index plate and is disposed in abutment with the wall of the recess along the arc 19. The stop pin, as it will be obvious, serves to limit the rotary movement of the index plate, as the rotation of said plate will be limited by the length of the arm 19 terminating at each end with the semi-circular formation 24 above referred to.

Affixed to the sides of the rectangular portion of the index plate by means of screws 27, preferably of the Allen type, are two upright brackets 26 disposed parallel to each other and cut off at the top at an angle of 45° as shown at 28 in Figures 1 and 2. Journalled within the brackets in bearings 29, aligned axially, is a horizontally disposed shaft 30. Straddling the shaft and secured thereon by means of screws 31 passing diametrically therethrough, is an angle bar 32 having in cross section the shape of an inverted letter V.

Mounted upon said angle bar 32 is a master plate 33, the plate being secured to the bar by means of screws 34 threaded through holes 35 in one leg of said angle bar into the body of said master plate, as best shown in Figure 3. Projecting from the back side of the master plate, is a pair of arcuate braces 36 shaped along an arc described from the axis of shaft 30. The braces are in abutment with the inner surface of the respective upright brackets 26 and are provided with arcuate slots 37 following an arc described from the axis of the above shaft. Extending from each bracket through the slot, inwardly, are bolts 38, each being provided at its end with a nut 39 bearing against the inner surface of the respective brace. As the master plate is intended to be swung with the shaft in an arc with respect to the axis of said shaft 30, said nuts 39 serve to secure the plate at any desired angle within the limits of its arcuate movement. This encompasses the arcuate distance from a position in which the master plate is disposed vertically resting on shoulders 25, being a part of the index plate, to a setting inclined at 45° to said vertical position. The top surface of each brace is calibrated in degrees from 0-45° as shown at 40, said calibrations being read with respect to a line 41 engraved in the top portion of the respective brackets as shown in Figure 2.

The plate 33, as will be seen in Figure 1, is rectangular in shape, its two lower corners being provided with flange plates, there being two flange plates for each corner—one, 42, affixed to the underside of plate 33, the other one, 43, being affixed to the side of said plate 33—the two flanges being at right angle to each other and projecting above the plane of what is the front face 44 of said master plate. The purpose of these flange plates will be described in the course of these specifications. The plates, as best shown in Figure 1, are secured externally on said master plate in their respective positions by means of screws 45.

Mounted for rotation on the front face 44 of the master plate 33 is a turntable 46 having the shape of a flat, circular plate cut off along the chord of its circular outline, and secured to the master plate by means of a bolt 47. The head 48 of the bolt, as best shown in Figure 7, fits into a recess 49 in the top side of said turntable, while the opposite end of the bolt is secured in place by means of an internally threaded nut 50. Interposed between the nut and the master plate

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33 is a washer 50 and an annular member 51 in a recess 52 in the underside of the master plate, both—that is, the washer and the annular member 51—skirting the body of the bolt 47. Similarly, an annular member 53, seated in a recess 54 in the top side of the master plate 33, skirts the body of said bolt on the underside of the turntable and is secured thereto for rotation therewith by means of a screw 55.

The above-said nut 50 is provided with a handle 51 secured to the outer surface of the nut by means of screws 52. A plurality of coiled springs 56, each disposed within a cylindrical aperture 57 in the body of said nut 50 and arranged about the axis of the bolt, bear against the washer 50, keeping it in a constant abutment with the underside of the master plate 33, even when the nut 50 is unloosened by means of handle 51 in order to permit easy rotation of the turntable upon the face of the master plate. Should it be necessary to lock the turntable against rotation, this may be effected by turning the handle in a clockwise direction to tighten the frictional contact of the turntable upon the surface of the master plate 33. The outer rim of the turntable 46 is provided with calibrations 53 in degrees as shown in Figure 6. The calibrations range along a semi-circle of 180° and are read with respect to the index line 54 engraved on the face of said master plate 33.

Radially mounted on the face of the turntable 46 by means of screws 55, is an arm 56 having a yoke-shaped recess 57 embracing a stop pin 58 secured to the body of the arm by means of a screw 59. Following the marginal portion of the turntable in a spaced relation thereto, is a T-slot 60 ground within the body of the master plate of the master plate 33 as best shown in Figures 1, 2, and 6. The slot serves for accommodation of removable check pins indicated generally in Figure 8, and including a bolt 62 having a laterally expanded head 63 fitted into the slot while its shank, projecting upwardly from the slot, is provided with a cylindrical jacket 63a and is secured in place at the top by means of a nut 64.

The check pin 61 may be shifted within the T-slot to any desired position to limit the extent of the rotary movement of the turntable upon the face of the master plate. Once the check pin has been moved to a desired position, it may be secured in place simply by tightening the nut 64. As the above-described stop pin 58 in arm 56 on the face of the turntable 46 projects beyond the rim of said turntable just far enough to be above the open top of the slot, it will be understood that the rotation of said turntable would bring the stop pin against the check pin 61. The use of this is quite obvious. Once the degree to which the turntable is to be rotated has been ascertained, the check pin may be tightened in its place for subsequent use, when a quick rotation of the turntable until the stop pin 58 has encountered said check pin 61, will eliminate the necessity of verifying the degree of the completed turn.

Affixed to the upper surface of the turntable in a position substantially diametric thereto, is a block 65 aligned with the cut-off side of said turntable and provided with a swallow-tail groove 66 disposed longitudinally therein for reception of a rack 67 to be actuated by a pinion 68. The latter is keyed to a shaft 69 extending outwardly of the block and terminating with a knurled knob 70. The shaft is housed in a sleeve 71 equipped with an annular flange 72 having holes for re-

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ception of screws 73 threaded into the body of the block as best shown in Figure 7. The rack 67, conforming to the inner shape of the swallow-tail groove 66, serves as the carrier of cylindrical mountings 74 for diamond tips 75.

Two metal strips 76, affixed to the body of the block along the edges of the groove 66 and projecting inwardly of said edges, serve to retain the rack in place, securing its engagement with the pinion 68. The strips are secured in place by means of screws 77. An apron 78, made of sheet metal and having two apertures 79 to fit over the above-said cylindrical mountings 74, is attached to the block 65 over the surface of the block to protect the slide-way of the rack against dust. The apron is secured in place by means of screws 88.

As a refinement for the purpose of more accurately controlling the swing of master plate 33, I have included in a modified species of my device a vertically disposed worm gear 89 mounted within bearings 90 at the top and 91 at the bottom, the latter being a part of bracket 26. The worm is in mesh with a geared member 92 keyed to an axial extension 93 of shaft 30 and secured to the master plate 33 by means of screws 94. A knob 95 on top of the worm shaft 96 serves to rotate the worm and by means thereof to swing the master plate in an arc from said shaft 30 to a desired angle. The degree of the elevation of the master plate can be ascertained from calibrations 40 as best shown in Figure 2.

In connection with the description of my device, I wish to refer to certain elements used with or named in connection with the operation thereof. These include a gauge block 97 shown in Figure 12, an abrasive wheel 98 shown in Figures 1, 18 and 19, and tools ground with the aid of the abrasive wheel dressed by my device, the tools being indicated by numerals 99, 100 and 101. Now I shall describe the manner of use of my device:

Generally, my device, or a dresser as the device will be alternately referred to herein, is designed for operative engagement with an abrasive wheel from below so that the diamond point used in dressing the wheel will move in a plane at right angle to the plane of rotation of the abrasive wheel. As already indicated in the specifications, my dresser includes a horizontally disposed index plate 11 adapted for rotation around a vertical axis. A master plate 33, which may be set vertically, supports a turntable which is mounted for rotation on a horizontal axis. This latter construction would permit the setting of the diamond point for a radius dressing of the periphery of the wheel, while the rotary movement on a vertical axis would permit radius dressing of the wheel provided that the diamond point was set up for operation on a level with the axis of the abrasive wheel. The use of dressing the wheel for radii is only incidental, and not the primary purpose of my improvement.

Where my device is of particular use is in dressing the wheel along straight lines defining the angles of the operative ends of the tools to be ground with respect to the abrasive wheel. Specifically, where a wheel is to be dressed at an angle, the master plate 33 is set up vertically, and the face of the turntable is adjusted so that its straight side is parallel to the top side of said master plate. As the turntable is provided with calibrations 53 in degrees and as said calibrations may be read with respect to an index line engraved on the master plate as shown by nu-

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meral 54 in Figure 1, it will be obvious that the turntable may be turned to any angle desired. In order to do that, it would be necessary to loosen the binding bolt 47, which may be done by means of the handle 51 on nut 50 on the end of the bolt as shown in Figure 7. Once the desired angle has been attained, the nut 50 is tightened by means of said handle, preventing the rotation of the turntable.

Instead of depending upon calibrations where quick setting may be required, I have provided gauge blocks 97 of different lengths, which gauge blocks as shown in Figure 6 may be placed at the conjunction of the flange plates 42 and 43 as illustrated in Figure 6. When a gauge block 97 is placed between said flange plates 42 and 43, the rotation of the turntable will be limited by a stop pin 58. For better understanding of the illustration in Figure 6, said figure ought to be viewed from the left side so that flange plates 42 are at the bottom. It will be understood that a plurality of such gauge blocks may be used, each of them marked for the number of degrees to which the turntable may be rotated until the stop pin 58 will encounter its respective side.

As another means of limiting the rotation of the turntable to any desired degree, I am using movable check pins 61. These are mounted partly within the T-slot 60 and may be shifted within said slot and secured in place by tightening nut 64 so as to limit the rotation of the turntable to any degree desired and first ascertained by calibrations 53. Once the turntable has been set to a desired angle the diamond points 75 will be carried on a slide 67, say, from a position shown in dotted lines in Figure 6 to a position shown by solid lines. The movement of the slide with the diamond point is effected by means of the rack and pinion arrangement described in the specifications, shown in detail in Figure 7, and operated by means of a knob 70 on shaft 69.

Assuming that a tool like that shown in Figure 17 is to be ground by means of the abrasive wheel, said wheel must be dressed so as to be suitable for grinding face 102 of said tool at the required angle, while a provision also has to be made for what is known as the clearance angle of the tool. In explanation, it must be said that, in dressing the wheel for grinding a form tool designed, say, to cut gear teeth, allowance for the clearance angle of the tool must be made as the depth of the cut to be made by the wheel is to be gauged vertically on a line passing through the center of the grinding wheel and not from the top of the tool on a line parallel to the side thereof. This is illustrated in Figure 18 where a clearance angle of the tool is indicated by letter *a* while the depth of the vertical cut desired in the tool is indicated by letter *b* and where the true depth of the form desired is indicated by letter *c*.

Allowance for said clearance angle is made in my device by tilting the master plate 33 from its normal, vertical position to a desired number of degrees which will be indicated on calibrations on the upper surface of arcuate braces 36. The calibrations will be read with respect to a line 41 on the top of a respective bracket as shown in Figure 2. It is assumed that nuts 39 shown in Figure 2 will be unloosened before the plate is swung to a desired angle, and that they will be tightened in place once the angle has been set.

In using the grinding wheel as dressed by my device a special auxiliary fixture is contemplated

which is not shown here, but which includes the same elements of construction—namely, a horizontal index plate, a vertical master plate capable of being tilted, a turntable thereon, and a straight-line slide on the turntable—with this difference, however, that instead of supporting diamond points, the slide would support clamping means. These would hold in place a blank to be ground into a tool. The setting on this auxiliary fixture would be made exactly the same as on my dresser so that, when the blank is brought into engagement with the grinding wheel, the angles for which the wheel is dressed would be automatically reproduced in the blank.

When a tool like that shown in Figure 16 and marked 100 is to be ground, an additional adjustment has to be made for the angle of the cutting head 103 with respect to the side thereof, this being the helix angle of the screw to be cut by said tool. In Figure 16, this would be the angle between line 105 at the base of the head 103 and the side 104 of the tool. An allowance may be made for this helix angle in my device, in addition to the setting already specified above, by rotating the index plate to the number of degrees corresponding to the angle of said inclination of the cutting head to the side of the tool. It will be understood that the blank to be ground into a forming tool, and held in the above-mentioned auxiliary fixture, would have to be held in said fixture at the same helix angle at which the diamond point is applied to dress the wheel.

It will be understood that some changes may be made in the construction of my device without departing from the inventive principle disclosed herein. What I, therefore, wish to claim is as follows:

1. A dressing device of the kind described, including in combination a flat base, a semi-circular index plate axially mounted for rotation thereon and calibrated in degrees along its outer periphery, the index plate having an integral extension defined by three sides of a rectangle, the fourth side of the rectangle being the line of junction to said index plate, a pair of parallel brackets rising vertically from the sides of said extension, a rectangular master plate mounted upon a horizontal shaft journaled in said brackets to permit the master plate to be rotated upon said shaft from a normally vertical position to a position at an angle thereto, a disc-like turntable axially mounted for rotation on the face of the master plate and having calibrations in degrees along its periphery, a straight-line slide disposed on the top face of the turntable, rack and pinion means to move the slide in a straight line upon said turntable, means on the slide having diamond-cutting members to dress the grinding wheel, and separate screw-nut means to lock in place the index plate, the master plate and the turntable thereon, respectively.

2. A dressing device of the kind described, including in combination a flat base, a semi-circular index plate axially mounted for rotation thereon and calibrated in degrees along its outer periphery, the index plate having an integral extension defined by three sides of a rectangle, the fourth side of the rectangle being the line of junction to said index plate, a pair of parallel brackets rising vertically from the sides of said extension, a rectangular master plate mounted upon a horizontal shaft journaled in said brackets to permit the master plate to be rotated upon said shaft from a normally vertical position to a position at an angle thereto, the master plate having on its

underside two arcuate braces drawn to an arc from the axis of the horizontal shaft and provided with calibrations in degrees upon the surface thereof, the calibrations to be read against a mark on a bracket, a disc-like turntable axially mounted for rotation on the face of the master plate and having calibrations in degrees along its periphery, a straight-line slide disposed on the top face of the turntable, rack and pinion means to move the slide in a straight line upon said turntable, means on the slide having diamond-cutting members to dress the grinding wheel, and separate screw-nut means to lock in place the index plate, the master plate, and the turntable thereon, respectively.

3. A dressing device for abrasive wheels, said dressing device including a flat base, a semi-circular index plate axially mounted for rotation upon said base and calibrated in degrees along its outer periphery, the index plate having a horizontal, integral extension on the level of said index plate, a pair of parallel, vertical brackets on said extension, the brackets being spaced from each other, a rectangular master plate mounted upon said brackets and adapted to be swung from a normally vertical position to a position at an angle thereto, said master plate having flange plates at two lower corners projecting above the top surface of said master plate for support of a replaceable gauge block in the respective corner, a disc-like turntable axially mounted for rotation on the face of the master plate and having calibrations in degrees along its periphery, a stop pin radially extending beyond the periphery of the turntable for abutting engagement with said gauge blocks in the course of the rotation of the turntable, a slide disposed on the top face of the turntable, rack and pinion means to move the slide in a straight line upon said turntable, means on the slide having diamond-cutting members to dress the grinding wheel, and separate screw-nut means to lock in place the index plate, the master plate and the turntable thereon, respectively.

4. A dressing device for abrasive wheels, said dressing device including in combination a flat base, a semi-circular index plate axially mounted for rotation upon said base and calibrated in degrees along its outer periphery, the index plate having a horizontal, integral extension substantially on the level of said index plate, a pair of parallel, vertical brackets on said extension, the brackets being spaced from each other, a rectangular master plate mounted upon said brackets and adapted to be swung from a vertical position to a position at an angle thereto, said master plate having a circular T-slot upon its upper surface, a movable check pin slideably seated within the slot and projecting above the surface of the master plate, a disc-like turntable axially mounted for rotation upon said master plate, but of a diameter smaller than the circle defining the T-slot, said turntable having calibrations in degrees along its outer periphery, a radial arm extending from said turntable and holding a stop pin for encounter in the course of the rotation of the turntable with said check pin, a slide disposed on top of the turntable, rack and pinion means to move the slide in a straight line upon said turntable, diamond-enclosing members on the slide for wheel dressing and separate screw-nut means to lock in place the index plate, the master plate, the turntable and the check pin, respectively.

5. A dressing device of the kind described, comprising in combination a flat base, a calibrated plate mounted thereon for rotation on a vertical

axis, two upright brackets on said plate, a rectangular master plate mounted at its lower end on a horizontal shaft journaled in said brackets for limited rotation of said master plate on a horizontal axis, angle flanges on said master plate at its lower corners for support at each corner of gauge blocks of graduated lengths, a circular turntable mounted centrally with respect to the lower corner for rotation on the master plate, a stop pin affixed to the turntable along its periphery for abutment against a gauge block held within the flanges of the respective corner to limit the extent of the rotation of the turntable, a straight-

line slide on the face of the turntable and diamond-point enclosing means on the slide for wheel dressing.

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