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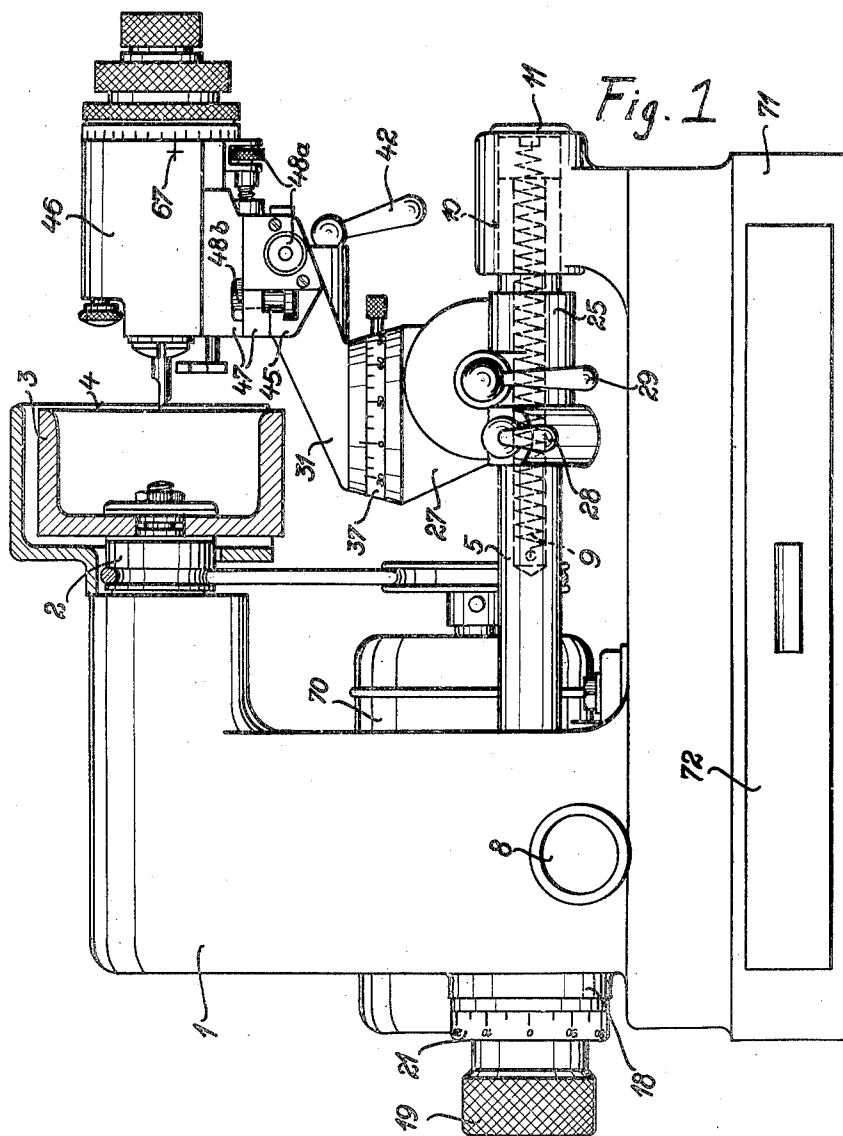
K. ZWICK

2,144,095

CUTTER GRINDING MACHINE

Filed July 16, 1936

4 Sheets-Sheet 1



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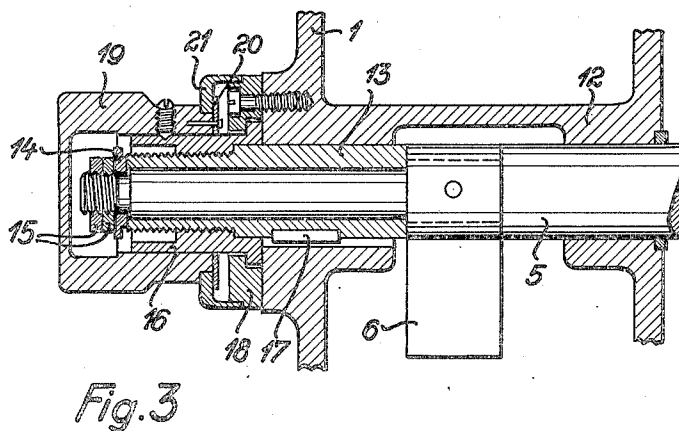
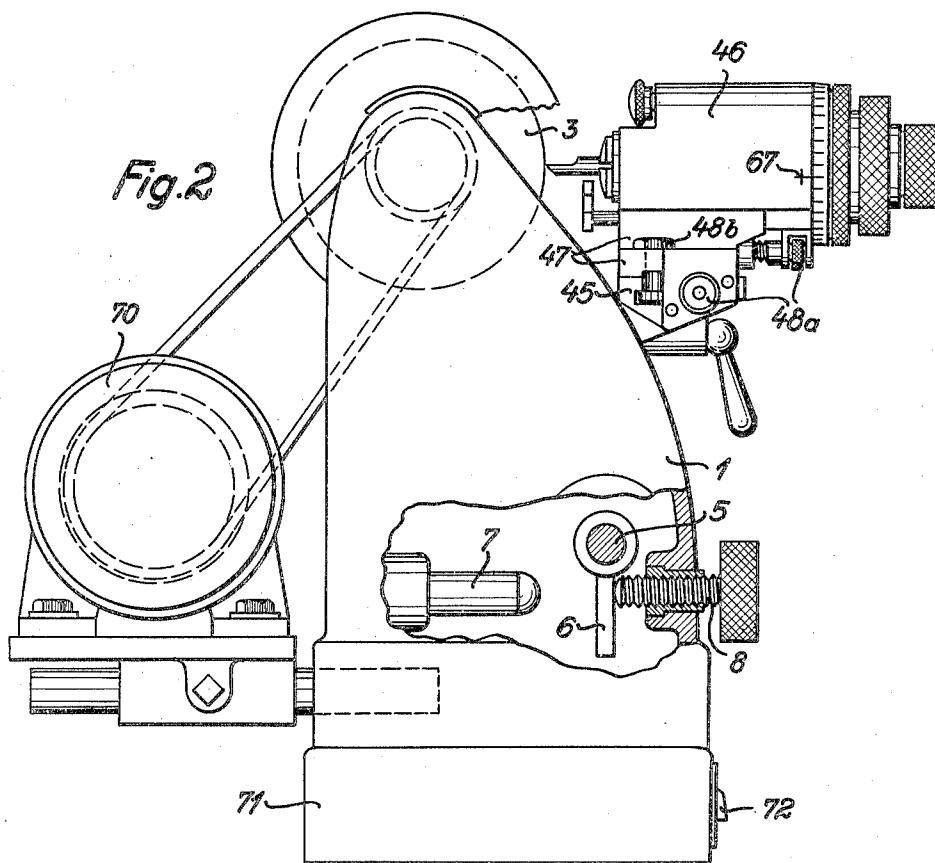
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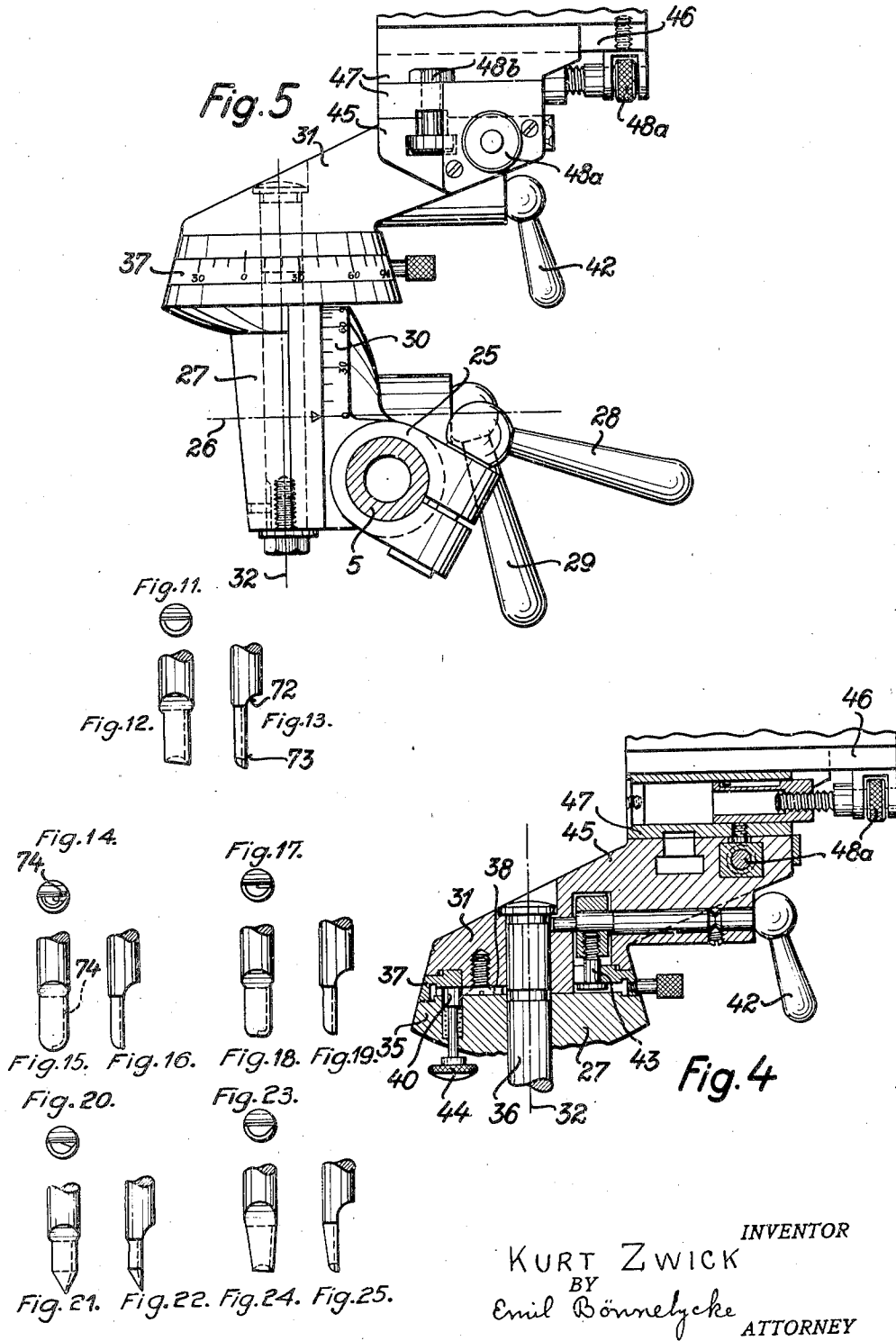
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Fig. 6

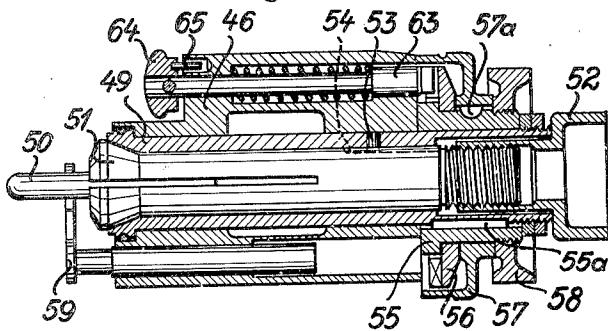


Fig. 8

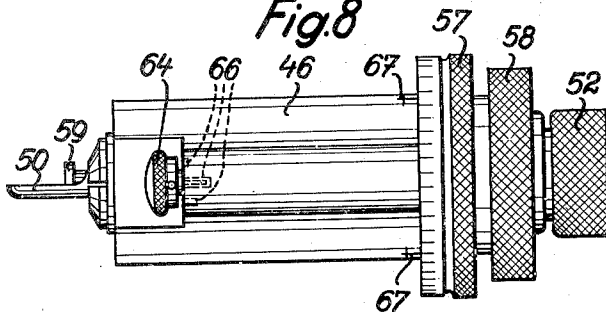


Fig. 10

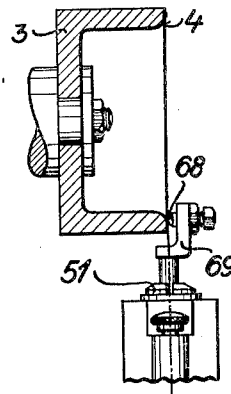


Fig. 9

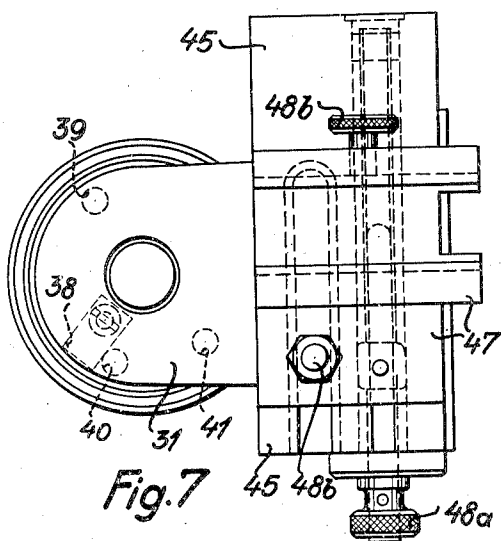
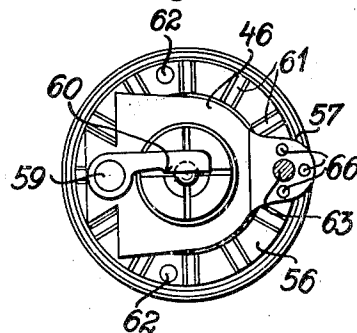


Fig. 7

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UNITED STATES PATENT OFFICE

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CUTTER GRINDING MACHINE

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Application July 16, 1936, Serial No. 90,998
In Germany July 22, 1935

10 Claims. (Cl. 51—124)

The invention relates to machines for grinding tools such as the cutters used in engraving machines, its object being to provide a machine enabling such work to be performed with great accuracy but also without involving difficult or delicate manipulation.

An embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figs. 1 and 2 are front and side elevations thereof respectively, both partly in section.

Fig. 3 is a sectional view of mechanism for adjusting the work holder horizontally in relation to the grinding tool.

Fig. 4 is a sectional view of part of the support of the work holder, and

Fig. 5 is an elevation of this part of the machine, including the remainder of the support.

Fig. 6 is a sectional view of the work holder,

Fig. 7 a plan view of a bed and slide carrying the work holder,

Fig. 8 a view of the work holder with its casing removed, and

Fig. 9 shows part of the mechanism for fixing the work in the holder.

Fig. 10 is a sectional view of the grinding tool, together with a device for truing the same.

Figs. 11, 12 and 13 are respectively an end view and two side views, partly broken away, of a cutter or graver ground by the machine.

Figs. 14, 15 and 16 are similar views of another form of cutter which can be ground by the machine, and

Figs. 17, 18, 19, Figs. 20, 21, 22, and Figs. 23, 24, 25 show further examples.

The grinding machine shown has a stand 1 in which the grinder spindle 2 is mounted in the usual manner. The grinding tool 3 is cupped, with a flat rim surface 4 serving as the grinding face and enabling perfectly even surfaces to be produced by grinding. A bar 5 is mounted in the stand 1, parallel with the grinder spindle, and carries the work holder 46. This bar is rotatable to a limited extent about its longitudinal axis, its rotation in one direction being limited by an arm 6 (Fig. 2), which when moved in one direction strikes a rubber stud 7 and when moved in the opposite direction strikes a set screw 8. The bar can be moved longitudinally, for which purpose the device shown in detail in Fig. 3 is used.

The bar 5 has a bore at its right hand end for reception of a coiled spring 9. One end of this spring is fastened to a stud in the bore, and the other end is attached to a disc 11 which closes the bore in a bearing 10 supporting the

bar. The left hand end of the bar is mounted at 12 in the machine stand and carries a sleeve 13, which is rotatable on the bar but is not slidable thereon, as it is held between the arm 6 and a washer 14 retained by nuts 15. This sleeve 13 has an external screw thread engaging a nut 16, and a spline 17 on the sleeve engages a groove in the stand 1, so that the sleeve cannot rotate relatively to the stand. The nut 16 is fixed to the stand 1 by a ring 18, and carries a cap 19, which covers the end of the bar 5. The rim of the cap has a seat for a scale ring 21, retained thereon by a resilient collar 20, and the scale ring engages a seat formed on the rim of the ring 18, which has thereon an index mark pointing to the scale. The scale ring 21 can be rotated in relation to the cap, but its frictional engagement with the cap is sufficient to cause it to rotate with the cap when the latter is turned.

Rotation of the cap 19, which is fixed to the nut 16, imparts axial movement to the bar 5, which remains free to rotate in its bearings. With the bar in any selected position the scale ring 21 can be set to zero, and the extent of any movement of the bar from the selected position, due to rotation of the cap, is then indicated on the scale. If for example the pitch of the screw is 1 mm. and the scale ring has 100 equal divisions the rotation of the ring through one scale unit imparts axial movement to the extent of 1/100 mm. Idle screw movement is prevented by the pull of the spring 9.

Between the stand 1 and the bearing 10 a second sleeve 25 (Fig. 5) is mounted on the bar 5, and this sleeve 25 carries a support 27 adapted to be rotated about a transverse axis 26. The sleeve 25 can be locked on the bar 5 by a handle 28 and the support 27 can be locked on the sleeve by means of a handle 29, the angular position of the support in relation to the bar being indicated by a scale 30. On the support is mounted an arm 31 carrying the work holder 46, the arm being rotatable about an axis 32 perpendicular to the axis 26, so that the work holder can be swung from the position shown in Fig. 2 to the position shown in Fig. 1. The swinging movement is limited by two stops, one of which is preferably adapted to be rendered inoperative so that the work holder can be moved beyond the last mentioned position if desired.

As shown in Figs. 4 and 5, the arm 31 is mounted on the head 35 of the holder by means of a pivot 36, so that it can easily be rotated without any tendency to wobble. The arm 31 carries a rotatable ring 37 having a handle, and

below this ring there is fixed to the arm 31 an abutment plate 38, which can move between two stops 39, 40 (Fig. 7) on the head 35. The stop 40 can be rendered inoperative as hereinafter to be described. In the ring 37 there is another stop 41 (Fig. 7), which coacts with the stops 39, 40; by adjusting this ring relatively to the work holder the angle of rotation of the latter may be limited as required. To this end the ring 37 can be clamped to the arm 31 by means of a handle 42 which actuates a bolt 43 by means of an eccentric. The ring 37 is provided with a scale which indicates the angular adjustment. The stop 40 is in the form of a plunger held by a spring in the path of the plate 38 and removable from the same by pulling a knob 44.

The arm 31 has at its upper end a bed or guideway 45, and the housing 46 of the workholder is supported thereon by means of a slide 47, which is movable on the bed transversely of the axis of the tool, and with which the housing of the tool holder is slidably engaged for axial adjustment. This enables adjustment to be made for grinding cutters of widely different lengths, and it also enables cutters to be produced for cutting grooves of exactly semi-cylindrical cross section (Fig. 12) or cutters with rounded edges (Fig. 13). Screws 48a and 48b serve for adjusting and for fixing the work holder and the slide 47. Rotatably mounted in the center of the housing there is a tube 49 (Fig. 6), which accommodates jaws 51 for holding the work 50, with the appurtenant tubular nut 52. A pin 53 engages a groove in the jaws and prevents them from rotating relatively to the tube 49. With the tube is coupled a second tube 55, which carries a lock ring 56, a scale ring 57 and a nut 58. The lock ring can by means of this nut be coupled in any desired position with the tube 49 and consequently with the work 50. The scale ring is, however, keyed to the tube 55, to prevent accidental rotation. This locking means renders it necessary to introduce the work at the start in a definite position in the jaw 51. For exactly ascertaining this position a withdrawable stop 59 is provided in the foot 47 of the housing, said stop having a face 60 which is exactly radial (Fig. 9). Blanks machined to semi-circular cross section are placed against said face when inserted and after adjusting the scale ring 57 to zero, with simultaneous rotation of the tube 49, the nut 52 is tightened, whereupon all working angle adjustments can be made in accordance with the graduations on the ring 57.

The lock ring 56 is provided with a number of radial grooves 61 (Fig. 9), and with two stops 62. In the upper part of the housing 46 there is mounted opposite said ring 56 a spring loaded pin 63, which projects from the housing for a distance depending on the position of the stop 65 on its head 64, said stop being adapted to engage into bores 66 of different depths in the housing (Fig. 8). In this way the pin is able in one position to engage into the grooves 61, whereas in another position it only co-acts with the stops 63, and in a third position, when it projects least, it allows said stops to pass, so that the work is able to rotate freely through 360°. The stops 62 are so fitted to the lock ring 56 that they permit the work to rotate through 180°. If the work is to be rotated from a certain position in opposite directions through 90° the lock ring must be so adjusted that the stops 62 register with two marks 67 (Figs. 1, 2 and 8) on the housing 46. The stops are preferably provided with similar marks.

The grinding disc is trued up by means of a diamond 68 which is mounted in a holder 69 so that its point lies exactly in line with the axis of the work holder when the holder is fixed in the jaw 51 in place of a cutter.

A motor 70 is preferably fixed to the rear of the machine to drive the grinder spindle, so that the grinding machine forms an independent unit which can be fitted to any convenient work-bench. The machine is also preferably provided with a bed 71 containing a drawer 72 in which a large number of cutters may be kept.

From the above description it will be clear that it is possible with this machine to grind with great precision all the faces of any engraving cutter or similar tool. Limitation of the rocking movement during grinding, by means of the screw 8, is very important, since it prevents damage to the sensitive edge of the grinder disc by the face 72 of the cutter (Fig. 11). Other important features are the limitation of the grinding angle by the stops 38 to 41, which enable a certain grinding angle to be maintained and the truing up, which enables the cutter shank to be exactly halved when grinding the breast face 73, and finally the intermediate member 27, which not only permits the holder to tilt about the axis 26, but also (in combination with the guide 45, 47) enables the cutting edges 74 of the half round cutter shown in Fig. 12 to be ground in one operation. To this end the desired cutting angle is set by the scale 30 (Fig. 5) and the holder 46 is at the same time so moved in the guide 47 that the stationary grinder disc contacts with all points of the cutting edge. Then the straight part of the cutting edge is machined, while tightening up the nut 19, and finally, without altering the adjustment of this nut, the cutting edge is ground to a finish by rotation about the axis 32, whereby said cutting edge is made perfectly circular with the desired cutting angle at all points.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a machine for grinding cutters and like tools the combination of a horizontal spindle, a grinding tool carried by said spindle, a work holder, a bar parallel with said spindle, a sleeve rotatable on or with said bar, a member pivoted on said sleeve on an axis transverse of the axis of said bar and a pillar pivoted near its one end on said member on an axis transverse of the axes of the said bar and said member, the said pillar carrying the work holder at its other end.

2. The combination claimed in claim 1, together with a stand rotatably supporting said bar, an abutment on said bar, an adjustable stop on said stand, coacting with said abutment to limit rotation of said bar in one direction, and a second abutment on said stand, coacting with said abutment to limit rotation of said bar in the other direction in a position wherein said work holder supporting means holds said work holder remote from said grinding tool so that the work is held clear of said tool.

3. The combination claimed in claim 1, said work holder including a housing, a tube rotatable in said housing, clamp jaws in said tube for holding the work, a scale ring on said tube, a notched lock ring rotatable on said tube, an axially movable pin mounted on said housing adapted to engage the notches in said lock ring, and means for fixing said lock ring to said tube.

4. The combination claimed in claim 1, said work holder including a housing, a tube rotatable in said housing, clamp jaws in said tube for hold-

ing the work, a scale ring on said tube, a notched lock ring rotatable on said tube, two abutments on said lock ring, an axially movable pin mounted on said housing, adjustable so that it can be made to engage the notches in said lock ring, or lie between said abutments in the path thereof, or be clear of said notches and also of said abutments, and means for fixing said lock ring to said tube.

5 5. The combination claimed in claim 1, said work holder including a housing, clamping jaws in said housing for holding the work, and a movable abutment carried by said housing, having a surface adapted by movement of said abutment to be positioned in front of said jaws so as to
10 15 contact with a radial face of a blank inserted between said jaws.

6. The combination claimed in claim 1 the work holder being adjustable in the pillar in the direction of its own axis.

20 7. The combination claimed in claim 1, the work holder being adjustable in the pillar in the direction of its own axis and also in the direction transverse of its own axis.

8. The combination claimed in claim 1, together with abutments limiting the rotation of said pillar with respect to the said member.

9. The combination claimed in claim 1 having a fine adjustment for said bar in direction parallel to the grinding tool spindle, comprising a stand supporting said bar, a screw threaded member and a nut thereon for axially adjusting said bar in said stand, and a scale ring frictionally engaged with said nut for rotation therewith but adapted to be rotated on said nut for adjustment to any selected scale position.

10. The combination claimed in claim 1, and comprising a screw threaded member and a nut thereon for axial adjustment of said bar, and a scale ring rotatable with said nut, the screw threaded member having a pitch of 1 millimeter or a multiple thereof, and the scale having a decimal graduation, so that each axial displacement of the said bar can be determined in decimal parts of millimeters.

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